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## ADMINISTRATION

The Board of Regents

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Paul R. Wunsch, Kingman
Max Bickford, Executive Officer, Topeka

# Kansas State University President 

James A. McCain

## Business Directions

General information about Kansas State University is obtainable from the President.

Prospective undergraduate students should communicate with the Dean of Admissions and Records in 118 Anderson Hall.

Prospective graduate students should communicate with the Dean of the Graduate School in 101 Fairchild Hall.

| Volume 55 |
| :--- |
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## FALL SEMESTER 1971-72

## August 26-28, Thursday-Saturday

Registration of all students, staff and school teachers, including physical exams, testing and orientation.

August 30, Monday
Classes begin. Late fee, $\$ 2.50$.

## September 3, Friday

End of first week. Late fee, $\$ 5$ for subsequent enrollment.

September 6, Monday
Labor Day. No classes.
September 10, Friday
End of second week. Last day to enroll without Dean's permission.

## September 17, Friday

Last day for all students except new undergraduate students to drop courses without a Wd or Failure being recorded.

## CALENDAR

## October 8, Friday

End of sixth week. Last day to withdraw and receive a partial fee refund.

October 11, Monday
Tentative copies of doctors' dissertations, with abstracts, due in major professor's office.

## October 15, Friday

Mid-semester grade reports for freshmen and sophomores due in Admissions and Records.

October 19, Tuesday
Tentative copies of masters' theses and reports, with abstracts, due in major professor's office.

## October 29, Friday

End of ninth week. Last day for new undergraduates to drop courses without a Wd or Failure being recorded.

## November 1, Monday

Dissertation approval forms due in Graduate Dean's office.

## November 11, Thursday

Finat date of doctors' oral examinations. Masters' approval forms due in graduate office.
November 16, Tuesday
Final date of masters' oral examinations.
November 23, Tuesday
10 p.m. Thanksgiving student recess begins. Thanksgiving Day is November 25.

## November 23, Tuesday

Final copies of doctors' dissertations due in Graduate Dean's office.
November 29, Monday Classes resume.
December 1, Wednesday
Final copies of masters' theses and reports due in Graduate Dean's office.

## December 3, Friday

Last day subject may be dropped.
December 13-21, Monday-Tuesday
Semester examinations for all students.
December 22, Wednesday Noon
Deadline for grades to Admissions and Records.

## SPRING SEMESTER 1972

## January 13-15, Thursday-Saturday

Registration of all students, staff and school teachers, including physical examinations, testing and orientation.
January 17, Monday
Classes begin. Late fee, $\$ 2.50$.
January 21, Friday
End of first week. Late fee, $\$ 5$ for subsequent enrollment.

January 28, Friday
End of second week. Last day to enroll without Dean's permission.
February 4, Friday
Last day for all students except new undergraduate students to drop courses without a Wd or Failure being recorded.
February 21, Monday
Washington's Birthday. No classes.
February 25, Friday
End of sixth week. Last day to withdraw and receive a partiai fee refund.
March 3, Friday
Mid-semester grade reports due in Admissions and Records.

## March 7, Tuesday

Tentative copies of doctors' dissertations with abstracts due in the major professors' office.

## March 17, Friday

End of ninth week. Last day for new undergraduate students to drop courses without a Wd or Failure being recorded.
Classes after 1:20 p.m. will not meet.
March 18, Saturday
All-University Open House.

## March 20, Monday

Tentative copies of the masters' theses and reports with abstracts due in the major professors' offices.

## March 25, Sałurday

Spring student recess begins. Easter is April 2.
April 4, Tuesday
Classes resume.
April 6, Thursday
Doctors' dissertations approval forms due in Graduate School office.
April 12, Wednesday
Approval forms due in Graduate School office for masters' candidates.

## April 14, Friday

End of period for doctors' oral examinations.

## April 20, Thursday

Final copies of doctors' dissertations due in Graduate School office.
April 21, Friday
End of period for masters' oral examinations.
April 27, Thursday
Final copies of masters' theses and reports due in Graduate School office.
April 28, Friday
Last day a subject may be dropped before end of semester.
May 8-16, Monday-Tuesday Semester examinations for all students.
May 12, Friday
Commencemen $\dagger$
May 17, Wednesday Noon
Deadline for grades to Admissions and Records.

## SUMMER TERM 1972

June 5-July 28
Sessions of eight, three and one week's duration.


## THE UNIVERSITY

The University, founded on February 16, 1863, was established under the Morrill Act, under which land-grant colleges came into being. At first the University was located on the grounds of the old Bluemont Central College, chartered in 1858, but in 1875 most of the work of the University was moved to the present site. The campus is at the northwest corner of the city of Manhattan, convenient to both business and residential sections. The campus itself consists of 315 acres carefully landscaped, on which the main buildings, most of them constructed of native limestone, are located. Beyond the campus there are 4,036 acres of land belonging to the University which are used for experimental work in agriculture. In addition there are five branches of the Agricultural Experiment Station located at Hays, Colby, Garden City, Mound Valley, and Tribune, totaling 4,555 acres plus a number of outlying experimental fields.



## Objectives of the Educational Program at Kansas State University

The objectives of the educational program at Kansas State University are to develop an individual capable of applying an enlightened judgment in his professional, his personal, and his social life. To that end the University program is designed:
I. To provide full and efficient counseling and guidance to the student while in the University. Specifically, this means to:

1. Learn and make known to the student before he enrolls all that is possible and useful about his interests, aptitudes, and abilities.
2. Apply that knowledge to the student's choice of courses and curriculums as fully as possible without encroaching harmfully on his initiative and feeling of selfresponsibility.
3. Provide continuing guidance for the student according to his needs.
II. To prepare the student adequately in a technical sense for an occupation or a profession which includes an organized body of information and theory so that he may realize his creative potentialities in the field of his choice. More specifically this means that the student should acquire:
4. The ability to recognize and master fundamental principles in his field of specialization.
5. The knowledge basic to his special field of study.
6. The ability to reason critically from facts and recognized assumptions to useful technical conclusions.
7. The basic skills associated with his field of study.
8. A professional attitude in his chosen work.
III. To provide every student with an opportunity to gain the knowledge and abilities which members of a democratic society, relative to their capabilities, need to possess in common, whatever occupation or profession they expect to enter. Specifically, this means that through its total program the University undertakes to help the student to:
9. Develop his communication skills.
10. Develop the ability to apply critical and creative thinking to the solution of theoretical and practical problems.
11. Understand the basic concepts of the natural sciences, the interrelations of the natural and social sciences, and the impact of science on society.
12. Comprehend and evaluate the processes and institutions in society at home and abroad, and develop a dynamic sense of his personal responsibilities as an effective citizen in a democratic society.
13. Develop habits of self-evaluation, responsibility, and enterprise which will increase the effectiveness of the educative process in college, and provide the basis for continued self-improvement.
14. Develop a well-adjusted personality, good character traits, and a sound philosophy of life.
15. Prepare for effective participation in family life.
16. Utilize actively and fully his capacity for esthetic appreciation and enjoyment.
IV. To stimulate the faculty and students to extend the boundaries of knowledge through critical and creative thinking and experimentation.
V. To provide the facilities for extending education outside the boundaries of the campus to the members of the community which the institution serves.


## GENERAL INFORMATION

## Accrediting

Kansas State University is fully accredited by the North Central Accrediting Association and by various professional accrediting agencies. Credit earned at K-State is transferable to other institutions.

## Admission of Undergraduates

Students interested in attending Kansas State University should write to the Admissions Office for an application form. The student should complete the form and return it to the Admissions Office. All correspondence about admission should be addressed to this office.

## Admissions Counseling

The Admissions Office is open weekdays during the academic year for admissions counseling. Campus offices are closed Saturday.

Students and parents are always welcome, and are encouraged to visit the campus for individual counseling. However, it is advisable to write two weeks in advance for an appointment. Normally several counselors are available for consultation concerning educational plans.

The Admissions Office is located in the center of the main administration building, Anderson Hall.

## High School Graduates

Residents of Kansas who are graduated from an accredited Kansas high school are admitted to Kansas State University. Out-ofstate applicants are expected to have a strong academic rank in class and to have made good scores on the American College Test battery.

No academically qualified applicant will be denied admission to the University on the basis of race, color, religion, or national origin.
Specific admission procedures are given to each student at the time he inquires about admission. Students should apply early in the senior year of high school.

## High School Prerequisites

Entering freshmen should have completed the high school mathematics courses which
are a necessary prerequisite for their curriculum as listed below. The capital letters correspond to the section on undergraduate degrees. See pages 11 and 12.
(A) One unit of algebra, or one unit of geometry, or a unit involving the combination of these, or approved substitute.
(B) One unit of algebra.
(C) Two units of algebra, or one unit of algebra and one unit of geometry.
(D) One unit of algebra and one unit of geometry.
(E) One and one-half units of algebra and one unit of geometry.
(F) Two units of algebra, one unit of geometry, and one-half unit of trigonometry.
In addition, entering freshmen should have completed at least three units of high school English and one unit of high school science.

## Transfer Students

All transfer students (those with previous college credit) are expected to have at least a 2.0 (C) average in previous academic work to be considered for admission to the University. This applies to Kansas and out-of-state transfer students.

Most credits from accredited junior and senior colleges and universities are transferrable to K-State. Transcripts of record should be sent to the Admissions Office directly from each institution previously attended. Unofficial transcripts and grade summaries should not be submitted by the student since these are not acceptable by the University.

Transfer students should apply for admission approximately six months prior to the term they wish to enter.

## American College Test (ACT)

Freshmen applicants to KSU are required to take the ACT and have their test scores forwarded to the University. The test should be taken on one of the national test dates throughout the year, preferably in October. Numerous test centers are available throughout the state and nation. Further information about the ACT can be obtained from your high school counselor or principal.

## Advanced Placement Examinations

A student who has completed one of the College Entrance Examination Board Ad-
vanced Placement Tests should have a report of his scores sent to the director of admissions at Kansas State University. College Board Advanced Placement Tests are given in May of the senior year in high schools offering advanced placement courses. Subjects include American history, biology, chemistry, English, European history, French, German, Latin 4, Latin 5, mathematics, physics and Spanish. Credit is given for scores of 5,4 , or 3 . Scores of 2 are referred to the appropriate department head for review. No credit is given for scores of 1 .

## Enrollment

Students who have been admitted to Kansas State University will be scheduled for enrollment. Enrollment for the fall semester normally takes place in June and July of each year. Students are scheduled in groups of approximately 200 in number for enrollment sessions in July. Specific information and instructions are sent to each student at the time the acceptance letter is mailed.

## New Student Advisement

Each new student is assigned a faculty adviser at the beginning of the school year. This adviser is available to him any time he needs help. Faculty advisers assist students in defining goals to be reached in college, give information regarding appropriate curriculums and courses, and discuss personal problems students may have, especially problems related to the student's progress and plans for subsequent work.

## Late Admission

A student who seeks to enter the University later than ten calendar days after the start of the semester is admitted only by special permission of his dean. Those who enroll after the regular registration period and prior to the end of the first week pay a late enrollment fee of $\$ 2.50$. University staff members, including graduate assistants and graduate research assistants and teachers employed in elementary and secondary schools, do not pay this fee. However, anyone enrolling after the first week must pay a $\$ 5$ late enrollment fee.

## Physical Examinations

Board of Regents' regulations require all new students to take a physical examination prior to registration.

It is recommended that all seniors take a physical examination and chest X ray prior to graduation.

Students who have been out of school one semester or longer are required to have a chest $X$ ray upon return.

## Special Students

A special student is one not regularly enrolled in work for a degree. Special students are expected to meet the same admission requirements as regular students. Students who will enroll for only a few courses may wish to apply under this category.

Under certain circumstances, outstanding high school students are admitted for the summer only as special students to take several courses between their junior and senior years. To be considered for such admission the student must have the recommendation of his high school principal and have an outstanding high school academic record.

Adults who are not high school graduates are sometimes admitted as special students if the high school work they completed was of good quality, or if they show promise of collegiate success as evidenced by scores on the American College Test battery.

Special students are subject to regulations for regular students, and are responsible for payment of all fees, regular attendance at classes and maintenance of satisfactory standing.

## Extension and Correspondence Credit

College-level credit earned through accredited extension divisions may be applied toward credit requirements for a degree at this institution. The credit must be applicable to the curriculum chosen and the amount of such credit which can be used is limited. In the College of Arts and Sciences a total of 30 semester hours of acceptable correspondence and-or extension work may be applied toward a degree.

## Credit by Examination

Credit may be granted to entering freshmen and other students in any subject if a comprehensive course content examination is passed.

The fee for taking an examination to obtain college credit (in lieu of attending classes) is $\$ 3$ per semester credit hour in which
examined for residents of Kansas and staff members, and $\$ 9$ per semester credit hour for non-residents.

Permission to take such an examination is issued by the student's dean after consultation with the head of the department in which the course is given. This fee must be paid before taking the examination and is not subject to refund; this service is available only to students who are or have been regularly enrolled and is not applicable to Continuing Education courses. Grades received on these examinations will be recorded on the student's permanent record.

## Service School Credit for Veterans

In general, the University follows the recommendation given in "A Guide to the Evaluation of Educational Experiences in the Armed Services," published by the American Council on Education.

## Assignment to Classes

A student is responsible for fulfilling all the requirements of the curriculum in which he is enrolled. He should consult with his adviser or his dean in planning his work. A student should be familiar with the "General Catalog" statéments about assignments and curriculums, because the catalog is the official source of information.

Catalogs are maintained for student use in the Admissions Office, all deans' offices, the library, and all departmental offices. If a student wishes a personal copy, it may be purchased for a small fee.

No student may be enrolled in classes or for private lessons in music or other subjects before getting an assignment. No assignment is complete until all fees and charges are paid.

Registration and assignment of courses take place as shown on the calendar near the front of the catalog. Later assignments to courses are made during regular office hours by the student's dean or adviser. A student may not enroll later than ten class days after the beginning of a semester or summer session except by permission of his dean. Students should enroll during the regularly scheduled registration periods in order to avoid penalty fees.

A student may not enroll for more than 18 hours including correspondence and extension study unless granted permission to do
so by his dean or dean's representative. However, if the normal assignment in his curriculum is 18 hours, a student may enroll for one additional hour without special permission.

A student whose grades were " $B$ " or better during the preceding semester, and who did not have a deficiency of any kind in that period, may ask to take additional hours. In no case may the total assignment including correspondence and extension work exceed 21 hours.

No more than 16 semester hours of nongraded credit may be assigned for any one academic year, nor may more than 20 hours of non-graded credit be applied toward an undergraduate degree. A non-graded class is one in which no traditional "letter grade" is given. The grades of Cr (credit and NCr (no credit) are given.

A regularly enrolled student must have the permission of his dean to take correspondence or extension courses while enrolled and this is counted as part of the student's semester load.

## Dropping and Adding Courses

No student may drop a course or change an assignment except by a formal reassignment by his dean or dean's representative.

If an instructor recommends a reassignment, a student should confer with his adviser.

The last day for dropping a course without a WD or $F$ being recorded is the 18th day of classes; however, beginning undergraduate students have nine weeks for this purpose.

During the last two weeks of a term, courses may not be dropped.

Students desiring to transfer from one college to another within the University should confer with both deans concerned.

## Class Attendance

Every student is encouraged to attend the classes to which he has been assigned. Each instructor shall establish the manner in which work missed may be made up.

## Withdrawal from the University

A student who withdraws from the University must have an official withdrawal permit from his dean.

If a student other than a beginning undergraduate student withdraws before or on
the 18th day of classes of the semester, no mark shall be reported to the registrar. If he withdraws thereafter, a mark of WD is reported in all courses in which he is passing, and $F$ is reported for courses in which he is not doing satisfactory work. Beginning undergraduate students have nine weeks for this purpose.

## Auditing Classes

Auditing consists of attending a class regularly without participating in class work and without receiving credit. Permission to audit a class is granted by the dean of the college in which the class is offered. A nonrefundable fee of $\$ 1$ a semester hour is charged each auditor except full-time University faculty members and employees. Laboratory courses may not be audited.

## Grades

The University uses the following grades:
A, for excellent work
$B$, for good work
C, for fair work
D, for poor work
F , for failure
Cr , for credit in courses for which no letter grade is given, (non-graded courses).
NCr , for no credit in courses for which no letter grade is given, (non-graded courses).
The report Inc (incomplete) is used at the discretion of the instructor when a student may have further time to complete the required work.

Hours taken on a non-graded basis will be graded by Cr , if passed, or NCr , if not passed. Courses in which a Cr grade is received will be used in fulfilling graduation requirements. Neither Cr nor NCr graded courses will be used in calculating resident grade averages.

## Examinations

A final examination period during which no regular classes meet is scheduled at the end of the fall and spring semesters. Final examinations are given during this period. There is no specially scheduled period for final examinations in the summer session.

A student whose semester grade in any subject is A may be excused from the final examination in that subject at the discretion of the instructor.

Permission for special examinations in subjects not taken in class, or for advanced credit, or to make up failures must be obtained, on recommendation of the department head in which the course is given, from the dean of the college in which the student is enrolled. Permission is granted only if the student has prepared for the examination. The examination must be taken under the supervision of the head of the department in which the course is given. A special examination may be given only to an enrolled student. The charge for such examinations is $\$ 2.50$ per credit hour for residents, $\$ 7.50$ per credit hour for non-residents.

## Report of Grades

As shown on the academic calendar, midsemester grade reports for freshmen and sophomores are sent to deans' offices and to parents at the close of the 7th week. The reports indicate whether a student is doing satisfactory "S", "D", or "F" work.

Other students desiring reports of grades must supply instructors with properly selfaddressed official cards, with postage affixed, after the seventh Saturday of the semester or with their final examination papers. Instructors send reports so requested to the students or to student organizations.

The instructor reports semester grades based on the examination and class work to the director of records.

If a student other than a beginning undergraduate drops a subject not later than the 18th day of classes, no mark is reported to the director of records. Beginning undergraduates have nine weeks for this purpose. An official drop slip from the student's dean is required.

If a student other than an undergraduate drops a subject after the 18th day of classes, either a mark of WD or a semester grade of F is reported, depending on whether the student was passing or failing at the time of dropping the subject. No course may be dropped after the date marking the close of this privilege as shown on the academic calendar. Regardless of the time of withdrawal, however, a final grade is reported and designated as such, if all the required work of the course has been completed.

In case of absence from the final examination, no semester grade is reported until the reason for such absence has been
learned; the instructor reports to the director of records a mark of Inc for Incomplete. If the student's absence is not excused by his dean, a semester grade is reported on the basis of zero for the final examination; but if the absence is excused, a reasonable time, usually not over one month, is allowed within which the examination may be taken.

Instructors leave all class books in the proper departments when semester grade cards have been made out. The head of the department keeps all grade books as a permanent file of the department.

## Points

For each semester hour of graded work a student earns points, according to the grades he makes, as follows: A, $4 ; \mathrm{B}, 3 ; \mathrm{C}, 2 ; \mathrm{D}, 1 ; \mathrm{F}$, 0.

## Scholarship Deficiencies

## Probation, Dismissal

A student's Kansas State University academic record of resident work is used to establish probation or dismissal status.

An undergraduate student (excluding students in the College of Veterinary Medicine) is placed on probation if he has 60 or more resident graded hours at Kansas State University with less than a 2.0 (C) overall or semester grade-point average. A student with less than 60 hours is placed on probation whenever he has more than five grade points less than needed for a 2.0 (C) overall or semester grade-point average.

The student automatically is taken off probation when his overall grade-point average reaches the required level.

A student on academic probation, who has completed 20 or more graded hours at Kansas State University, will be dismissed when his total resident grade points are not within 18 points of a 2.0 (C) overall average on his resident work.

A student who neglects his academic responsibility may be dismissed at any time on recommendation of his academic dean.

Students are notified by their academic deans of their status from information supplied to the deans by the Director of Records. The scholastic record of each undergraduate will be evaluated twice yearly, at the end of the fall semester and at the close of the spring semester.

## Reinstatement

A dismissed student will be readmitted only when approved for readmission by the academic standards committee of the college from which he was dismissed or is attempting to enter. Normally a student must wait at least one semester before he will be considered for readmission.

The application for reinstatement must be directed to the academic standards committee of the specific college of the University in which the student was last enrolled. If the student is seeking readmission to another college of the University, that application will be referred with whatever pertinent information is available to the academic standards committee of the college of his choice for a decision relative to his readmission.

A student who earns a "C" (2.0) or better average on 12 or more credits during the semester he is dismissed may be considered for immediate reinstatement.

## Scholastic Honors

To be eligible for scholastic honors, awarded each semester, an undergraduate must receive a letter grade in a minimum of 12 semester hours of undergraduate work in residence and earn a grade-point average of 3.30 or better for that semester's work. Students in the Graduate School are not considered for this recognition.

Bachelors degree candidates who have completed a minimum of 60 graded hours in residence are considered for graduation with scholastic honors as follows: Students with a 3.950 or above academic average are eligible for "Summa Cum Laude." Those with 3.70 or above will receive diplomas inscribed "Magna Cum Laude." The remaining candidates with 3.3 or above are graduated "Cum Laude."

For the Commencement Program, graduates with honors will be computed on a minimum of 45 graded resident hours completed prior to the semester of graduation. Candidates for degrees other than the baccalaureate are not considered for this recognition.

## Credits for Extracurricular Work

Students may earn credit toward graduation by satisfactory participation in
certain extracurricular activities. These activities, and the maximum semester hours of credit allowed, are as follows:

| Subject | Semester | Total |
| :---: | :---: | :---: |
| Orchestra | . 1 | 4 |
| Band | 1 | 4 |
| Concert Choir | . 1 | 4 |
| Collegiate Chorale | 1 | 4 |
| K-StateSingers | 1 | 4 |
| Varsity Men's Glee Club | 1 | 4 |
| Women's Glee Club | 1 | 4 |
| Madrigal Singers | 1 | 4 |
| Instrumental Ensemble | 1 | 4 |
| Debate | . 2 | 4 |
| Oratorical Contest | . 2 | 4 |
| Kansas State Collegian journ | lism 1 | 4 |
| Ag Student News journalism | ... 1 | 4 |
| K-State Engineer journalism |  | 4 |
| Royal Purple journalism | . 1 | 4 |

Credits may be counted as electives in the student's curriculum. A student may use no more than eight semester hours in these subjects toward graduation and enroll for not more than two in a semester.
A student is regularly assigned to these activities, but only on the written recommendation of the instructor in charge of the work. A student enrolling in one or more of these activities must be enrolled for credit even though the credits exceed the maximum usable for credit toward graduation.

## Course Description Key

Courses carrying no credit (pre- or noncollegiate in effect) are numbered 0-99; those carrying no prerequisites, generally aimed at non-majors or introductory general educational ideals, 100-199; courses aimed at freshman-sophomore development in a major field, 200-399; courses aimed at junior-senior development in a major field and for graduate students in a minor field, 400-599; courses for advanced undergraduates and graduate students in a major field, 600-799; advanced research and high-level specialized courses for graduate students, 800-999.

Within the parentheses ( ) following each course title are shown the semester hours of the course, followed by the terms it is offered. Each unit usually represents one 50 -minute period of lecture or recitation, or two or three 50 -minute periods of laboratory each week of the semester. I, II, S indicate when the course if offered. I means first or fall semester; II, second semester; and S, summer session. I, II, mean both semesters. Pr. indicates "prerequisite." Conc. means concurrent.

## Classification of Students

A student who is a high school graduate, or offers 15 acceptable units of high school work, is classified as a freshman. A student is advanced to a higher classification when he has completed successfully sufficient credit hours to meet the requirements as listed below:

| Sophomore | Junior | Senior | Fifth-year student |
| :---: | :---: | :---: | :---: |
| 25 | 58 | 90 | 120 |

## Undergraduate Degree Requirements

To be graduated, a student must complete a prescribed curriculum. Under special conditions substitutions are allowed as the interests of the student warrant. The total credit requirement for bachelor's degrees ranges from 120 to 160 hours, according to the curriculum taken. To be awarded an undergraduate degree a student must have earned a grade-point average of at least 2.0 (C) on all Kansas State University courses taken for resident graded credit and applied toward the degree. Not more than 20 semester hours of non-graded credit may be applied toward a degree. Professional curriculums may impose additional degree requirements.

Further, the student must complete 20 of his last 30 undergraduate hours in residence with not fewer than 30 hours of resident undergraduate credit at this institution. Courses in the student's major field shall be taken in residence unless an exception is granted by the major department on petition of the student. That department shall have jurisdiction over the acceptance of major courses by transfer for fulfillment of the major requirement.

Exceptions to the residence requirement of the final year may be made by the dean of the college and the department head in the student's major field if the student has completed a total of three years of work acceptable to Kansas State University; the student must submit satisfactory plans and reasons for completing his degree requirements at another institution as for medicine, dentistry, law, medical technology and physical therapy prior to earning a degree here.

Resident work includes all regularly scheduled class or laboratory instruction given by the regular University faculty but excluding extension courses and courses completed by special examination.

Candidates for spring graduation are urged to attend commencement. Summer and fall graduates are invited to participate in the following spring commencement exercises. Also, prospective graduates may participate in the spring exercises prior to graduation. All participants must wear the appropriate cap and gown.

## DEGREES

The degrees shown below are conferred on completion of the prescribed curriculums: The letter which precedes each curriculum indicates the prerequisite high school courses as listed on page 5 . It is recommended that enterıng freshmen complete the prerequisite mathematics courses.

## Coliege of Agriculture

(E) Agriculture, BS in Agriculture, BS in Agricultural Journalism, pages 32 and 33 . Agricultural Economics major, page 33. Agricultural Journalism major, page 33. Agricultural Mechanization major, page 33. Agronomy major, page 33.
Animal Science and Industry major, page 33.
Dairy Production major, page 33.
Entomology major, page 33.
Horticulture major, page 34. Plant Pathology major, page 34. Poultry Science major, page 34. Pre-Veterinary Medicine major, page 34.
(E) Agricultural Education (Teachers), BS in Agriculture, page 34.
(E) Bakery Science and Management, BS in Bakery Science and Management, page 35.

Administration option, page 35. Chemistry option, page 35. Operations option, page 35.
(F) Biochemistry, BS in Biochemistry, page 35.
(E) Dairy Foods Science and Industry, BS in Agriculture, page 36.
(E) Feed Science and Management, BS in Feed Science and Management, page 36.

Administration option, page 36.
Chemistry option, page 37. Operations option, page 37.
(E) Horticultural Therapy, BS in Agriculture, page 37.
(E) Milling Science and Management, BS in Milling Science and Management, page 37.

Administration option, page 37.
Chemistry option, page 38.
Operations option, page 38.

## College of Architecture and Design

(F) Architecture (five years), Bachelor of Architecture, page 66.
(F) Architectural Structures option (five years), Bachelor of Architecture, page 67.
(F) Bachelor of Interior Architecture, page 68.
(F) Landscape Architecture (five years), Bachelor of Landscape Architecture, page 68.
(F) Building Construction, BS in Building Construction, page 67.

## College of Arts and Sciences

Bachelor of Arts AB
(B) Anthropology
(A) Art
(E) Biology
(E) Chemistry
(A) Computer Science
(B) Economics
(A) English General Majors:
(D) Biological Sciences
(A) Humanities
(E) Physical Science
(A) Social Science
(E) Chemistry
(B) Geography
(E) Geology
(E) Geophysics
(A) History
(B) Journalism \& Mass Communications
(F) Mathematics
(A) Modern Languages
(A) Music
(A) Philosophy
(B) Political Science
(B) Psychology
(B) Radio and TV
(B) Sociology
(A) Speech
(A) Statistics

## Bachelor of Science

 BS(B) Anthropology
(E) Biology
(E) Chemistry
(E) Computer Science
(B) Economics General Majors:
(D) Biological Science
(A) Humanities
(E) Physical Science
(A) Social Science
(E) Geochemistry
(B) Geography
(E) Geology
(E) Geophysics
(B) History
(B) Journalism \& Mass Communications
(F) Mathematics
(E) Physics
(B) Political Science
(B) Psychology
(B) Radio and TV
(B) Speech
(E) Statistics

## Pre-Professional

 AB(D) Physical Therapy
(E) Pre-Dentistry
(B) Pre-Law
(E) Pre-Medicine BS
(E) Medical Technology
(D) Physical Therapy
(E) Pre-Dentistry
(A) Pre-Elementary Education
(B) Pre-Law
(E) Pre-Medicine
(B) Pre-Nursing
(B) Pre-Pharmacy
(A) Pre-Secondary Education
(E) Pre-Veterinary
(A) Bachelor of Fine Arts
(A) Bachelor of Music
(A) Bachelor of Music Education
(A) Bachelor of Physical Education

## College of Business Administration

(E) Business Administration, BS in Business Administration, page 172.
(E) Accounting, BS in Business Administration, page 173.

## College of Education.

(A) Elementary Education, BS in Elementary Education, page 182.
(A) Secondary Education, BS, page 183.

## College of Engineering

(F) Agricultural Engineering, BS in Agricultural Engineering, page 199.
(F) Chemical Engineering, BS in Chemical Engineering, page 199.
(F) Civil Engineering, BS in Civil Engineering, page 200.
(F) Electrical Engineering, BS in Electrical Engineering, page 200.
(F) Industrial Engineering, BS in Industrial Engineering, page 201.
(F) Mechanical Engineering, BS in Mechanical Engineering, page 202.
(F) Nuclear Engineering, BS in Nuclear Engineering, page 202.
Dual degree programs in Engineering, page 203.

## College of Home Economics

(C) Home Economics with options, BS in Home Economics, page 231. Home Economics Education-Vocational Teaching, page 232. Extension, page 234. Radio and Television, page 231. Clothing and Retailing, page 232. Textile Research, page 232. Fashion Design, page 233.
Interior Design, page 233. Community Services, page 234.
Early Childhood Education, page 233.
Consumer Interest, page 234.
Housing and Equipment, page 234.
Foods and Nutrition in Business, page 235. Foods and Nutrition Science, page 235. Dietetics and Institutional Management, page 236.
(C) Home Economics and Journalism, BS in Home Economics and Journalism, page 237.
(C) Home Economics with Liberal Arts, BS in Home Economics, page 237.
(C) Restaurant Management, BS in Restaurant Management, page 236 .

## College of Veterinary Medicine

Veterinary Medicine, Doctor of Veterinary Medicine, page 250.
(For completion of six-year combination of preveterinary curriculum and veterinary medicine curriculum)
(See Colleges of Agriculture and Arts and Sciences for BS degrees in connection with College of Veterinary Medicine.)

## FEES

Fees Subject to Change. The following schedule of fees was in effect when this catalog was printed. However, there is no guarantee this schedule will not be changed prior to the beginning of any semester or summer session without notice.

Payment of Fees. Each student must pay the total amount of his semester or summer session fees on the day he enrolls, either by cash or check. Students receiving scholarships or grants not processed through the Kansas State University Aids and Awards Office must present evidence of the award to the Aids and Awards Office prior to registration or they will be required to pay the full amount of their fees from personal resources.

Incidental Fee. The incidental fee is the student's contribution toward the costs of instruction and covers approximately 20 to 25 percent of the instructional costs.

Student Health Fee. For a description of the services provided by this fee, see page 25 .

Student Union Annex I Fee. This fee is used to retire the K-State Union Annex I building revenue bonds.

Student Union Annex II Fee. This fee is used to retire the K-State Union Annex II building revenue bonds.

Stadium Bonds Fee. This fee is used to retire the KSU Stadium revenue bonds.

Student Activities Fee. The student activities fee is used for student publications, KState Union operations, musical groups, fine arts, intramural sports, open houses, University for Man, Student Governing Association, and for judging, debate, rifle, rowing and soccer teams, and other student activities. Those enrolling in six credit hours or less do not pay a full activities fee and thus are not entitled to the yearbook and certain student events without additional payment nor to student athletic ticket rates.

Withholding Student Records. When necessary, the University withholds student records for non-payment of fees, loans and other appropriate charges.

## Fees for Regular Semesters

The following schedule of fees was in effect when this catalog was printed. However, there is no guarantee this schedule will not be changed prior to the beginning of any semester or summer session without notice.


For students enrolled in seven or more semester credit hours.

| Incidental Fee: | Residents of Kansas and Staff Members | Nonresidents of Kansas |
| :---: | :---: | :---: |
| All except Veterinary |  |  |
| Medicine students . | \$180.00 | \$475.00 |
| Veterinary Medicine students | 220.00 | 535.00 |
| Student Health | 25.00 | 25.00 |
| Student Union Annex I | 2.25 | 2.25 |
| Student Union Annex II | 10.25 | 10.25 |
| Stadium Bonds | 4.25 | 4.25 |
| Student Activities (including |  |  |
| Union operations) | 16.25 | 16.25 |
| Totals-All except Veterinary Medicine students | 238.00 | 533.00 |
| Totals-Veteri- |  |  |
| nary Medicine students | 278.00 | 593.00 |

For students enrolled in six or less semester credit hours.


## For staff members enrolled in Graduate

 School.Incidental Fee .per credit hour
$\$ 12.00$
Campus Privilege Fees:
A. If enrolled in seven or more credit hours:

| Student Health | .total fee | 25.00 |
| :---: | :---: | :---: |
| Student Union Annex I | .total fee | 2.25 |
| Student Union Annex II | .total fee | 10.25 |
| Stadium Bonds | .total fee | 4.25 |
| Student Activities (including |  |  |
| Union operations) | .total fee | 16. |
| B. If enrolled in six or less semester credit hours: |  |  |
| Student Health | .total fee | $25.00^{*}$ |
| Student Union Annex I | total fee | 1.50 |
| Stud. Union Annex II | .total fee | 6.50 |
| Stadium Bonds | l fee | 50 |
| Student Activities (including |  |  |
| Union operations) | tota | 4.5 |

[^0]
## Fees for Summer Sessions

The following schedule of fees was in effect when this catalog was printed. However, there is no guarantee this schedule will not be changed prior to the beginning of any. semester or summer session without notice.

These fees include the Incidental, Student Health, Student Union Annex I and II, Stadium Bonds, Student Activities fees and parking fees.

|  | Residents of Kansas and Staff Members | Nonresidents of Kansas |
| :---: | :---: | :---: |
| Per semester credit hour: |  |  |
| Incidental Fee | \$12.00 | \$32.00 |
| Campus Privilege Fees* | 5.00 | 5.00 |

## Special Fees and Refund Policy

Staff Members. For fee assessment purposes staff members are defined as:
a. Employees working four-tenths time or more and paid on a Kansas State University unclassified or classified payroll during at least a part of each of the following months:

For fall semesters - September, October and November
For spring semesters - January, February and March
For summer sessions - June or the preceding January, February and March
b. Military ROTC staff members and federal employees given courtesy appointments.

Wives and Dependent Children. For fee assessment purposes wives and dependent children, but not husbands, of full-time employees paid on the above payrolls, and wives and dependent children, but not husbands, of military ROTC staff members and federal employees given courtesy appointments, are assessed fees as residents.

Private Music Lessons and Practice Facilities. University students enrolled in a bachelor's or master's degree program with a major in music, music education or applied music are exempt from fees for private music lessons and music practice facilities. Fees for all others, payable in advance, are as follows (Subject to refund policy on following page):


NonUniversity University Students Students

Two 30 -minute lessons a week,
per semester . ............................. . $\$ 42$ \$70
One 30 -minute lesson a week,
per semester ............................. 24 36
Two 30 -minute lessons a week,
summer session .......................... 21 . 35

One 30 -minute lesson a week,
summer session .......................... . . 1218
Single lessons, each ...................... 4 4
Practice piano, 1 hour daily,
per semester ............................. 5
Practice piano, 2 hours daily,
summer session ........................ 5 . 5
Practice organ: Two-manual, 1 hour daily per semester
$10 \quad 10$
Two-manual, 2 hours daily,
summer session ...................... . . 10 . 10
Three-manual, 1 hour daily, per semester ........................... . $20 \quad 20$
Three-manual, 2 hours daily, summer session ........................ . 20 20
"Not applicable to students enrolled in off-campus instruction and assessed
only on the first six credit hours for each summer session enrollment on campus

Field Geology Fee. The fee for the summer geology field camp is $\$ 80$, which is the additional amount required from all students enrolled in this course to pay for their transportation and lodging for the field camp.
Refund Policy. (Applicable only to refundable fees-incidental, health, union, stadium, activities, field geology and private music lessons.) Refunds will not be made until sufficient time has elapsed to insure that student checks have been honored-usually 15 days after students enroll. If an enrollee withdraws during a regular semester or eightweek summer session, the following schedule of refunds shall apply. However, the student activities fee is not refunded if the student does not return his student fee receipt card

|  | Regular Semester | 8-week <br> Summer <br> Session |
| :---: | :---: | :---: |
| During the first academic week | 100 | 100 |
| During the second academic week | 90 | 75 |
| During the third academic week | 80 | 50 |
| During the fourth academic week | 70 | no refund |
| During the fifth academic week | 60 | no refund |
| During the sixth academic week | 50 | no refund |
| After sixth academic week .... | . . no refund | no refund |

Late Enrollment, Including Re-enrollment After Withdrawal. A late enrollment fee of $\$ 2.50$ shall be assessed and collected from each person enrolling after the regularly scheduled enrollment period. A larger late enrollment fee of $\$ 5$ shall be assessed and collected from each person enrolling, reenrolling or paying his fees after the first week of a semester or session; however, only one or the other of these fees shall be collected for each late enrollment or re-enrollment. Late enrollment fees shall not be subject to refund, and payment thereof shall be considered a part of the enrollment process.
Student Identification Card. A charge for the original card is included in the Student Activities fee. A $\$ 2$ fee is assessed for each card replaced.

Special Examination Fee. The fee for taking an examination to obtain college credit (in lieu of attending classes) is $\$ 3$ per semester credit hour in which examined for residents of Kansas and staff members; $\$ 9$ per semester credit hour for non-residents of Kansas. (Not subject to refund; not applicable to Continuing Education courses and this service available only to students who are or have been regularly enrolled).

Auditing Fee. An auditor who is neither an enrollee paying full incidental fee nor a staff member shall be assessed $\$ 1$ a semester credit hour for courses audited. Laboratory or Continuing Education courses may not be audited. This fee is not subject to refund.

Laboratory Fees and Course Charges or Deposits. No laboratory fee, course charge, or deposit may be assessed against or collected from persons enrolled in any regular semester or summer session at Kansas State University, except for chemistry laboratory courses, geology field camps, and for excessive usage, breakage or losses due to personal negligence on the part of the student. Charges then can only be for the actual fair value of supplies used or lost and are subject to the approval of the appropriate dean or the president.
Correspondence Study. Information about correspondence study courses, including the fees charged, is available from the Extramural Independent Study Center, University of Kansas, Lawrence, Kansas 66044.

Charges to Government or Private Agencies. The fees collected under arrangements with governmental or other agencies follow in general the fees outlined above, and in all cases the charges are equal to or greater than the fees stated herein.

Military Uniforms. Every student who takes military training must have a uniform. For the basic courses the uniform is furnished by the government. The money value of any missing articles will be collected when the uniform is returned. Failure to return or pay for missing articles of the uniform may result in withholding of credit and in extreme cases may cause the University to refuse a transcript or to graduate the student concerned. The uniform which is purchased for each advanced course student under contract becomes his personal possession upon completion of the course. All or nearly all of the cost of this uniform is paid by the federal government.

Other Expenses. In addition to the previously mentioned fees, students are required to purchase textbooks, drawing instruments, slide rules, gym suits and other personal equipment and supplies when needed for courses in the curriculum chosen. Costs will vary each semester.

## SERVICES AND FACILITIES

## Postal Sevice

All mail for students must be addressed to their Manhattan residence.

Manhattan Post Office personnel deliver U.S. mail directly to University buildings and residence halls and pick up outgoing U.S. mail from various locations on the campus.

A self-service postal unit is located on the ground floor of the K-State Union.

The University Postal Center in Anderson Hall sells stamps, money orders and other postal supplies; weighs, insures and registers mail, and receives outgoing U.S. mail.

## Computing Center

The Computing Center is a service department of the University and functions directly under the authority of the VicePresident for Academic Affairs. The Kansas State University Computing Center IBM 36050 computer, peripheral equipment and supporting sciences are intended for the research and instructional computer needs of the faculty, staff and students.

The IBM $360-50$ has 128 K bytes of main core and $1,000 \mathrm{~K}$ bytes of extended core; as such, it is able to meet a wide variety of research and instructional needs. This machine installed in June of 1967 includes tape and disc drives, two card readers, a card punch, two line printers and card-processing equipment as supporting gear. Attached to the machine are slow speed typewriter remote terminals for interactive computing. During the high usage hours a printer and card reader are made directly available to users for immediate access batch entry to the machine.

The Computing Center is located on the ground floor of Cardwell Hall. The professional staff provides assistance in use of the hardware and software. A library of manuals and programs is available.
Programming languages in current use include FORTRAN, COBOL, PL-1, RPG, WATFIV PL-C, PLAGO, LISP and assembler language. A series of non-credit seminars and classes are held each semester for users and prospective users.

For further information about the Computing Center, write to the Director, Computing Center, Cardwell Hall.

## Scientific Equipment

Kansas State University in cooperation with the Atomic Energy Commission operates one of the major facilities in the United States for accelerating atomic particles. The largest accelerator is a $12-\mathrm{V}$ tandem de Graaff which became operational in 1969. Also, there are several smaller accelerators which together with the $12-\mathrm{MeV}$ tandem accelerator provide the University and the State of Kansas with particle accelerator capabilities over an unusually large range of energies and projectiles.

The accelerator laboratory is housed in Cardwell Hall. A professional staff and graduate students maintain an active research program which extends beyond conventional nuclear structure studies to include experiments in astrophysics and physics of the solid state. For further information about the Accelerator Laboratory write to the Director, Nuclear Sciences Laboratory, Physics Department.

Another major item of scientific equipment is the TRIGA Reactor facility. Besides such basic research activities as fast neutron spectroscopy the Reactor Laboratory provides the entire University community with the capability of material analysis by neutron activation. For further information about the Reactor Laboratory write to the Director, Reactor Laboratory, Nuclear Engineering Department.

## The Speech and Hearing Clinic

The clinical facilities and services of the Speech and Hearing Clinic, 23 Eisenhower Hall, are available for consultation, examination and therapy. Services are extended to University students who have impairments of their speech, hearing or language functions. These clinical services are also available to children and adults of the surrounding communities. A purpose of the clinic is to provide educational and clinical experiences to students at Kansas State University who are preparing for careers in speech pathology and audiology. Students may call for information or they may be referred by instructors or other interested persons.

## The University Press of Kansas

Kansas State University, together with the University of Kansas and Wichita State

University, is a sponsor of the University Press of Kansas, an organization dedicated to the advancement of scholarship through publication of scholarly books, as well as material on Kansas and mid-America. Stemming from the former University of Kansas Press, the current organization was established July 1, 1967, through an enabling resolution passed the previous October by the Kansas Board of Regents. It is the first university press in the United States to be operated on a statewide level under the specific sponsorship of all the state's universities.

Administrative control of the Press rests with a board of trustees composed of the academic vice-president of the sponsoring institutions. The Press's chief executive officer is the director, who is assisted in editorial decisions by a nine-member editorial committee, of which he is chairman. Three faculty members from each of the universities, or their alternates, serve on the committee, with each delegation headed by a vice chairman. The Press offices are located at 366 Watson Library, The University of Kansas, Lawrence 66044.

## Kansas State University Publications

University Publications
General Catalog
This Is Kansas State University
Summer Catalog
KSU-Centered on You
Biennial Report
Financial Report
Extension Bulletins
Agricultural Experiment Station Bulletins
Engineering Experiment Station Bulletins

## Student Publications

The Kansas State Collegian-newspaper published five days a week during regular semesters and three days a week in summer.
The Royal Purple-yearbook.
The University Directory-published annually.
Other Publications
The Agriculturist-published quarterly.
The Kansas State Engineer-published six times annually.
The K-Stater - published eight times a year by the Alumni Association.

## Library System

The Francis David Farrell Library, named after Kansas State University's eighth President, is the central unit of the university
library system. It is supplemented by six branch libraries located in other buildings: Architecture, Chemistry, Physics, Veterinary Medicine, and two dormitory libraries, Derby and Kramer.

The Libraries contain 600,000 cataloged volumes. Growth is at 30 to 40,000 volumes per year. In addition to the cataloged volumes, the libraries contain a full government depository collection, including the publications of the Atomic Energy Commission, a teaching materials collection, an extensive microform collection and 50,000 records, tapes and slides. The Library subscribes to a current list of 9,000 journals.

With the completion of the second addition to Farrell Library in the fall of 1970, the central building now provides over 200,000 square feet of space. Seating is available for 3,000 students and there is sufficient shelf space for over one million volumes. One hundred locked study carrells are provided for faculty and doctoral candidates. Five hundred additional individual study spaces are available to graduate and undergraduate students.

Except for the rare book room, the library is entirely open shelf. Collections are organized into three subject divisions: Humanities, Social Science and Science. These divisions are supplemented by a general reference and bibliography division, a documents division and a special collections division.

With its land-grant background the library has always had a superior science collection. During the past five years, to meet its multipurpose university responsibility, significant additions have been made to the collections in the humanities and the social sciences. Much of this material has been in microform as evidenced by the need for a microform reading room in each of the divisions.

The Library has made rapid strides in automation. Serials check-in and the production of the serials holdings list are now automated. The acquisitions and bookkeeping operations were automated during 1970. The University's IBM $360-30$ computer is in the basement of the library building.

To take advantage of the library resources in the region, the Library operates a courier service that travels three times a week east to Kansas City and twice a week south to Wichita. Much use is made of the collections
in the Linda Hall Library and the University of Kansas Library. The six state-supported institutions of higher education belong to a teletype network. They also permit direct borrowing by students and faculty. The Library is a member of the Kansas Information Circuit-a teletype network of the larger public and system libraries of the state. Direct teletype connection is also available to other "Big 8" libraries, the Library of Congress and the National Medical and Agricultural Libraries.

## THE SUMMER SCHOOL

The Summer School is an integral part of the educational program of Kansas State University. It is designed to meet the needs of the following groups:

1. Undergraduate students who wish to accelerate their programs of study toward an early graduation, and those who wish to make up courses missed during fall or spring semesters.
2. Graduate students, for whom the Summer School offers an opportunity to make more rapid progress towards a degree, and teachers who are unable to attend the University during the two semesters.
3. Special interest, non-degree groups, including public school, business and industrial personnel.
High school graduates expecting to enter the University for the first time are urged to attend the Summer School. These students find it valuable in establishing study habits, becoming acquainted with the campus and faculty, and adjusting to university life.

The Summer School has available all the facilities and services of the University which are available in the regular semesters, including housing, food service, counseling and testing services, Student Health Center, and K-State Union recreational programs. A large number of the classrooms and library study rooms are air conditioned.

A special recreation program is planned for each summer session. It includes dancing, parties, movies, lectures, concerts, plays, tennis, boating, water skiing, swimming, fishing, bowling and other sports.

The Summer School consists of an eightweek session in which a student may earn as many as nine semester hours of credit. Full credit two, three and four-week concentrated courses are offered to accommodate students who cannot attend the eight-week session.

Workshops, short courses, and conferences are offered to accommodate those students who find it inconvenient to attend the full eight-week session. The length of these special sessions varies from a week to four weeks.

The Summer School Bulletin gives complete and detailed information about the Summer School. It is available in February each year. A copy may be obtained free of charge by requesting it from the Dean of Admissions and Records.

Through the University Telenetwork system, a unique two-way, teaching-learning device, some K-State summer courses are offered at 16 state-wide locations. The special telephone hookups allow classes originated on the K-State campus to be taught simultaneously, and for credit, to the various locations of the Telenetwork system in the state.

The teaching staff of the Summer School is formed from the regular instructional staff of the University, supplemented by visiting professors and lecturers.

The courses offered in the summer are chosen from among those offered in regular semesters with the addition of conferences and workshops planned to meet special needs. The particular courses chosen for Summer School are determined by student demand.

## STUDENT PERSONNEL SERVICES

CHESTER E. PETERS, Vice President for Student Affairs

Kansas State University has developed a complete program of student personnel services because education involves many experiences outside the classroom.

This philosophy stresses the importance of providing the student with a variety of opportunities and services aimed at improving and supporting his academic activities; his intellectual development; his vocational interests, aptitudes, and skill; his emotional balance; his social relationships; his moral
and religious values; his physical health; and his aesthetic appreciations.

Student needs for adequate medical care, housing, food, financial assistance, employment, counseling, recreation, and spiritual inspiration, have been anticipated in this program.

The Vice President for Student Affairs is responsible for maintaining a close relationship with the faculty and administrative staffs in helping to interpret student needs.

He has general responsibility for the administration and coordination of the following eight divisions comprising the Student Personnel Program: Aids, Awards, and Veterans Services; Career Planning and Placement Center; Center for Student Development; Housing and Food Service; Intramurals and Recreation; K-State Union; Lafene Student Health Center and University Hospital; and Residence Halls Programs.

The Vice President also has a special assistant for university human relations who is responsible for counseling and programs with minority groups.

## Center for Student Development

GENE C. KASPER, Director
MARGARET L. NORDIN, Associate Director
Staff members of the Center for Student Development work in a variety of ways with individual students and student groups, and also serve as liaison to all elements of the University community. Therefore, units within the Center are organized to identify and meet the needs of K-State students.

Responsibilities include a working relationship with residence halls, fraternities and sororities, student government, student organizations, campus religious groups, and the university judicial system.

Also, major direction for many programs comes from the Center for Student Development including: summer enrollment and orientation, special assistance to minority and foreign students, student leadership and staff training, workshops for housemothers, freshman seminars, discussion groups in study skills, vocational and occupational information, and interpersonal relations.

Another major emphasis is on individual development. Counseling assistance is
available and students are encouraged to examine their potentials and to increase their ability to become self-directed individuals.

The various programs are evaluated by research staff members who also study characteristics of K-State students and changes which occur. Several staff members hold part-time academic appointments in addition to their positions in the Center.

## Program Development and Implementation Unit

If students have questions about any subject relating to K-State, there is one spot on campus, Holtz Hall, where they can find out what is going on. The University Learning Network is one established way to try to answer any question asked. If the staff members do not have the information readily available, they will direct students to someone on campus who can help. Students should feel free to drop in at Holtz Hall any time.

The new student orientation program assists approximately 3,000 new students during summer pre-enrollment. The summer program usually is the students' initial encounter with the University and helps get their university education off to a meaningful start. Parents' Orientation is a concurrent program to acquaint parents of new students with the University, its programs and facilities.

The freshman seminar program gives new students a chance to meet with small groups of other entering students and upperclass student leaders. The weekly meetings provide opportunities for self-examination and for learning more about the University.

Religious life at the University finds expression in many church-sponsored student religious organizations in more than 30 church congregations in Manhattan. On campus there are two memorial chapelsDanforth and All Faith-which are available for student religious services and private meditation.

## Minority and Cultural Program Unit

To help provide greater educational opportunities to a larger number of minority students residing in Kansas, recruitment of minority group students is encouraged. Special services are provided to these students including individual guidance and
counseling, academic advisement, individualized instruction and other tutorial services, leadership training programs, specialized financial assistance including budget information, and part-time employment.

## Individual Development Unit

Most students find counseling services useful. In the Individual Development Unit of the Center for Student Development, counselors are available to discuss with students a wide variety of concerns. These often are regarding decision-making or planning, such as vocational uncertainty or difficulty in choosing a major. Sometimes students develop new habits and attitudes through counseling, such as better study habits and improved attitudes toward academic or social performance. Students use the counseling service to learn more about themselves and to increase understanding of their own goals, values, interests, and abilities.

Whatever his reason for calling upon the Center, the student will find a friendly, interested counselor. In a relaxed, completely confidential setting the counselor helps students learn to handle their specific situations. Together they explore attitudes, feelings and motivations, and gain new insights from a variety of sources such as students' experiences, psychological tests, occupational data, university requirements and others. Discussion groups are available to help students explore interests.
High school seniors also are eligible to use the Center's services before they enter college and may make appointments by writing to the Center or by coming to Holtz Hall.

## International Student Center

The International Student Center serves more than 400 foreign students on the Kansas State University campus. Frequently it is called upon to advise the student about renewals of stay, passports, work permits, and general status questions. It also serves in developing programs for foreign students. The International Student Center works with all facets of the university to implement and support the goals of the student and the University in international education.

The Foreign Student Adviser advises all international students on campus. He helps
promote mutual concern between foreign and American students, as well as concern among the foreign students, the faculty and the community.

## Evaluation and Research Unit

Students and faculty members find current information and recent publications on student development in the Research Unit. General impressions and observations of campus trends and concerns are collected in this office. The Research Unit (Fairchild Hall 212) sponsors studies of KSU students and publishes Higher Education Briefs, a monthly newsletter. This unit also maintains an Information Center with books, journals and free materials about college students, higher education, student development and related subjects.

## Aids, Awards and Veterans Services

GERALD R. BERGEN, Director

## Loan Programs

Many Kansas State University students are assisted with student loans through the National Defense Education Act Loan Program, the Alumni Association Loan Program, and various loan units of the Endowment Association. Many other student loans are provided through the Guaranteed Loan Program under Title IV of the Higher Education Act of 1965.

To qualify for most long-term loans, an undergraduate or graduate student must show reasonable financial need as well as the ability to meet the scholastic minimums established by the University Loan Committee.
Short-term, interest-free loans are available to assist qualified students in an emergency.

While no absolute deadline has been established for submitting loan applications, it is advisable to plan early and apply for loan assistance prior to April 1 of each academic year.

Students interested in applying for student loan assistance or information should write or visit the Aids, Awards, and Veterans Services Office.

## Scholarship Programs

More than 700 Kansas State University undergraduate students receive scholarship
assistance each year. Some scholarships are awarded for a single year. Others are renewable for additional years.
Students desiring scholarship applications or information relative to scholarships should write to the Aids, Awards, and Veterans Services Office. The deadline for submitting completed applications is the February prior to the fall semester in which the student intends to enroll.

## Part-Time Work

Kansas State University employs more than 3,000 students each year. Many other part-time job opportunities are available in the Manhattan community. Any student enrolled in seven or more semester credit hours who wants assistance in securing a part-time job should visit the Aids, Awards, and Veterans Services Office immediately after arriving in Manhattan.

## Work-Study Program

This program is part of the Economic Opportunity Act of 1964 to assist students from low-income families by providing jobs on campus or with affiliated organizations. Additional information and applications may be obtained from the Aids, Awards, and Veterans Services Office.

## Services for Veterans

The University maintains a Veterans Service Office to aid veterans and children of deceased or disabled veterans in securing educational benefits.

Those veterans who have more than 181 days of service after January 31, 1955, may be eligible for educational benefits.

Children of a deceased or disabled veteran may be entitled to educational benefits, providing the veteran's death or disability was due to active service in World War I, World War II, the Korean Campaign, or Viet Nam.
Information may be obtained from your nearest Veterans Administration Office or the Aids, Awards, and Veterans Services Office at Kansas State University.

## State Vocational Rehabilitation Program

The University cooperates with the State Board for Vocational Education in providing rehabilitation training for physically handicapped persons who need financial
assistance. Correspondence should be addressed to the Vocational Rehabilitation Division of the State Board for Vocational Education, Topeka, Kansas.

## Career Planning and Placement Center

## J. BRUCE LAUGHLIN, Director

One vital criterion in the selection of a college or university should be the career development services it provides. On this basis Kansas State University compares most favorably with other institutions.

The Career Planning and Placement Center, in Anderson Hall, assists prospective freshmen, undergraduates, graduating seniors, graduate students, and alumni with career planning and employment. However, the Office of Aids, Awards, and Veterans Services is responsible for part-time employment.
In business and industry, education, alumni, and summer employment the Center is particularly effective in attracting employers from throughout the state and nation. Considerable emphasis is placed upon career counseling and guidance. Supplementing this effort is the Center for Student Development, particularly in student self-evaluation, interest and aptitude testing, etc.

As its name implies, the Career Planning and Placement Center provides a centralized placement system for all colleges and departments of the University, bringing together students, faculty members, and employer representatives seeking collegeeducated manpower.

Employment trends and opportunities in business, industry, agriculture, education, and government are recorded and made available to interested K-Staters.

A Graduate Study information section assists in planning for advanced study.

In the field of education, current information is filed on positions open and qualifications required in elementary, secondary, and college-level work, including administration. Information on employment opportunities is available, and qualified staff members are eager to help students and alumni with employment considerations.

One of the leading offices of its kind in the nation, the Career Planning and Placement Center is designed to promote wise and responsible career planning.

## Housing and Food Service

A. THORNTON EDWARDS, Director

JEAN M. RIGGS, Associate Director

## Residence Halls Program

THOMAS J. FRITH, Director

Kansas State University considers the housing of students as part of the total educational plan. All single, minor freshmen not living at home are housed in University residence halls or Greek housing. Veterans and all other students may choose to live in University residence halls, scholarship houses, fraternities, sororities, rooming houses, or apartments.

Any exceptions to the above policies must be approved in advance by the Residence Halls Program director.

## Available Housing Facilities

Kansas State University provides residence hall living for 4,100 students, scholarship housing for approximately 90 men, cooperative housing for 64 women, and 576 apartments and 52 mobile home lots for married couples. Sororities provide 600 places for women, and fraternities have accommodations for 1,400 men. Others find privately owned rooms and apartments from University-approved listings.

## Self-Government in Residence Halls

Learning to manage your own affairs is certainly a part of university life. This takes maturity and self-discipline. K-Staters start as freshmen with self-government within the framework of general University regulations. In all University residences, elected hall councils assume responsibility for many activities. Married students on campus use the mayor-council form of government to regulate their community life.

## Residence Halls

Each residence hall is staffed with a professionally trained director and staff. The total residence hall personnel program is coordinated by the Residence Halls Program director.

The following service and facilities are furnished in residence halls: sheets and pillowcases-laundered weekly; free facilities-washers and driers and areas for hand laundry; pleasant rooms with beds,
mattresses, mattress covers, chests of drawers, closet facilities, study tables, and lamps. The resident furnishes pillow, towels, bedspreads, etc.

Each hall has lounges and recreation rooms for relaxation and social activities-TV sets, hi-fi equipment, ping-pong tables and the like providing for any occasion from a gamewatching party to a Christmas ball.

With the exception of the Sunday evening meal, three meals are served daily. Most meals are served cafeteria style, but special dinners and faculty buffets add to the variety of the food service program.

Contracts are issued on receipt of a residence hall room application and $\$ 25$ nonrefundable application fee for fall enrollees and $\$ 12.50$ for those entering in the spring.

When the hall application and fee are received by the Office of Housing and Food Service, a nine-month housing contract is forwarded to the student.

Students may elect either the full payment plan or installment plan.

## Payment Schedule

A. Full payment of $\$ 468$ or
B. Payment schedule (if not paid in full) below:

| Fall Semester |  | Spring Semester |  |
| :--- | ---: | :--- | ---: |
| Payment with |  | January 10 | $\$ 118$ |
| $\quad$ contract | $\$ 118$ | February 10 | 118 |
| September 10 | 118 | March 10 | 118 |
| October 10 | 118 | April 10 | 118 |
| November 10 | 118 |  |  |
| $\quad$ Rates are subject to change. |  |  |  |

Applications and further detailed information are available through the Office of Housing and Food Service.

## University Scholarship Housing

There are many students who would profit greatly from a university education, but do not feel they can afford four college years. Kansas State University offers, in addition to scholarships, two scholarship houses for men.

These are cooperative units, in the sense that the students do their own housekeepingcooking, cleaning, and dishwashing. In this way living costs, a big item in the budget, are lowered considerably. The men in Straube and Smith Scholarship Houses spend about six hours a week at their house duties. Fortyfive men live in each house.

Smurthwaite House for women provides cooperative living for 64 freshmen and upperclass women at low cost. This is a new and contemporary house which has, in part, been supported by donations from Home Demonstration Units of Kansas.

At Smurthwaite, house duties are rotated so each student has a chance to learn all aspects of house management. The duties take about an hour daily. Everyone lends a hand on special occasions.

Applications for these houses are considered on the basis of academic ability and financial need. Write to the Office of Aids, Awards, and Veterans Services for applications and information.

## Married Student Housing

Married students have not been overlooked in the housing program at Kansas State University. Pride can be taken in the one- and two-bedroom apartments at Jardine Terrace. These completely furnished, low-cost apartments are close to the campus. Each group of buildings has a central laundry.

In addition, there are mobile home lots in North Campus Courts for married couples.

The furnished apartment rates are $\$ 80$ a month for a one-bedroom apartment and $\$ 95$ for a two-bedroom apartment. A limited number of unfurnished apartments are available; one-bedroom $\$ 75$ per month, twobedroom $\$ 87.50$. The trailer parking lot rental is $\$ 25$ a month. For the apartments the rental includes utilities such as gas, water, and 140 KWH of electricity. The rental for the trailer parking lot includes sewer, water, and 140 KWH of electricity. Rates are subject to change.
Applications are available at the Office of Housing and Food Service, Pittman Building.

## Graduate Student Housing on Campus

Single graduate students are welcome to live in the residence halls. When possible, these students are assigned to a graduate area of a hall.
Since graduate assistants are classified under faculty, single graduate assistants qualify for the Evans Apartments. There are 20 apartments in this building which rent for $\$ 80$ a month for a one-bedroom and $\$ 95$ a month for a two-bedroom. These are furnished and all bills are paid up to 140 KWH of
electricity. Applications are available from the Office of Housing and Food Service.

## Off-Campus Housing

The Office of Housing and Food Service, Pittman Building, has a card file of rooms and apartments that are available in Manhattan. It is necessary that students who wish to live off campus visit Manhattan and personally select their own rooms and apartments.

Listings change too rapidly to be of use by mail. Rent ranges from $\$ 30$ to $\$ 45$ a month for one person to a room and $\$ 30$ to $\$ 35$ a month per person when two or more reside in a room. Meals at the K-State Union Cafeteria and local cafes will cost $\$ 70-90$ a month. Apartments rent from $\$ 60-250$ per month, depending upon the size of the family and the facilities required.

All Manhattan householders who rent to students are expected to follow the University policy of making accommodations available to all students regardless of race, color, or national origin.

## Sororities

Booklets describing sororities and setting forth the provisions regulating selection of new members are provided to all prospective freshman and interested upperclass women by Panhellenic Council. These may be obtained by writing to the Faculty Adviser to Sororities.

House bills in sororities will average approximately $\$ 540$ per semester. This includes room, board, and sorority dues. Freshman members, however, live in residence halls and pay sorority dues of approximately $\$ 25$ a month. The following national sororities have established chapters at K-State:

Alpha Chi Omega, Alpha Delta Pi, Alpha Xi Delta, Chi Omega, Delta Delta Delta, Delta Sigma Theta, Delta Zeta, Gamma Phi Beta, Kappa Alpha Theta, Kappa Delta, Kappa Kappa Gamma, and Pi Beta Phi.

## Fraternities

Fraternities select new members primarily during the summer months. High school seniors are often guests at fraternity houses during their senior years, and throughout the spring and summer months each fraternity has representatives visiting high school
seniors and their parents in Kansas and surrounding states.
Freshman men may live in a fraternity house if they accept an invitation to membership before classes start and if they do not sign a residence hall contract. Costs will average $\$ 540$ per semester. For more information, write to the Faculty Adviser to Fraternities. The following national fraternities are established at K-State:
Acacia, Alpha Gamma Rho, Alpha Kappa Lambda, Alpha Tau Omega, Beta Sigma Psi, Beta Theta Pi, Delta Chi, Delta Sigma Phi, Delta Tau Delta, Delta Upsilon, FarmHouse, Kappa Alpha Psi, Kappa Sigma, Lambda Chi Alpha, Phi Delta Theta, Phi Gamma Delta, Phi Kappa Tau, Phi Kappa Theta, Pi Kappa Alpha, Sigma Alpha Epsilon, Sigma Chi, Sigma Nu, Sigma Phi Epsilon, Tau Kappa Epsilon, Theta Xi, and Triangle.

## Clovia

Clovia 4-H House provides accommodations for 62 upperclass women. Although $4-\mathrm{H}$ members are given preference, any coed is eligible for membership. Freshman members live in a residence hall their first year. Since Clovia 4-H House is a cooperative unit with the members supplying the labor for cooking and cleaning, monthly housebills are approximately $\$ 75$ including social fees. The women spend about six hours a week at their house duties. Applications are made through the County Extension Offices, the State $4-\mathrm{H}$ Department at Kansas State University, or the Clovia Membership Chairman, 1200 Pioneer Lane, Manhattan, Kansas, 66502.

## Lafene Student Health Center

ROBERT E. SINCLAIR, M.D., Director
The Lafene Student Health Center, a modern facility serving the health needs of KState students, is conveniently located in the center of the campus just west of the Library. It is made up of a clinic for the care of ambulatory patients and a hospital unit where KState students may be hospitalized when necessary. It is accredited by the Joint Commission on Accreditation of Hospitals.

The Center is staffed by full-time physicians with adequate medical supporting personnel to care for students. When necessary, the student is referred to specialists for treatment.

After regular clinic hours an ill or injured student may receive medical care in the Emergency Room. Home calls are not made.

The hospital is equipped to provide medical care for most illnesses, but major surgery must be done at one of the two local hospitals. If surgery is necessary, the patient has a choice of several able Manhattan surgeons and treatment is at the student's expense.

Medication, laboratory tests, and X-rays are available at the Student Health Center at reduced rates. Many services are provided at no cost. Hospitalization for the first 21 days is provided at special rates; thereafter, the charge is reasonable and comparable to that of other Kansas hospitals.

Hospital insurance plans may be used at the Lafene Student Health Center. An insurance policy, available to students only at a special rate, supplements the coverage provided by the Health Center. The student may purchase this insurance at the time of enrollment for the regular semester. It is recommended that students carry insurance.

The State Board of Regents requires a complete medical examination of each new student. This examination should be done by the family medical doctor, and the completed examination form should be sent to the Student Health Center. The student must visit the Health Center for an evaluation of his health prior to enrolling or at the time he enrolls.

The purpose of the examination is to evaluate the student's state of health, determine remediable defects, detect infectious or contagious conditions, discuss preventive measures such as immunizations, and to classify the student for physical education.

Students who have been out of school longer than three years must present a current physical examination and visit the Health Center for an evaluation. Students returning within three years must visit the Health Center for an evaluation and necessary tests, but a current physical examination is not required.

## K-State Union

RICHARD D. BLACKBURN, Director
The K-State Union is the "campus community center," offering extensive facilities for social, recreational, and cultural life of the campus. The five-level structure includes
a cafeteria-snack bar, a ballroom divisible into five areas, 35 meeting rooms, banquet and party rooms, recreation facilities (bowling, billiards, table tennis, etc.), a little theatre, activities center, lounges, and a central information desk.
A 2.8 million dollar addition was opened in the fall of 1970. The new areas include a 576 seat auditorium, bookstore, enlarged space for student activities, a completely renovated and expanded cafeteria-snack bar, a spacious interior courtyard, private dining rooms and meeting rooms.
The K-State Union provides some 150 student organizations with comfortable headquarters and qualified staff assistance for carrying on their activities-everything from typing minutes to planning a major allUniversity event.

The Union Governing Board is responsible for the Union policies and program. There are more than 300 students working on Union committees, which provide an extensive program of interesting activities designed for the cultural and personal growth of students. These activities are coordinated by the Union Program Council. The Union program committees are: Campus Entertainment, K-Purrs, Magic Lantern Company, News and Views, Open Cyrkle, Recreation, and Trips and Tours. All students are invited to apply for membership on one of these committees.

## Intramurals and Recreation

donald l. rose, Director
The intramural athletic and recreational program at KSU encompasses many sports. It ranks in the top 20 Universities in terms of outdoor facilities and is striving to increase its indoor facilities.

Record student interest and participation make the intramural programs an important part of the University. Students can participate in the following intercollegiate sports: Men-soccer, judo, crew, and sports parachuting: Women - basketball, gymnastics, field hockey, volleyball, softball, and tennis.

Intramural competition is available in the following activities:

Men. Flag football, swimming, golf, cross country, horseshoes-singles \& doubles, handball-singles \& doubles, tennis-singles \& doubles, volleyball, bowling, wrestling,
badminton, basketball, table tennis, softball, free throw tourney, and track.

Women. Table tennis, golf, kickball, swimming, bowling, volleyball, badminton, basketball, softball, tennis, track, and canoeing.
While competition is keen in intramurals, you don't have to be a skilled player to compete and enjoy the sports. The physical activities and social contacts are more important than winning or losing, and sportsmanship and fair play are stressed. There are opportunities to be employed on the student payroll as a referee or game official.
In addition to organized intramural programs for men and women students, the department sponsors as much free play and recreational use of its facilities for facultystaff and their families as is possible. Intramural facilities include the Nichols Gymnasium pool, Ahearn Gymnasium, the L. P. Washburn Recreational Complex (outdoor) and the canoes and shells at the K-State Boathouse on Tuttle Creek Reservoir, largest lake in the state.

## Operation of Motor Vehicles

Possession of cars by students is discouraged. All motor vehicles operated on the campus or in Manhattan must be registered with the University Traffic and Security Office. Students living in residence halls and freshmen cannot secure parking permits for the campus proper. However, residence hall students can purchase a parking permit for their residence hall lot only. Driving and parking of motor vehicles are governed by regulations established by a student-faculty Traffic and Parking Committee, by authority of Chapter 484 of the Laws of Kansas, 1957.

## University Organizations

The University has many organizations which complement the academic, cultural, social, and religious lives of the students; provide the means for student government in a number of areas; and provide constructive recreational opportunities.
The All-University governing body is the Student Governing Association. All undergraduate students enrolled in seven or more hours and all graduate students are members of this association and entitled to hold any office.

Departmental and professional clubs and societies afford many opportunities for students to strengthen their academic work. In these organizations students may meet with faculty members and other professional persons informally and practice the theories learned in class.

Other groups, though often representing academic fields, are open to students in any curriculum and provide for extracurricular activity in line with the objectives of the University.

## Honorary

Alpha Mu (Milling)
Arnold Air Society (Air Force ROTC Cadets)
Blue Key (Senior Men)
Chi Epsilon (Civil Engineering Honors Committee)
Chimes (Junior Women)
Delta Phi Delta (Art)
Delta Sigma Rho (Debate)
Gamma Sigma Delta (Agriculture)
Kappa Delta Pi (Education)
Kappa Kappa Psi (National Men's Band Honorary)
K-Fraternity (Varsity Letter Winners)
Mortar Board (Senior Women)
National Collegiate Players
Omicron Delta Upsilon (Economics)
Pi Epsilon Delta (Dramatics)
Scabbard and Blade (Cadet ROTC Officers)
Sigma Alpha Eta (Speech Therapy)
Spurs (Sophomore Women)
Tau Beta Sigma (National Women's Band Honorary)

## Scholastic Honorary

Alpha Delta Theta (Medical Technology)
Alpha Epsilon Rho (Radio-TV)
Alpha Lambda Delta (Freshman Women)
Alpha Zeta (Agriculture)
Delta Mu Delta (Business Administration)
Eta Kappa Nu (Electrical Engineering)
Gamma Theta Upsilon (Geography)
Omicron Nu (Home Economics)
Phi Alpha Mu (Arts and Sciences)
Phi Alpha Theta (History)
Phi Epsilon Kappa (Men's Physical Education)
Phi Eta Sigma (Freshman Men)
Phi Kappa Phi (All-University)
Phi Lambda Upsilon (Chemistry and Chemical Engineering)
Pi Mu Epsilon (Mathematics)
Pi Tau Sigma (Mechanical Engineering)
Putnam Scholarship Association
Sigma Delta Pi (Spanish)
Sigma Gamma Epsilon (Geology)
Sigma Lambda Pi (Building Construction)
Sigma Tau (Engineering)
Sigma Xi (Faculty, Graduate Student, Science)
Tau Sigma Delta (Architecture)

## All-University Honor Societies

Phi Kappa Phi. A national fraternity. Membership is open to honor students in all departments, on the basis of scholarship. The Kansas State chapter was installed in 1915.

Sigma Xi. A national fraternity. Members of the faculty and graduate students are eligible for election to active membership on the basis of achievement in original scientific investigation; seniors who have shown excellence in two departments of science are eligible for election to associate membership. The Kansas State chapter was installed in 1928.

## Professional

Alpha Chi Sigma (Chemistry, Chemical Engineering, Biochemistry)
Alpha Kappa Psi (Business Administration)
Alpha Tau Alpha (Agricultural Education)
American Chemical Society
American Guild of Organists
American Home Economics Association
American Institute of Aeronautics and Astronautics
American Institute of Architects
American Institute of Chemical Engineers
American Institute of Industrial Engineers
American Institute of Interior Designers
American Institute of Physics
American Institute of Planners
American Nuclear Society
American Society of Agricultural Engineers
American Society of Civil Engineers
American Society of Landscape Architects
American Society of Mechanical Engineers
American Veterinary Medical Association
Associated General Contractors
Bakery Management Club
Institute of Aerospace Sciences
Institute of Electrical and Electronics Engineers
Kappa Alpha Mu (Photo Journalsim)
Music Educators National Conference (MENC)
Mu Phi Epsilon (Women; Music)
Phi Delta Kappa (Men's Education)
Phi Mu Alpha (Men's Music)
Phi Upsilon Omicron (Home Economics)
Sigma Delta Chi (Journalism)
Society of American Military Engineers
Soil Conservation Society of America
Steel Ring (Engineering)
Theta Sigma Phi (Women Journalists)
Wildlife Society

## Student Religious Groups

Baptist Student Union (Southern Baptist)
Campus Crusade for Christ
Chi Alpha (Church of God)
Chinese Christian Fellowship
Christian Science Organization
Episcopal
Friends (Quaker)
Grace Baptist Student Fellowship
Islamic Association
B'nai B'rith Hillel Foundation
Kansas State Christian Fellowship (Inter-Varsity Christian Fellowship)
Lutheran, Missouri Synod (Gamma Delta)
Lutheran, National Lutheran Council (Lutheran Student Association)
Mennonite Fellowship

Mormon (Latter Day Saints Student Group)
Mormon (Reorganized Latter Day Saints; Liahona Fellowship)
Navigators
Newman Club
United Ministries in Higher Education at Kansas State University Affiliating Denominations:
American Baptist
Christian (Disciples of Christ)
Church of the Brethren
United Church of Christ
United Methodist Church
United Presbyterian Church
Wesleyan Campus Fellowship


## AGRICULTURE

GLENN H. BECK, Vice President for Agriculture

Agriculture at Kansas State University includes instruction, research, extension, and international agriculture. County agents, branch experimental stations, experimental fields throughout the state, and programs of agricultural education in other countries are a part of agriculture. Under the vice president for agriculture are four administrators: the dean of the College of Agriculture, the director of the Experiment Station, the director of Cooperative Extension, and the director of International Agriculture.


## THE COLLEGE OF AGRICULTURE

CARROLL V. HESS, Dean
FRANK R. CARPENTER, Assistant Dean DAVID J. MUGLER, Assistant to the Dean

The College of Agriculture has two objectives: 1) to help the student develop a philosophy for constructive living, an understanding of people, and leadership abilities, and 2) to provide professional education in the professional and scientific area of his choice.

## The Profession

Professional agriculture is the application of the physical, biological and social sciences and the principles of management to food production, food preservation and processing, crop and livestock marketing, culture of flowers and ornamentals, life processes of plants and animals, natural resources management, economics development and related fields. This broad profession includes areas such as soil physics, animal nutrition, cereal chemistry, and land economics.

Twenty examples of positions held by recent graduates are:

1. Superintendent, flour mill
2. District sales manager, feed company
3. Research director, fertilizer manufacturer
4. County extension agricultural agent
5. Produce manager, retail food chain
6. Beef editor, farm magazine
7. Vocational agriculture instructor
8. Farm appraiser and loan officer
9. Graduate student, for Ph.D.
10. Fieldman, farm management company
11. Technical representative, pesticide company
12. Work unit conservationist, SCS, USDA
13. Commission salesman, livestock market
14. Editor, flower and garden magazine
15. Assistant manager, pork department of meat
16. Economist, Foreign Agricultural Service, USDA
17. Farm or ranch manager
18. Owner, city flower shop
19. Medical entomologist
20. Meat inspector

## The Faculty

Students who enter professional colleges are concerned primarily with quality of the faculty. More than 85 per cent of the instructional faculty of the College of Agriculture have Ph.D. degrees. All are actively involved in research and publish their findings regularly in scientific journals. They work closely with extension specialists in their fields. Such integration of teaching, research, and extension insures that courses are current, factual and relevant.

## Facilities

Effective instruction in the application of basic sciences to "going industries" requires expensive and varied equipment. A feed mill, flour mill, and bakery include modern equipment from eight countries. Wellequipped drafting rooms are used by milling students. Greenhouses, hotbeds, and field plots provide stock for horticulture courses.

Over 4,000 acres of land are used for experimental work and for instruction. Poultry and livestock of many breeds and various ages, and various soil types, field crops, fruits, vegetables, and ornamentals are used in teaching and research.

A Dairy and Poultry building completed in 1963 and a modern Animal Industry building contain the latest equipment for teaching and research in nutrition, genetics, and food processing (meat, milk, eggs). New entomology and biochemistry laboratories are now in use.

Many students work part time in the laboratories, greenhouses and on the farms. This experience adds greatly to students' learning and understanding.

Some curriculums and majors are closely related to agricultural resources and products. For example agronomy is related to crops and soils, animal science and industry to livestock and livestock products, and milling science and management to flour.

Electives permit adaptation of the program to the student's goals.

A student planning to farm, for example, might enroll in any one of several majors, and work with his adviser in developing an academic program most effective and valuable for him. One who wants to write for a flower and garden magazine might major in agricultural journalism and minor in horticulture, or vice versa.

The "Agriculture" curriculum includes those majors which have a relatively large number of courses in common. Note that a student may enroll in General Agriculture if he wants to enter some part of professional agriculture but is not yet ready to identify a particular curriculum. Separate curriculums are available for the student whose professional interests require a special program of course work. These curriculums are Agricultural Economics, Agricultural Education, Bakery Science and Management, Biochemistry, Dairy Foods Science and Industry, Feed Science and Management, Milling Science and Management, Natural Resources Conservation and Use, and Horticultural Therapy. He can take basic courses during his freshman year that will be useful in any curriculum or major, and he may take courses in several branches of agriculture to determine which branch best fits his interests and abilities.

A majority of students select a curriculum (or a major in the Agriculture curriculum) at the time they enter. They are provided an academic adviser in their major field. Those who enter General Agriculture are provided an academic adviser who is a representative of the dean's office. These students are urged to choose a major before the close of the freshman year.

A student may change his curriculum or major at almost any time and with relative ease, though a change after the sophomore year may delay graduation.


[^1]Courses required for majors in the Core Curriculum are:
English Composition I ..... 3
English Composition II ..... 3
Oral Communication ..... 2
Agriculture in Our
Society ..... 2
College Algebra .....  3
Economics I ..... 3
Chemistry I or General
Chemistry ..... 5
Physical Education I ..... 0
Physical Education II ..... 0
Humanities ..... $6^{1}$
Social Sciences ..... $6^{2}$
Communications ..... 2 or $3^{3}$
Additional Curriculums Options
Agricultural
Education

| Bakery Science | Administration |
| :---: | :--- |
| and Management | Chemistry <br>  |
|  | Operations |

Biochemistry

| Dairy Foods Science | Administration <br> Science <br> Food Processing |
| :---: | :--- |
| Feed Science | Administration |
| and Management | Chemistry <br> Operations |

Horticultural Therapy

| Milling Science | Administration |
| :---: | :--- |
| and Management | Chemistry |
|  | Operations |


| Natural Resources | Soil and Water |
| :---: | ---: |
| Conservation and Use | Conservation | Economics of Conservation

Conservation of Recreation Areas

[^2]
# Additional Minimum Requirements for Majors in the Curriculum in Agriculture Except for Pre-Forestry and Pre-Veterinary Medicine 

|  | Business and |  |  |
| :---: | :---: | :---: | :---: |
| Science | Industries | Production | Services |

Agriculture:

## Soils

Plant Sci.
Prin. An. Sci. or Basic An. Sci. \& Ind
Prin. Ag. Econ.
Engg. in Ag .
Engg. in Ag.
Econ. Entom
Econ. Entom
Plant Path.

Five of the courses listed (three for Ag Econ and Entomol. ogy majors).

Prin. Ag. Econ., a
second Ag. Econ.
course, and 12 credits
in other courses listed.

Biological Science:
Gen. Botany ${ }^{\prime}$
Gen. Zoology'
Genetics
Microbiol.
Envir. Biol.

Gen. Botany or Gen Zoology plus two ${ }^{3}$ other courses listed.

Gen. Bot. or Gen. Zoology plus one ${ }^{3}$ other course listed.

Gen. Bot. or Gen Zoology plus one ${ }^{3}$ other course listed.

Prin. of Ag. Econ. plus four other courses listed.

Mathematics, Statistics, and Computer Science:
Plane Trig.
Calc. 1
Plane Trig. plus two
Elem. Stat. ${ }^{4}$
Elem. Dig. Comp.
Fund. Comp. Prog

Two of courses
listed.

One of courses listed.

Elem. Stat.s plus one other course listed.

Physical Science:

| Desc. Physics |  |  |  |
| :---: | :---: | :---: | :---: |
| Physics 1 |  |  |  |
| Physics 11 |  |  |  |
| Physical Geol. |  |  |  |
| Chem II | One course from each |  |  |
| Chem Anal. | of three of the four |  | Two of courses |
|  | groups (one course |  | listed, including one |
| Elem. Org. Chem. | from two of the four | One of courses listed. |  |
| Gen. Org. Chem. | groups for Ag. Econ. |  | the course Intro. to |
| Org. Chem. 1 | majors). |  | Org. \& Biochem. |
| Intro. Org. Chem. \& |  |  |  |
| Biochem. |  |  |  |
| Elem. Biochem. |  |  |  |
| Gen. Biochem. |  |  |  |

One of courses listed, plus:
Gen. Psych.
Social Psych.
Social Psych. ${ }^{6}$
Intro. To Soc. ${ }^{6}$
Comm. Org. \&
Lead.
Adm. Process or
Adm. Policy
Pub. Finance
Ethics or Prof. Ethics
Elem. Logic
Acctg.
Meth. of Ext.
Teaching
Persuasion
Group Discussion

Accounting and Business Administration:

Gen. Bot. or Gen. Zoology plus one ${ }^{3}$ other course listed.
 stituted for the combination of Gen. Bot. and Gen. Zool. Principles of Biology may substitute for Gen. Bot. or Gen. Zool.
2. One of these may be General Botany or General Zoology.
3. May be General Botany or General Zoology.
4. Stat. Meth. I may substitute.
5. Ag. Econ. Stat. May substitute.
6. These courses fill social science requirements.

## Science Option

(Research \& Graduate Study)
Nearly 30 per cent of recent graduates are in graduate school, aiming for M.S. or Ph.D. degrees. Graduate students will do best if their undergraduate programs were strong in the basic sciences - mathematics, botany, zoology, physics, chemistry, statistics, computer science, economics, and in communications.

## Business and Industries Option

About 25 per cent of recent graduates of the College of Agriculture are now employed in
industry as salesmen, plant superintendents, buyers, and writers. This shows that many students should take courses to prepare them to compete in industry. Likely courses are accounting, labor relations, corporation law, sales psychology, journalism, and others.

## Production Option

Those who plan to farm or ranch should consider their future community responsibilities and the changing characteristics of farming as they select their courses. Farmers will want to understand state and local government, principles of taxation, and
corporation law as applied to farms, in addition to the technology of crop and livestock production.

## Services Option

This option is for personnel who will be working in administration, education and services. These areas require that individuals have a broad understanding of agriculture, including production, assembly, processing and distribution. In addition they must develop some knowledge of the social sciences and the humanities. Fields of employment which majors in this option enter include: cooperative extension, economic planning and development, recreation administration, and positions in many other public agencies and private businesses.

In addition to one of the options each student will complete courses prescribed by his major department, some of which are listed on the following pages.

## Majors

Agricultural Economics

Non-Maior Courses
Depending upon the student's professional interests and objectives, he may select, with the consent of his adviser, courses from the following areas: (20 hours)
Professional Agriculture
Business Administration
Extension Education
Economics, Political Science, Sociology, and Psychology
General Electives
These may be selected by student with the consent of his adviser to fulfill the student's personal educational interests and objectives ( 17 hours).

## Agricultural Journalism

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Technical Journalism Courses
    Agricultural Journalism
    Reporting II
    Editing
    Photo. Journalism I
    Principles of Advertising
    Magazine Article Writing
    Public Relations
    Radio & TV News
    Ag Student Magazine
    Journalism Electives
Professional Agriculture Courses
A minimum of 12 hours must be taken in one of the following areas:
        1. Agricultural Economics
        Agronomy
        Animal Science and Industry
        Dairy Science
            Entomology
        6. Grain Science and Industry
            Horticulture and Forestry
            8. Poultry Science
            9. Agricultural Mechanization
```


## Agricultural Mechanization

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Major Courses
Farm Power
Agricultural Machinery Management
Planning and Management of Ag. Buildings
Conservation Surveving and Planning
```



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Farmstead Utilities
One or more of the following courses in Ag. E
\(352,452,651,652,653,654\)
```

Non-Major Courses
Graphical Communications I ................................................ 2
General Physics ................................................................................. 8
Plane Trigonometry 8
3
Professional Agriculture Courses
A minimum of 12 hours in one of the following

1. Agricultural Economics and Iournalism
2. Agronomy, Entomology, Horticulture, and

Plant Pathology
3. Animal, Dairy, and Poultry Science

## Agronomy

Major Courses
Plant Science
Soils
Crop Production
Soil Fertilitv
Weed Science
Range Management
Soil Management and Moisture Conservation
Crop Improvement

Non-Major Courses
Dependent on option chosen.
Students may specialize in agricultural chemical sales, soil science, crop science, range management, soil conservation, or irrigation.

Animal Science and Industry
Major Courses
Basic Animal Science and Industry or
Principles of Animal Science
Animal Science and Industry
Principles of Feeding
Animal Nutrition
Principles of Livestock Selection
Elements of Meat Processing
Beef Science
Swine Science
Sheep Science
Animal Breeding
Animal Science and Industry Seminar
Non-Major Courses
To be chosen in consultation with adviser
Students may specialize in animal nutrition, aminal breeding and genetics, meat science, or livestock management.

## Dairy Production

Major Courses
Principles of Animal Science
Dairy Science
Fundamentals of Nutrition
Genetics
Dairy Cattle Nutrition
Dairy Cattle Management
Dairy Cattle Genetics
Dairy Cattle !adging
Milk Secretion
Artificial Breeding of Farm Animals
Market Milk \& Dairy Inspection
Dairy Seminar
Non-Major Courses
To be chosen in consultation with adviser

## Entomology

```
Major Courses
    General Entomology
    External Insect Morphology
    Insect Taxonomy
    Advanced Applied Entomology I
    Advanced Applied Entomology II
    Properties of Insecticides
Non-Major Courses
    Biology
    Chemistry II and Lab
    Elementary or General Organic Chemistry
    Plant Pathology
    Genetics
    Microbiology
    Trigonometry
```

Students who plan to work on the M.S. or Ph.D. in entomology should secure information from the Department on further undergraduate recommendations and requirements.

## Horticulture

Major Courses
Home Horticulture
Horticulture Seminar
Plant Science
Landscape Horticulture
Fruit Production
Floriculture
Vegetable Ecology
Non-Major Courses Dependent on option chosen.
All horticulture majors are expected to take the departmental courses listed above. Additional departmental requirements vary with the option selected. Students may specialize in horticultural crop science or production, plant environmental relationships, horticultural crop marketing, and agricultural chemical sales.

## Plant Pathology

```
Major Courses
    General Botany
    Plant Science
    Plant Pathology
    Botanical Science
    Introductory Mycology
Non-Major Courses
    Soils
    General Zoology
    Genetics
    Chemistry II and Lab
    General Organic Chemistry
    Economic Entomology
    Bacteriology
    General Physics I
    General Plasicsi ..........
    Descriptive Meteorology
```


## Poultry Science

Major Courses
Principles of Animal Science
Poultry Science
Nutrition of the Fowl
Quantitative Genetics and Poultry I mprovement
Avian Metabolism
Poultry Products Technology
Poultry Management
Non-Major Courses
To be developed in consultation with adviser.
Pre-Veterinary Medicine Program ${ }^{1,2}$


In addition, satisfactory completion of Pre-Veterinary Medicine may qualify students to enter a college or university offering a Doctor of Veterinary Medicine degree.

## Additional Curriculums

Agricultural Education
B.S. in Agriculture

The Curriculum in Agricultural Education is for those who are interested in becoming teachers of vocational agriculture in high schools of Kansas and other states, teachers of agriculture in area vocational schools, or entering other educational work in some branch of the agricultural profession, such as county extension work. Students who complete the curriculum as outlined qualify for a state certificate to teach vocational agriculture in Kansas public schools.


SOPHOMORE

| Fall Semester |  |  |  |
| :---: | :---: | :---: | :---: |
| Biochemistry | 020 | 120 | Intro. Bio. \& Org. Chem. ....... 5 |
| zoology | 215 | 205 | General Zoology ............... 4 |
| $\mathrm{Ag} . \mathrm{E}$. | 506 | 151 | Ag. Mechanics Practices . . . . . . 2 |
| Education | 405 | 202 | Educational Psychology I ...... 3 |
| Economics | 225 | 110 | Economics I .................... 3 |
|  |  |  | 17 |
| Spring Semester 015 Soils |  |  |  |
| Agronomy | 015 | 270 | Soils .......................... 4 |
| Ag. E. | 010 | 201 | Prin. of Ag. Econ. |
| Speech | 281 | 105 | Oral Communications I ........ 2 |
| Ag. E. | 506 | 251 | Farm Power ...................................... ${ }^{3}$ Elective ................. |
|  |  |  |  |
| JUNIOR |  |  |  |
|  |  |  |  |
| Fall Semester |  |  |  |
| Education | 405 | 302 | Educational Psychology II ...... $\quad 3$ Ag. E. Elective ................. 2 |
|  |  |  | Literature or Language ........ 3 |
|  |  |  | Elective Agricultural Science .. 6 |
|  |  |  | Elective Social Science ......... 3 |
|  |  |  | 17 |
| Spring Semester 405400 |  |  |  |
| Education | 405 | 450 | Prin. of Secondary Ed. ......... 3 |
| Journalism | 289 | 350 | Agricultural Journalism ....... 3 |
|  |  |  | Elective Agricultural Science .. 6 |
|  |  |  | $\begin{aligned} & \text { Ag. E. Elective .................... }{ }^{2} \\ & \text { Elective Social Science ....... } \end{aligned}$ |
|  |  |  |  |
| SENIOR |  |  |  |
|  |  |  |  |
| Fall Semester |  |  |  |
| Education | 405 | 702 | Vocational Education ........... 3 |
| Education | 405 | 500 | Methods of Teaching Ag. ....... 2 |
| Education | 405 | 477 | Tchg. Partic. Sec. Sch. ......... 6 |
| Ag. E. | 506 | 459 | Ag. Mechanic Methods ......... 3 |
| Ag. E. | 506 | 351 | Ag . Machinery Operation ...... 2 |
|  |  |  | 6 |
| Spring Semester 2 |  |  |  |
| Spring Semester |  |  | Ag. E. Elective .................. 2 |
|  |  |  | General Education Elective .... 3 |
|  |  |  | Elective - Ag. Science ........ 8 |
|  |  |  | Literature or Language ........ 3 |
|  |  |  | 17 |

Eight weeks during the first or second semester of the senior year are devoted to fulltime student teaching. Oncampus courses meet extra periods while the student is

[^3]on campus, so he has no other academic responsibilities while teaching. When student teaching is taken in the spring, fall semester courses shown on preceding page are moved to spring semester. See "Admission to Teacher Education" \& "Admission to Student Teaching" in College of Education section of catalog.

## Bakery Science and Management

B.S. in Bakery Science and Management

## FRESHMAN



Option C (Operations)

| Biochemistry | 020 | 120 |
| :--- | :--- | :--- |
| Chemistry | 221 | 250 |
| Mathematics | 245 | 220 |
| Mathematics | 245 | 221 |
| Mathematics | 245 | 222 |
| Physics | 265 | 310 |
| Physics | 265 | 311 |
| Applied Mechanics | 510 | 220 |
| Applied Mechanics | 510 | 305 |
| Elect. E. | 530 | 419 |
| Indust. E. | 550 | 401 |
| Mech. E. | 560 | 218 |
| Mech. E. | 560 | 400 |

Intro. to Org. \& Bio. Chem. Chemisiry ll Lab Anal. Geometry \& Calculus Anal. Geometry \& Calculus I Anal. Geometry \& Calculus Ill Engineering Physics I Engineering Physics Strength of Materials Strength
Statics
Electrical Circuits \& Machines Industrial Management Graphical Comagnicat Graphical Communications II Elementary Thermodynamics 5
2
4
4
4
5
5
2
3
4
3
2
3
13

Biochemistry
B.S. in Biochemistry

FRESHMAN*
Fall Semester
Chemistry
Chemistry
Mathematics
English
English
Speech
Physical Education
Biochemistry

Spring Semester
Chemistry
Chemistry
Mathematics
English
Physical Education
$\begin{array}{ll}221 & 230 \\ 221 & 271 \\ 245 & 221 \\ 229 & 120 \\ 261 & 011\end{array}$

|  |  | Course Sem.Hrs. |
| :---: | :---: | :---: |
| 221 | 210 | Chemistry I |
| 221 | 211 | Chemistry I Lab |
| 245 | 220 | Anal. Geometry \& Calculus I |
| 229 | 100 | English Composition I |
| 281 | 105 | Oral Communication |
| 261 | 011 | Physical Education |
| 020 | 100 | Biochemistry Orientation |
| 221 | 230 | Chemistry II |
| 221 | 271 | Chemical Analysis |
| 245 | 221 | Anal. Geometry \& Calculus II |
| 229 | 120 | English Composition II |
| 261 | 011 | Physical Education |

SOPHOMORE
Fall Semester
Mathematics
Chemistry
Chemistry
Chemistry
Physics

Spring Semester
Chemistry
Chemistry
Chemistry
Physics

JUNIOR
Chemistry
Biochemistry
Biochemistry

Spring Semester
Chemistry
Chemistry
Biochemistry
Biochemistry

| 245 | 222 |
| :--- | :--- |
| 221 | 431 |
| 221 | 451 |
| 265 | 310 |

Anal. Geometry \& Calculus III . 4
Organic Chemistry I ..............
Organic Chemistry I :............
Organic Chemistry I Lab ........ 2
Engineering Physics I ......... 5 $\overline{14}$
$\begin{array}{lllll}221 & 445 & \text { Chemical Separations } & \ldots . . . . . & 2 \\ 221 & 450 & \text { Organic Chemistry } 11 & . . . . . . . & 3\end{array}$

| 221 | 450 | Organic Chemistry II ............. | 3 |
| :--- | :--- | :--- | :--- | :--- |
| 221 | 451 | Organic Chemistry II Lab |  |
| 265 | 311 | Engineering Physics II | 2 |

Engineering Physics II ........ $\frac{5}{12}$

Biochemistry

## SENIOR

Fall Semester


Spring Semester
Modern Language** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 3 or 4
Stubtotal
Biology . . . . . . . . . . . . . . . . . . . . . . . . 16
Social Science
16
6
Nonrestricted Electives:
Total hours . ............................................................... 120
Sufficient electives should be taken each semester so that the total semester load will be 16.17 hours.
'Students requiring Algebra and Trigonometry must take these courses duling the freshman year or during the summer school prior to their fresh. man year. If students take Algebra and Trigonometry during the fall and spring semester of the freshman year, they must enroll in Physical Chemistry I and II lectures during the summer between the junior and senior years if they wish to finish in four years.
*The modern language requirement may be satisfied by a minimum of slx hours of one of the following: German, Russian or French.

Dairy Foods Science \& Industry
B.S in Agriculture

## FRESHMAN



JUNIOR

| Fall Semester |  |  |  |
| :---: | :---: | :---: | :---: |
| Dairy \& Poult. Sci. | 025 | 681 | Dairy Foods Processing I |
| Dairy \& Poult. Sci. | 025 | 510 | Dairy Technology |
| Ag. E. | 010 | 455 | Dairy Mechanics |
|  |  |  | Descriptive Physics |
|  |  |  | Humanities |
|  |  |  |  |
| Spring Semester |  |  |  |
| Dairy \& Poult, Sci. | 025 | 683 | Dairy Foods Processing III |
|  |  |  | Humanities ............ |
|  |  |  | Options |
|  |  |  | Communications Elective ...... 3 |
|  |  |  | Elective ..... .............. 3 |
|  |  |  |  |
| SENIOR |  |  |  |
| Fall Semester |  |  |  |
| Dairy \& Poult. Sci. | 025 | 682 | Dairy Foods Processing II |
| Dairy \& Poult. Sci. | 025 | 685 | Dairy Foods Processing Lab A |
| Statistics | 285 | 320 | Elements of Statistics ........ |
|  |  |  | Option ........................... ${ }^{7}$ |
|  |  |  | Food Processing Elective ...... 3 |
|  |  |  |  |
| Spring Semester |  |  |  |
| Dairy \& Poult. Sci. | 025 | 684 | Dairy Foods Processing IV |
| Dairy \& Poult. Sci. | 025 | 686 | Dairy Food Processing Lab B |
| Ag. Econ. | 010 | 245 | Prin of Ag. Marketing |
| Dairy \& Poult. Sci. | 025 | 500 | Dairy Seminar |
| Dairy \& Poult. Sci. | 025 | 695 | Dairy Plant Management |
| Dairy \& Poult. Sci. | 025 | 670 | Quality Control of Dairy |
|  |  |  | Products $\ldots \ldots . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ~$ 5 |

ADDITIONAL ELECTIVE COURSES
Science Option


Food Processing Option
Foods II
Experimental Baking il
Quality of Wheat \& Flour
Elements of Meats Processing
Meat Selection \& Utilization H. E
Poultry Products Technology
Meats Processing
Dairy Products Evaluation il

## Feed Science and Management

B.S. in Feed Science and Managemen $\dagger$

## FRESHMAN

Fall Semester


JUNIOR

| Fall Semester Grain Science | 045 | 410 | Feed Technology I ............... ${ }^{4}$ Social Science Elective ......... 10 Option A, B, or C ................ |
| :---: | :---: | :---: | :---: |
|  |  |  | 17 |
| Spring Semester Grain Science | 045 | 660 | Qualities of Feed Ingred. ......... ${ }^{3} 4$ Option A, B, or C.............. 14 |

SENIOR
Fall Semester


Option A (Administration)

| Ag. Economics | 010 | 120 | Grain Marketing |
| :---: | :---: | :---: | :---: |
| Biochemistry | 020 | 120 | Intro. to Org. \& Biol. Chemistry |
| Grain Science | 045 | 610 | Flour \& Feed Analysis |
| Grain Science | 045 | 680 | Feed Technology II |
| Chemistry | 221 | 271 | Chemistry II Lab |
| Economics | 225 | 120 | Economics II |
| Economics | 225 | 430 | Money \& Banking |
| Mathematics | 245 | 350 | Elem. Digital Computing Tech. |
| Physics | 265 | 211 | General Physics I . . |
| Physics | 265 | 212 | General Physics II |
| Statistics | 285 | 320 | Elements of Statistics |
| Mathematics | 245 | 340 | Intro. to Analytic Processes |
| Bus. Ad. | 305 | 275 | Fund. of Accounting |
| Bus. Ad. | 305 | 305 | Managerial Accounting |
| Bus. Ad. | 305 | 325 | Business Law 1 |
| Bus. Ad. | 305 | 342 | Sales Management |
| Bus. Ad. | 305 | 410 | Business Finance |

[^4]2. See List of Humanities and Social Sciences Electives, page 31.

| Option B (Chemistry) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Biochemistry | 020 | 421 | General Biochemistry | 3 |
| Biochemistry | 020 | 422 | General Biochemistry Lab | 2 |
| Grain Science | 045 | 610 | Flour \& Feed Analysis | 5 |
| Chemistry | 221 | 271 | Chemical Analysis | 4 |
| Chemistry | 221 | 400 | Desc. Physical Chemistry | 3 |
| Chemistry | 221 | 431 | Organic Chemistry | 3 |
| Chemistry | 221 | 432 | Organic Chemistry I Lab | 2 |
| Chemistry | 221 | 450 | Organic Chemistry ${ }^{\text {d }}$ | 3 |
| Chemistry | 221 | 451 | Organic Chemistry II Lab | 2 |
| Mathemalics | 245 | 220 | Anal. Geom. \& Calc. 1 | 4 |
| Mathematics | 245 | 221 | Anal. Geom. \& Calc. II |  |
| Mathemalics | 245 | 222 | Anal. Geom. \& Calc lli | 4 |
| Physics | 265 | 310 | Engineering Physics I | 5 |
| Physics | 265 | 311 | Engineering Physics II |  |
| Statistics | 285 | 520 | Statistical Methods I Electives | 14 |
| Option C (Operations) |  |  |  |  |
| Biochemistry | 020 | 120 | Intro. to Org. \& Biol. Chemistry | 5 |
| Grain Science | 045 | 210 | Advanced Flow Sheets | 2 |
| Grain Science | 045 | 680 | Feed Technology II | 4 |
| Grain Science | 045 | 720 | Adv. Flour \& Feed Tech. | 3 |
| Grain Science | 045 | 730 | Flour \& Feed Mill Constr. | 3 |
| Chemistry | 221 | 250 | Chemistry II Lab | 2 |
| Mathematics | 245 | 220 | Anal. Geom. \& Calc I | 4 |
| Mathematics | 245 | 221 | Anal. Geom. \& Calc. II | 4 |
| Mathematics | 2.45 | 222 | Anal. Geom. \& Calc. III | 4 |
| Mathematics | 245 | 240 | Series \& Diff. Equations | 4 |
| Physics | 265 | 310 | Engineering Physics I | 5 |
| Physics | 265 | 311 | Engineering Physics II |  |
| Applied Mechanics | 510 | 220 | Strength of Materials | 3 |
| Applied Mechanics | 510 | 305 | Statics | 3 |
| Electrical Engineering | 530 | 419 | Elec. Circuits \& Machines Electives | $4$ |

## Horticultural Therapy

## B.S. in Agriculture

This curriculum is designed to train undergraduate students in horticultural therapy. Currently such undergraduate training is not available elsewhere in the United States. Hospitals, psychiatric institutions, rehabilitation centers, correctional institutions, geriatric homes and retirement communities have great need for people trained in this field. During their senior year students will spend six months in field service training at the Menninger Foundation, Topeka, Kansas.

## FRESHMAN



| SOPHOMORE |  |  |  |
| :---: | :---: | :---: | :---: |
| Fall Semester |  |  |  |
| Biology | 215 | 210 | Botany I or |
| Biology | 215 | 121 | Principles of Biology |
| Hort. \& For. | 040 | 130 | Floral Arrangemen $\dagger 1$ |
| Landscape Arch. | 110 | 100 | Landscape Design |
|  |  |  | Humanifies ...... <br> Electives |

Spring Semester
Hort. \& For.
Psychology

$$
\begin{array}{ll}
040 & 200 \\
273 & 405 \\
040 & 410
\end{array}
$$

JUNIOR
Fall Semester


Milling Science and Management
B.S. in Milling Science and Management

FRESHMAN
Fall Semester

General Agriculture
Grain Science
Chemistry
English
Physical Education

Spring Semester
Chemistry
English
Mathematics
Physical Educałion
Speech
Mech. Engineering

| 229 | 120 |
| :--- | :--- |
| 245 | 105 |
| 261 | 011 |
| 281 | 105 |
| 580 | 213 |

English Composition 1
Plane Trigonometry
Physical Education
Oral Communication i
Graphical Comm.

SOPHOMORE


| Option B (Chemistry) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Biochemistry | 020 | 421 | General Biochemistry | 3 |
| Biochemistry | 020 | 422 | General Biochemistry Lab | 2 |
| Grain Science | 045 | 610 | Flour \& Feed Analysis | 5 |
| Grain Science | 045 | 620 | Adv. Wheat \& Flour Test | 3 |
| Chemistry | 221 | 271 | Chemical Analysis | 4 |
| Chemistry | 221 | 400 | Desc. Physical Chemistry | 3 |
| Chemistry | 221 | 431 | Organic Chemistry | 3 |
| Chemistry | 221 | 432 | Organic Chemistry I Lab | 2 |
| Chemistry | 221 | 450 | Organic Chemistry 11 | 3 |
| Chemistry | 221 | 451 | Organic Chemistry II Lab | 2 |
| Mathematics | 245 | 220 | Anal. Geom. \& Calc. 1 | 4 |
| Mathematics | 245 | 221 | Anal. Geom. \& Calc. II |  |
| Physics | 265 | 310 | Engineering Physics | 5 |
| Phsyics | 265 | 311 | Engineering Physics II Electives | 5 |
| Option C (Operations) |  |  |  |  |
| Biochemistry | 020 | 120 | Intro. Org. \& Biol. Chem. | 5 |
| Grain Science | 045 | 210 | Adv. Flow Sheets |  |
| Grain Science | 045 | 670 | Milling Technology II | 4 |
| Grain Science | 045 | 720 | Adv. Flour \& Feed Tech. |  |
| Grain Science | 045 | 730 | Flour \& Feed Mill Constr | 3 |
| Chemistry | 221 | 230 | Chemistry II Lab | 2 |
| Mathematics | 245 | 220 | Anal. Geom. \& Calc. 1 |  |
| Mathematics | 245 | 221 | Anal. Geom. \& Calc. 11 | 4 |
| Mathematics | 245 | 222 | Anal. Geom. \& Calc. III | 4 |
| Physics | 265 | 310 | Engineering Physics 1 | 5 |
| Physics | 265 | 311 | Engineering Physics II |  |
| Applied Mechanics | 510 | 220 | Strength of Materials | 3 |
| Applied Mechanics | 510 | 305 | Statics |  |
| Electrical Engg. | 530 | 419 | Elec. Circuits \& Machines Electives | ${ }_{12}^{4}$ |

## Natural Resources Conservation and Use

## B.S. in Agriculture

This curriculum provides courses in communications, mathematics, and basic sciences, with emphasis on biological, physical, and economic aspects of the development, use, and conservation of land, water, and other natural resources. Three options are available: (A) Soil and Water Conservation, (B) Economics of Conservation, and (C) Conservation of Recreation Areas. A college committee administers this curriculum and its members serve as advisers to students. Students should contact the Dean's office to determine their advisers. The following is a suggested schedule of courses.

## FRESHMAN

Fall Semester


Physical Education

## Spring Semester

English Composition II
Plane Trigonometry
Oral Communication I
General Botany
Chemistry II Lecture
Physical Education

## SOPHOMORE

Fall Semester
Economics I
Physical Geology
Plant Science .
General Physics
Agricultur
Chemistry 1
English Composition
Intro. Political Science or American Democracy

Spring Semester
Spring Semester
Soils
Principles of Ag. Economics
General Zoology
Option and Electives

JUNIOR
Animal Sciences .
General Psychology
Maihematies or Statistics ................................................................... 3 or 4
Humanities
Option and Electives ........................................................................................................... ${ }^{3}$
2

Humanities
Environmental Biology
Economic Entomology
Option and Electives

SENIOR
Fall Semeste
Pop. \& Human Ecology
Geography of Extractive Industries .................................................................................. 33
Geography of Extractive Industries
Option and Electives

Spring Semester
Microbiology. .
Option and Elective

Option A: Soil and Water Conservation ${ }^{2}$
Chemistry II Lab
2
5
Select courses from four of the following areas
Soil Mgmt. and Moist. Cons. or Mgmt. or Irrig. Soils
Soil Dev, and Classif.
Soil Fert. or Chem. Prop. Soils

Soil Physics ..........................
Cons. Surv. \& Plän. ........................................................ . . . . . 3 or 4
Electives ....................................................................... . . . . $15-17$
$\frac{-17}{35}$
Option B: Economics of Conservation ${ }^{3}$
Economics II
Production Economics
Ag. Law \& Economics
Nat. Resc. Economics
Agricultural Policy
Rural Sociology
Electives
ption C: Conservation of Recreation Areas
General Organic Chemistry
Forest Conservation
Turf Management
Arboriculture
Landscape Design
Community Recreation
Electives
ectives ...............

## Agriculture and Business Administration Degree Combinations

The Agribusiness complex of industries (processing, preservation, distribution, and retailing of farm-produced food, and manufacture and sale of farm-used equipment, feeds, and agricultural chemicals) employs a variety of professionally trained personnel in increasing numbers. Type of education required ranges from general business or accounting to professional and scientific agriculture to biological and physical sciences. Intensity of education needed ranges from the B.S. degree to the Ph.D. degree.
Agricultural businesses have expanded in size and number in Kansas. The College of Business Administration and College of Agriculture have identified at the top of the following page several programs that will prepare young people for some of the jobs in this vast complex. Academic years listed are estimates.

[^5]1. A Bachelor of Science degree in some discipline within the College of Agriculture (see majors and curriculums on p.31), followed by a Master's degree in Business Administration (see p. 175). $51 / 2$ academic years.
2. A Bachelor of Science degree in some discipline within the College of Agriculture, followed by a B.S. degree in Business Administration (see p. 174). 5 academic years.
3. A Bachelor of Science degree in some discipline within the College of Agriculture, including in the degree program a group of courses in Business Administration (see options and areas of study on page 174). 4 academic years.
4. A Bachelor of Science degree in Business Administration, including in the degree program a group of elective courses in some discipline within Agriculture.
5. A Bachelor of Science degree in Business Administration, followed by a B.S. or a master's degree in some discipline within Agriculture. 5 or 6 academic years.

To take advantage of one of these programs, a student would enroll in the College of Agriculture or the College of Business Administration. His B.S. program would be based on degree requirements listed in the respective College section of the catalog, and would need to be approved by his academic adviser and his dean. If he pursues a second B.S. or a master's degree, he would transfer to the second college following receipt of his first degree.

## Two-Year Programs in Agriculture

## Pre-forestry

Hours earned in this program can be transferred to most other colleges offering a degree in forestry. The required program follows:


## Retail Floriculture

This is a two-year technical program administered by the Department of Horticulture and Forestry. It combines a year of supervised practical training with a full year of University course work in preparation for employment in a retail flower shop. The first year of instruction is at Kansas State University where the course sequence is completed during the fall, spring and summer sessions. The second year, the student serves an apprenticeship at a selected retail florist business. Every effort is made to select a florist shop in a city of the student's choice. The apprentice will be an employee of the flower shop during this year of training and will receive a salary sufficient to meet normal living expenses.


## For Prospective Transfer Students

Some students desire to complete one or two years at a junior college or denominational college prior to attending the College of Agriculture.

The 63 semester hours listed below, with exceptions and variations footnoted, can be transferred to any of the professional programs listed at the top of the next page and a degree earned in four semesters by capable students with good academic records.


1. For Bakery Science and Management, Feed Science and Management, or Milling Science and Management, replace with five hours additional inorganic chemistry (including quantitative analysis), two additional hours organic chemistry and two hours engineering graphics.
2. For Biochemistry, replace with one semester of quantitative analysis
and or a second semester of Organic Chemistry, Physics, or Calculus
3. Required only in Professional Programs number 4, 7, 8, 9, 12, 13, 16, 17,

19 and 20 .
4. Required only in chemistry and operations options of 7,12,13 and in 8.
5. Eight hours required in all except that only five hours are required in 1,
$2,3,4,6,10,15$ and 18.
6. Not required in $1,3,4,10,14,15,18,19$ and option " $B$ " of 16.
. Required only in $4,7,8,9,12,13,16,17,19$ and 20 .
8. Not required in 3, 4, 7, 8, 9, 12, 13 and 20.
9. Not required in $3,4,7,8,12,13,14,15$ and 19

## Professional Programs in Agriculture

```
Agricultural Economics: B.S., M.S., Ph.D.
Agricultural Education (teaching); B.S., M.S
Agricultural !ournalism; B.S.
Agricultural Mechanization; B.S., M.S
Agronomy (Crops and Soils); B.S., M.S., Ph.D
Animal Science & Industry; B.S., M.S., Ph.D.
Bakery Science & Management; B.S., M.S., Ph.D.
Biochemistry; B.S., M.S., Ph.D
Dairy Foods Science & Industry; B.S., M.S
Dairy Production; B.S., M.S
Entomology: B.S., M.S., Ph.D.
Feed Science & Management; B.S., M.S., Ph.D
Milling Science & Management; B.S., M.S., Ph.D
Horticulture; B.S., M.S Ph.D
Horticultural Therapy; B S
Natural Resources Conservation & Use; B.S
Plant Pathologv: B.S., M.S., Ph.D
Plant Pathologv; B.S., M.S
Poultry Science: B.S.,
Pre.Veterinary Medicine (2 years)
```


## Course Scheduling

A few courses in the College of Agriculture, especially in Dairy Foods Processing and in Horticulture and Forestry, are offered only once a year or once every other year. Students pursuing these majors should visit the K-State campus or correspond with the department to determine whether courses will be offered in the sequence necessary to permit graduation in minimum time, without missing important courses. Also, time conflicts between or among required courses sometimes exist.
Two semesters of physical education taken at a junior college fulfill our non-credit requirement in that field.

## DEPARTMENTS AND COURSE OFFERINGS

## Agricultural Economics

(The College of Agriculture Section of the Department of Economics; see also College of Arts and Sciences.)

PaUl l. KELLEY,* Head of Department
EDGAR S. BAGLEY, Assistant Head, Teaching and Graduate Studies
NORMAN V. WHITEHAIR, Assistant Head, Extension
Professors Coppersmith,* Kelley,* Manuel,* McCoy,* Montgomery," Orazem,* Phillips,* Pine,* Schruben,* Scoville,' Sjo,* Sorenson,* and Whitehair;* Associate Professors Buller,* Erickson, Knight,* Koudele,* Norman,* Schlender, Thomas and Walker; Assistant Professors Baker, Biere,* Brinkman, Figurski, Flinchbaugh, Frazier, Langemeier,* McReynolds, Niernberger, Olsen, Olson, Overley, Treat, Vacin, and Whipps; Emeritus: President Farrell,* Dean Howe;* Professors Coolidge and Jaccard; Associate Professor Otto.*

## Undergraduate Study

Undergraduate programs of study in agricultural economics are available in each
of four areas: agricultural production, agricultural science, agricultural business and industry, and agricultural services. Also, students may select the Economics of Conservation option of the Curriculum in Natural Resources Conservation and use, see page 38.
The agricultural production program is designed primarily for students who plan to operate a farm after graduation or to seek a job closely related to farming, e.g., county agricultural agent. The program includes courses in the physical and biological sciences, applied agriculture, and general education, as well as agricultural economics.
The agricultural science program is intended for students who wish to prepare for graduate study or for employment as agricultural economists at the subprofessional level. While including courses in basic and biological science, agriculture, and general education, it emphasizes economics, mathematics, and statistics.
The agricultural business and industry program is designed for students seeking a career in the off-farm segment of agriculture, particularly with companies and industries that process or handle farm products or supply farmers with goods and services, including credit. Emphasis is on courses in economics, sociology, and business, with a background of biological and physical science, applied agriculture, and general education.
The agricultural services option combines technical agriculture and human relations, thus preparing students to work with rural people. Types of employment would include rural youth programs, international agriculture, poverty programs and administration of many types of rural action programs. Course emphasis is on technical agriculture, human behavior, and communication courses.
Sufficient flexibility is provided in all four programs to permit students, in consultation with faculty advisers, to select courses to fit individual needs.
Inspection trips and information obtained by research are used to supplement textbooks and reference materials for classroom purposes. Opportunity for capable students to assist with research projects on a part-time basis provides students an additional opportunity to learn principles involved in the various areas of agricultural economics.

## Graduate Study

Graduate study leading to the degrees Master of Science and Doctor of Philosophy is offered in the department. Research for theses may be in marketing, farm management, finance, land economics, conservation, prices, production economics, taxation, agricultural policy, international development, agricultural business and industry and other areas.
Prerequisite to graduate work in agricultural economics is acceptable undergraduate credit in economics, including agricultural economics. Graduate students majoring in agricultural economics take courses in general economics as well as in agricultural economics.

## Courses In Agricultural Economics

UNDERGRADUATE CREDIT (no prerequisite - open to all university students)
010 100. Principles of Agricultural Economics. (3) I, II. A course suggested for all students interested in the agricultural economy. A study of economic principles, with emphasis on their application to the solution of farm, agribusiness, and agricultural industry problems in relationship to other sectors of the United States economy and foreign countries. No prerequisite. Three hours lecture a week.
010 101. Economics of Population, Food and Environment. (3) I. A course suggested for all students interested in population, food, and environmental problems. Survey of the impact of economic activity on ecology; the population explosion and world food problems; the effect of economic advancement on the rate of resource utilization. No prerequisite. Three hours lecture a week.
010 102. Rural Poverty. (3) II. A course suggested for all students concerned with rural poverty problems. The American experience will serve as a laboratory for student study. Survey the nature and extent of rural poverty and its changes, and relate to location, occupation, race, migration, industrialization, education, vocational training and public policies. No prerequisite. Three hours lecture a week.

010 170. Natural Resources and Man. (3) I,II. An introductory course that assesses the environment to acquaint students with the kinds and extent of natural resources, their availability, and utilization. No prerequisite. Three hours lecture a week. See also 015 170, Agronomy and 040 170, Horticulture.

## UNDERGRADUATE CREDIT

010 245. Principles of Agricultural Marketing. (3) I. Marketing functions, costs, efficiency; market organization and institutions; consumer behavior; food processing and industries; role of government; agricultural price determination. Pr.: Econ. 110.

## UNDERGRADUATE CREDIT AND GRADUATE CREDIT IN MINOR FIELD

010 400. Production Economics. (3) I. Application of economic principles to problems of agriculture. Economic structure and aspects of American agriculture; analysis of demand, supply, production of agricultural products with particular reference to the firm. Ag. Econ. 405 is a continuation of this course and they are intended to be taken in consecutive semesters. Three hours recitation a week. Pr.: Ag. Econ. 100 or Econ. 120

010 405. Agricultural Market Structures. (3) II. Continuation of Ag. Econ. 400. Theory and application of economic principles to marketing problems in agriculture. Pricing of agricultural output and productive services under various forms of economic organization and competition; regional specialization location, and trade; determinants of economic change; evaluation of economic and consumer welfare. Three hours recitation a week. Pr.: Ag. Econ. 400.
010 410. Agricultural Policy (3) II. Analytical treatment of recent and current economic problems and governmental policies and programs affecting American agriculture, will include price and income problems, rural development, and rural poverty. Three hours recitation a week. Pr.: Junior standing.
010 411. Consumption Economics in Agriculture. (3) I. Factors determining consumption patterns of individuals and households; contributions of economics and other social sciences in study of consumer behavior; macroeconomics of food consumption and distribution; consumption a nalyses related to problems of agriculture. Three hours recitation a week. Pr.: Econ. 110.

010 412. Farm Management. (3) II. Principles and practices of organization and management; nature and structure of business; functions and operations; management tools; decision making processes. Two hours recitation and two hours laboratory a week. Pr.: Econ. 110 and Ag. Econ. 100 or Econ. 120.
010 413. Farm Resource Acquisition and Finance. (3) I. Acquisition of resources needed for farms and ranches through purchasing, leasing, and other contractual arrangements; financing resource acquisition; resource market structure and pricing; financial management. Three hours recitation a week. Pr.: Econ. 110.
010 414. Economics of Food Marketing. (3) I. Problems of assembly of farm products for processing and the marketing of the final food products. Special attention will be given to purchasing and distributing problems of dairy, poultry and meat processing. Three hours recitation a week and field trips. Pr.: Econ. 110.
010 415. International Agricultural Develop ment. (3) II. A study of principles of economic development and national and international policies that will stimulate development. Individual study is encouraged to meet student interests for understanding the problems and policies for agricultural development and the influence of such development on international policies of the United States. Three hours recitation a week. Pr. : Econ. 110.
010 416. Agricultural Law and Economics. (3) I. The legal framework impinging upon decision making by farm firms, families and individuals; liabilities, real and personal property, contracts, uniform commercial code, organization of farm firms, intergeneration property
transfers, water law, fence law, federal and state regulatory power, insurance, income tax and social security. Three hours recitation a week. Pr.: Econ. 110 and Junior standing.
010 417. Rural Banking. (3) II. Management of banks in rural areas including organization and personnel, sources and uses of funds, credit, and services, particularly farmers and agricultural businesses; the role of rural banks in the U.S. banking system. Two hours recitation and two hours laboratory a week, including field trips and guest bankers. Pr.: Econ. 110, B.A. 275, and Junior standing.
010 431. Economic Principles of Agricultural Business Firms. (3) II. A study of the concept of agribusiness and its relationship to the economy as a whole. Particular attention is given to the application of economic principles in the management of marketing and farm supply firms. Three hours recitation a week. Pr.: Ag. Econ. 100 or Econ. 120 and B.A. 275.
010 441. Agricultural Economics Seminar. Credit arranged. Seminars of special interest will be offered upon sufficient demand in the areas of (a) Farm Management, (b) Marketing, (c) Land Economics, (d) Policy, (e) other selected areas. Pr.: Consent of the instructor.
010 480. Agricultural Economics Statistics. (3) I. Principles and methods involved in the collection, analysis, interpretation, and presentation of statistical materials, with special reference to agricultural economics data. Two hours recitation and two hours laboratory a week. Pr.: Econ. 110 and Math. 100.

UNDERGRADUATE CREDIT (not available as major electives) AND GRADUATE CREDIT IN MINOR FIELD
010510 Grain Marketing. (3) I. The general areas covered include price influences and relationships, market structure, buying and selling problems, domestic and export trade; grain trade organization and regulation. Three hours recitation a week, including field trips. Pr.: Econ. 110.
010 511. Livestock and Meat Marketing. (3) II. A study of the market structure and organization of the livestockmeat economy; with emphasis on factors affecting prices, changing competitive market arrangements, and marketing problems of farmers and ranchers, market agencies, and processing firms. Three hours recitation a week. Pr.: Econ. 110.
010 512. Ranch and Feedlot Management. (3) I. Organization and management of a ranch or feedlot; selection of a livestock system; economics of size of business; financial management of the business. Two hours recitation and two hours laboratory or field trips a week. Pr.: Econ. 110.

## UNDERGRADUATE AND GRADUATE CREDIT

010 600. Bargaining and Cooperation in Agriculture. (3) I. A study of collective bargaining and cooperative activity in agriculture. Other marketing institutions such as marketing orders, marketing agreements, and agricultural marketing boards will be included. Emphasis is placed upon assessing the potential of these marketing techniques to strengthen the economic position of farmers in the economy. Three hours recitation a week. Pr.: Junior standing.

010 605. Price Analysis. (3) II. The analysis of selected agricultural prices; application of regression analysis to price analysis and special econometric considerations. Three hours recitation a week. Pr.: Ag. Econ. 400 and 480.

010 610. Quantitative Methods in Agricultural Marketing Firms. (3) I. Application of mathematical programming and other operations research techniques to practical management problems in agriculture. Two hours recitation and two hours laboratory per week. Pr.: Ag. Econ. 431 or consent of instructor.
010 612. Economic Analysis of Farm Firms. (3) II. The application of methods such as correlation, regression and linear programming for solving farm business problems and how results are used in decision making. Three hours recitation a week. Pr.: Ag. Econ. 400 and Stat. 520, or consent of instructor.
010 625. Natural Resources Economics. (3) I. Supply and demand for natural resources; optimal development, use and conservation of natural resources within welfare economics; benefit-cost analyses; public and private ownership and control over natural resources; particular attention given to recreational uses of resources, forests, wildlife, and urban uses of natural resources; quality, esthetic, and other non-market factors associated with natural resources. Three hours of recitation a week. Pr. : Econ. 110 and Junior standing.
010 630. Rural Human Resource Development. (3) II. Study of the nature of community development, the problems facing rural communities, and alternative solutions. Emphasis is placed on identifying problems, studying background materials such as public decision making, property rights taxation, zoning, etc., and developing communities through industrialization recreation, agricultural businesses and the creation of new employment centers. Three hours of recitation and field work a week. Pr.: Junior standing.
010 641. Agricultural Economics Seminar. Credit arranged. S. Seminars of special interest will be offered upon sufficient demand in the areas of (a) Farm Management, (b) Agricultural Finance, (c) Marketing, (d) Land Economics, (e) Policy, (f) other selected areas. Pr.: Consent of instructor.
010 650. Agricultural Economics Problems. Credit arranged. I, II, S. Pr.: Consent of instructor.

## GRADUATE CREDIT

010 801. Seminar in International Agricultural Development. (3) II. Reading, study, analysis and group discussion of (a) important problems of agricultural development in underdeveloped regions, (b) relevant development, theories and (c) approaches to agricultural development, including contribution of education, development of institutions, and other actions to advance the welfare of rural people. Pr.: Consent of instructor. 010 811. Seminar in Agricultural Policy. (3) I. An analysis of the relation of government to the economic aspects of farming as individual enterprise and agriculture as an industry, including the international aspects of United States agriculture. Pr.: Consent of instructor.
010 822. Seminar in Agricultural Marketing. Credit arranged. Offered on sufficient demand. Analysis of
special problems and current developments faced by firms and agencies associated with the marketing process for agricultural products. Pr.: Consent of instructor.
010 823. Production Economics II. (3) II. Economic theories of choice under conditions of imperfect knowledge (i.e. under risk and uncertainty) and the application of these theories to production decisions. Pr.: Ag. Econ. 620 or consent of instructor.
010 829. Seminar in Land Economics. (2) I. Comprehensive analysis of problems dealing with the control and use of public and private land resources. Pr.: Consent of instructor.
010 830. Analysis of Agricultural Resource Use. (3) II. Formulation and analysis of static and dynamic problems of agricultural resource use by firms and industries. Pr.: Basic courses in economics and statistics and consent of instructor.
010 831. Agricultural Marketing Management and Analysis. (3) I. Marketing problems of firms that market or process farm products and handle farm supplies, with special emphasis on decision processes as they relate to marketing; tools of analysis for solving marketing problems. Pr.: Ag. Econ. 405 and B.A. 275 or consent of instructor.
010 832. Agricultural Marketing Organization and Institutions. (3) II. A study of the competitive framework, firm behavior, and economic performance in agricultural product and factor markets, including an analysis of institutional arrangements, legal restraints, and marketing control programs. Pr.: Econ. 410 or consent of instructor.
010 840. Seminar in Agricultural Economics. (3) Offered on sufficient demand. Problems and current developments in agricultural economics. Pr.: Consent of instructor.
010 851. Research in Agricultural Economics. Credit arranged. I, II, S. Research for thesis or master's report.
010 861. Seminar in Economic Research. (3) II. The scientific reasoning underlying the selection of research problems, the formulation and testing of hypotheses, and the evaluation and presentation of results. Pr.: Consent of instructor.

## Agronomy

0. W. BIDWELL,* Acting Head of Department
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## Undergraduate Study

Agronomy is a science of many aspects and attracts students with interests ranging from practical soil management to the physics and chemistry of soils and from practical crop production to the study of photosynthesis, crop physiology and genetics.

Undergraduate programs of study in agronomy are available in each of four broad areas: agricultural science, including crop science, soil science and range management; agricultural production; agricultural services; and agricultural business and industry.

Flexibility in programs of study is maintained to meet individual needs. In addition, personal attention is given to each student through the department advisory system and through the undergraduate Wheat State Agronomy Club.

There is a demand for agronomists in research, industry, and both public and private service.

The farms used by the Department of Agronomy comprise 460 acres of mediumrolling upland soil and 200 acres of irrigated bottom land. The general fields and experimental plots, used for the breeding and testing of farm crops and for conducting experiments in soil fertility and methods of culture, afford the student opportunity for study and investigation. Experiment fields are also maintained by the department at nine locations in the state.

Laboratories for soil and crop work are available for the regular use of students. Material is provided for the study of the grain and forage crops best adapted to different purposes and most suitable for growing in the state. Greenhouse space is provided for problem and research work in crops and soils.

## Graduate Study

Major work leading to the degrees Master of Science and Doctor of Philosophy is offered in the fields of crop production, crop physiology, crop ecology, pasture improvement, plant breeding, weed science, plant genetics, soil chemistry, soil fertility, soil physics, dryland farming, soil management, irrigation, soil classification, and dynamics of wind erosion.

Prerequisite to work for advanced degrees in these fields is the completion of an undergraduate curriculum in general
agriculture, or in science for students having an agricultural background and some agricultural training. Students who have not had training in the following fields will be required to enroll in the appropriate undergraduate courses before completing an advanced degree: plant science, soil science, inorganic chemistry, organic chemistry, college algebra, general botany, college physics and trigonometry.

## UNDERGRADUATE CREDIT

015 200. Plant Science. (4) I, II. Study of the principles of the production of economic plants, including morphology, taxonomy, physiology, ecology, propagation, preservation, storage, and utilization. Three hours lec. and one two-hour lab. a week. Taught in cooperation with the Department of Horticulture and Forestry. Not open to Juniors and Seniors except with consent of instructor.
015 200. Plant Science. (4) I, II. Study of the principles of the production of economic plants, including morphology, taxonomy, physiology, ecology, propagation, preservation, storage, and utilization. Three hours lec. and one two-hour lab. a week. Taught in cooperation with the Department of Horticulture and Forestry.
015 201. Crop Production. (4) I, II. Study of the fundamental principles of production management, identification, and grading of the major cereal, forage, oil, and miscellaneous crops. Three lectures and one threehour lab. a week. Pr.: Agron. 200.
015 230. Grain Grading and Seed Analysis. (2) II. Application of the federal standards for grading farm crops and judging of grains and other crop products. Six hours lab. a week. Pr.: Agron. 200.
015 240. Forage Crops. (3) I. Adaptation, distribution, production, and utilization of forage crops; studies of species and types of principal forage crops. Two hours rec. and two hours lab. a week. Pr.: Agron. 200.
015 250. Grain and Seed Technology. (2) I. Commercial grading and judging of field crops and identification of principal types and varieties. Six hours lab. a week. Pr.: Agron. 230.
015 261. Market Grading of Cereals. (2) I. Market grades of cereals and factors that influence them. Six hours lab. a week. Pr.: Gr. Sci. 100.
015 270. Soils. (4) I, II. Fundamental chemical, physical and biological properties of soils; their formation, fertility and management. Two hours lec., one hour rec. and two hours lab. a week. Pr.: Chem. 110 or 210 or credit in high school chemistry with grade of A or B.
015 300. Soil Management and Moisture Conservation. (3) I, II. Principles and practices of soil and water management suited to semi-arid, sub-humid and humid areas. Three hours rec. a week. Pr.: Agron. 270.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

015 400. Development and Classification of Soils. (3) II. Geologic, climatic, and plant interactions in soil formation and distribution and methods of mapping and classifying soils in the field; field trips. Two hours rec.
and three hours lab. a week. Pr.: Geol. 100, Agron. 270, or consent of instructor.
015 401. Microclimatology. (3) I. A description of climatological conditions near the ground and their applications to the biological sciences. Pr.: Math. 100, Phys. 211. (Joint listing with the Department of Physics. See 265 401)
015 410. Range Management I. (3) II. Presents fundamental ecological principles of production, conservation, and utilization of grasslands. Applies these fundamental principles to range management. Three hours rec. a week. Pr.: Agron. 200.
015 420. Crop Improvement. (3) I. Methods of breeding agricultural crops and evaluation, distribution and maintenance of crop varieties. Three hours rec. a week. Pr.: Agron. 200.
015 430. Tropical Agronomy. (3) II. A study of the soils and plant materials of tropical areas, their distribution and use. Systems of agriculture and problems of agricultural production in tropical regions with emphasis on developing countries. Pr.: Junior standing and consent of instructor.

## UNDERGRADUATE AND GRADUATE CREDIT

015 600. Crop Problems. Credit arranged. I, II, S. Studies may be chosen in the fields of: Genetics, Crop Improvement, Pasture Improvement, Ecology, Weed Control, Plant Physiology, Production.
015 620. Weed Science. (3) I. Principles of weeds and herbicides relating to managerial and chemical weed control. Two hours rec. and one three-hour lab. a week. Pr.: Agron. 200, Chem. 190 or equiv.
015 621. Range Management Problems. Credit arranged. I, II, S.
015 630. Soil Problems. Credit arranged. I, II, S. Studies may be chosen in the fields of: Chemistry, Physics, Conservation, Fertility, Development and Classification. 015 640. Chemical Properties of Soils. (3) I. A study of soils as a chemical and colloidal system, including their chemical and mineralogical composition and reactions occurring in them. Three hours rec, a week. Pr.: Agron. 270, Gl. Gg. 100.
015 650. Soil Fertility. (3) I. A study of the relationship of soil chemistry to plant nutrition; forms of the essential elements in soils and the roles of these elements in plant nutrition; basic concepts of fertilizer applications and manufacturing. Three hours rec. a week. Pr.: Agron. 200, 270.

015 660. Soil Physics. (3) I. A study of the physical properties of soils, including soil moisture, texture, structure, aeration, temperature, and properties of disperse systems. Two hours rec, and three hours lab. a week. Pr.: Agron. 270, Math. 100, Phys. 211.
015 665. Advanced Microclimatology. (3) I. Offered 1972-73 and alt. years. An advanced course in the theory of solar and thermal radiation, heat budgets, and turbulent transfer processes at the earth-atmosphere interface near the growing crop. Pr.: Phys. 212, Math. 222, Agron. 401 or consent of instructor.
015 670. Soil Analysis Application. (3) I. Offered 1971-72 and alt. years. Theories and procedures for the chemical analysis of soils. Applications of analysis in soil fertility evaluations and in research work are discussed. One
hour rec. and six hours lab. a week. Pr.: Agron. 270, Chem. 271.
015 680. Field Course in Range Management. (2) S. A summer field and lecture course dealing with the principles of range ecology as applied to range management practices; emphasis on field techniques for range plant identification and mensuration, range site evaluation, range condition classification, plant succession, and the impact of various range management practices. Two weeks field course given jointly by Kansas State University and Fort Hays State College. Pr.: Agron. 410, Biol. 530. Suitable field experience may be substituted for these prerequisites with consent of instructor.
015 690. Plant Genetics. (3) I. Concepts and application of basic genetic principles in higher plants. Measurement of linkage, mapping, aneuploidy analyses, gene transfer, and estimation of genetic parameters for quantitative characters. Three hours rec. a week. Pr.: A.S.I. 400.
015 700. Crop Ecology. (3) II. Study of crop plant growth with relation to genetic, climatic, biotic and soil factors, with special emphasis on the inter-dependency of these factors. Pr.: Agron. 200, 270 or consent of instructor.
015 701. Crop Physiology. (3) II. Principles of nitrogen metabolism, mineral nutrition, photosynthesis, growth substances, and hardiness applied to crop production. Two hours rec. and two hours lab. a week. Pr.: Biol. 600.
015 711. Identification of Range and Pasture Plants. (2) II. Offered 1971-72 alt. years. Field and laboratory study of range and pasture plants, with special emphasis on grasses and their distinguishing characteristics. One hour rec. and two hours lab. a week. Pr.: Biol. 210.
015 720. Management of Irrigated Soils. (2) II. Principles of soil moisture retention, movement and measurement; reclamation and management of saline and alkali soils; water quality; management. Two hours rec. a week. Pr.: Agron. 200, 270.
015 730. Chemical Fertilizers. Not offered in 1971-72. (3) II. A study of the processes involved in the formulation of chemical fertilizers, the physical and chemical properties of various fertilizer materials and the technology of fertilizer use. Three hours rec. a week plus a field trip to inspect fertilizer manufacturing facilities. Pr.: Agron. 200, 270.
015 740. Range Management II. (3) II. Offered 1971-72 and alt. years. Application of principles of plant ecology to management and conservation of natural grazing land and to the characterization and mensuration of range vegetation, with special emphasis on ranges. Two hours rec, a week and one credit of laboratory consisting of field trips to representative range areas. Pr.: Agron. 410, Biol. 530.
015 750. Soil Erosion and Its Control. (3) I. Offered 197273 and alt. years. Mechanics of wind and water erosion, methods of predicting quantities of erosion, principles and practices for erosion control. Three hours rec. a week. Pr.: Agron. 270, Phys. 211, or consent of instructor. 015 751. Soil Erosion Laboratory. (1) Offered 1972-73 and alt. years. Three hours lab. a week. Pr.: Agron. 270, 750 , or conc. enrollment.

## GRADUATE CREDIT

015 800. Methods of Plant Breeding. (3) II. Offered 197172 and alt. years. The application of principles and methods of breeding field crops, including laboratory,
greenhouse, and field procedures. Two hours rec. and three hours lab. a week. Pr.: Agron. 200, A.S. I. 400. Pl. Path. 605.
015 810. Agronomy Seminar. (1) I, II. A discussion of agronomic developments. Pr.: Graduate standing.
015 820. Research in Crops. Credit arranged. I, II, S. Special problems which may extend through the year and furnish data for a master's or doctor's thesis. Pr.: Consult instructor.
015 825. Research in Genetics. Credit arranged. I, II, S. Special problems which may extend throughout the year and furnish data for a master's or doctor's thesis. Pr.: Consent of instructor.
015 830. Topics in Plant Breeding. Credit arranged. I, II, S. Discussion and lectures on important papers and contributions in this field. Pr.: Consent of instructor.
015 840. Advanced Crop Ecology. (3) I. Offered 1972-73 and alt. years. Principles of growth and development of crops in relation to the environment. Three hours rec. a week. Pr.: Agron. 700, or equiv., and Biol. 600.
015 850. Topics in Plant Genetics. Credit arranged. I, II, S. Discussion and lectures on important papers and contributions in this field. Pr.: Consent of instructor.
015 860. Advanced Forage Crops. (3) I. Offered 1971-72 and alt. years. Important forage crops species are studied throughout current literature with regard to growth characteristics, utilization and breeding procedures. Three hours rec. a week. Pr.: Agron. 240.
015 880. Research in Soils. Credit arranged. I, II, S. Special problems which may extend throughout the year and furnish data for a master's or doctor's thesis. Pr.: Consult instructor.
015 890. Soil Physical Chemistry. (3) I. Offered 1972-73 and alt. years. Application of physical chemistry to soils; cation and anion equilibria, cation activities, electrokinetics, sorption and other physiochemical reactions in soils. Two hours rec. and three hours lab. a week. Pr.: Agron. 640, 660 and Chem. 585.
015 900. Advanced Soil Physics. (3) I. Offered 1971-72 and alt. years. An advanced study of prominent theories concerning the physical behavior of soils. Three hours rec. a week. Pr.: Agron. 660, Math. 222, Phys. 211.
015 920. Soil Genesis. (2) II. Offered 1972-73 and alt. years. Theories of soil formation processes. Two hours rec. a week. Pr.: Agron. 400.

## Animal Science and Industry

## DON L. GOOD,* Head of Department

Professors Cox,* Koch,* Moyer, Richardson,* E. Smith," and Wheat;* Associate Professors Brent,* Drake," Francis, Harbers,* Hines,* Kiracofe,* Dropf,* McAdams, McKee, W. Smith,* Tuma,* and Zoellner; Assistant Professors Able,* Ahlswede,* Allee, Allen,* Ames, * Clary," Dikeman,* Schalles,* and Westmeyer; Instructors Hoover and McCollough; Emeritus: Professors Aicher, Auble, Mackintosh, McCormick, and Weber.

Courses in the Department of Animal Science and Industry give the student instruction in the selection, breeding, feeding,
management, and marketing of all classes of meat animals.
The animal science and industry farm and pastures consist of approximately 4,000 acres of land which are devoted to the maintenance of herds and flocks of purebred cattle, sheep, hogs, and horses, and to experimental projects with meat animals. All animals maintained by the department are used for class work.
The laboratory of the animal science and industry student is the feed lot, the judging pavilion, and the abattoir (as well as the animal nutrition, wool, meats, genetics, and animal breeding laboratories), where the animal can be studied from the standpoint of maintenance, growth, reproduction, structure and body composition.

## UNDERGRADUATE CREDIT

005 101. Basic Animal Science and Industries. (2) I, II. An introductory study of reproduction, nutrition, marketing procedures and management involved in the production of beef cattle, sheep, swine, and horses. Two hours rec. a week (A.S.I. 103 is a companion course.)
005 102. Principles of Animal Science. (3) I, II. Basic principles which apply to animal agriculture; survey of the industry; types, purposes and products of livestock; principles of breeding, selection, nutrition, lactation, reproduction, management and marketing. Three hours rec. a week. Taught in cooperation with the Department of Dairy and Poultry Science (A.S.I. 103, D.S. 103, and P.S. 104 are companion courses). Students cannot apply credit for both A.S.I. 101 and 102 or Dy. and Pl. Sc. 102 toward a B.S. degree.
005 103. Animal Science and Industry. (1) I, II. A study of the breeding and market types and classes of livestock including a comparision of the live animal and carcass evaluation. A companion course to A.S.I. 101 and 102 and Dy. and Pl. Sc. 102.
005 205. Principles of Livestock Selection. (3) I. Origin, development, characteristics, and adaptation of different breeds of livestock, with special emphasis on the selection of breeding animals. One hour rec. and four hours lab. a week. Pr.: A.S.I. 101 or 102, A.S.I. 103.
005 210. Judging Farm Animals. (2); II. Advanced judging of beef cattle, sheep, swine and horses. Pr.: A.S.I. 205 or consent of instructor.

005 220. Form \& Function in Livestock. (2) I. A detailed study of animal form and type; influence of type upon function; special training in presenting orally the relative merits of animals of all breeds. Pr.: A.S.I. 210. 005 230. Principles of Feeding. (3) I, II. Review of the digestive systems, metabolic processes and basic nutritional processes; origin, chemical analysis and feeding value of common feeds; nutritive requirements for maintenance, growth and production; basic ration formulation and evaluation. Three hours rec. a week. Pr.: Five hours of chem. or consent of instructor.
005 240. Livestock Feeding. (3) I. A resume of digestion and nutrition of ruminants and monogastric species.

Feed ingredients, feed control laws, feed sample analysis, feeding standards, energy systems, feed preparation, ration formulation and feeding. Open only to students in Veterinary Medicine. Three hours rec, a week. Pr.: Chem. 350, Physi. 635 or consent of instructor. 005 250. Elements of Meat Processing. (2) I, II. A survey and discussion of the red meat industry and the product quality, processing, merchandising and promotional trends and techniques. Two hours lec. a week. Pr.: A.S.I. 101 or 102 and 103 or consent of instructor.
005 260. Meat Processing. (1) I, II. Processing and marketing techniques for meat and meat products; to include slaughtering, pricing, cutting, cut identification, preservation, processing, meat cookery and color and product control. Three hours lab. a week. Pr.: A.S.I. 101 or 102 and 103; 250 or conc. assignment.
005 270. Principles of Meat Evaluation. (2) I. Introduction to subjective and objective standards employed in evaluating beef, lamb and pork carcasses and also wholesale cuts. Application of these factors to carcass grade, and yield of edible portion; value and consumer acceptance. Two hrs. class per week. Pr.: A.S.I. 250, 260 or conc, enrollment (or consent of instructor) and sophomore standing.
005 275. Wool Grading and Classification. (1) I. A study of factors determining the commercial classes and grades of wool and the desired fleece qualities of the breeds of sheep; practice in judging, grading and scoring wool. Three hours lab. a week. Pr.: A.S.I. 101 or 102.
005 280. Meat Selection and Utilization, H.E. (2) I. For students in home economics. Selection of meats, cutting meats, carcass grading, prepared meats and meat products, frozen meats and meat preparation are demonstrated and discussed. Two $2-\mathrm{hr}$. lecture demonstrations per week.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

005 400. Genetics. (3) I, II, S. Variation, Mendelian inheritance and related subjects. Three hours lec, a week. Pr.: Biol. 198 or 205 or 210.
005 410. Animal Breeding. (3) II. Physiology of reproduction; present status of livestock improvement; function of purebred livestock; breeding systems and practices; application of genetics to problems of animal breeding. Pr.: A.S.I. 400.
005 415. Beef Science. (3) I, II, A comprehensive course covering all phases of the beef cattle industry. Practical application of nutrition, breeding, physiology of reproduction, carcasses, merchandising and related areas. Special emphasis on management systems of raising, growing and finishing beef cattle. Pr.: A.S.I. 230 or consent of instructor.
005 420. Horse Science. (2) I. A study of the light horse industry in the U.S. Types and breeds of horses, selection, nutrition, management, performance and health. Two hours rec. a week. Pr.: A.S.I. 230 or consent of instructor.
005 425. Sheep Science. (3) I. Survey of the sheep and wool industry. Application of scientific principles and research findings to lamb and wool production. Attention given to different production programs. Three hours rec. a week. Pr.: A.S.I. 230 or consent of instructor.

005 435. Swine Science. (3) I, II. Application of basic scientific principles to the economical production of pork. Recommendations are made in breeding, reproduction, nutrition, health, housing, marketing and general overall management of swine production units of varying sizes. Three hours rec. a week. Pr.: A.S.I. 230 or consent of instructor.
005 440. Advanced Wool Grading and Classification. (1) I. Advanced work in commercial and purebred fleeces, with particular emphasis on the grading used by commercial wool marketing agencies. Laboratory exercises to acquaint the student with the physical properties of wool as they may affect its grading classification. Three hours lab. a week. Pr.: A.S.I. 275 or consent of instructor. 005 450. Classification, Grading and Selection of Meats. (1) I. Advanced study in the evaluation and classification of carcasses and wholesale cuts of beef, lamb and pork. Application of grade standards to beef, lamb and pork carcasses. Three hours lab. a week. Pr.: A.S.I. 250, 260. 005 460. Animal Science and Industry Practicums. (2) II. Manual phases of livestock management. Open only to majors in Animal Science and Industry and in Agricultural Education. Four hours lab. a week.
005 480. Animal Science and Industry Seminar. (1) II. Open only to senior and graduate students majoring in animal science and industry. One hour rec. a week. Pr.: A.S.I. 230.

## UNDERGRADUATE AND GRADUATE CREDIT

005 600. Animal Nutrition. (3) I. Study of nutrients, their functions and requirements for livestock, with special attention to recent discoveries in Animal Nutrition. Pr.: A.S.I. 230.
005 605. Commercial Cattle Feedlot Management. (2 to 4) S, I. Principles of commercial cattle feedlot management including cattle management, animal health, feed yard maintenance, feed mill operation, office management, and animal evaluation. A maximum of two hours credit for each 4 weeks of supervised workstudy at an approved commercial cattle feedlot. Pr.: A.S.I. 415.

005 610. Population Genetics. (3) II. Application of genetic principles to livestock improvement; selection methods, mating systems, heritability estimates. Three hours rec. a week. Pr.: A.S.I. 400 and three hours in statistics.
005 615. Swine Production Unit Operation. (2-4) S, I. A maximum of two hours credit for each 4 weeks of supervised work-study at an approved commercial swine production unit. Pr.: A.S.I. 435.
005 620. Population Genetics Laboratory. (1) II. Compilation and analyzing of genetic data. Three hours lab. a week. Pr.: A.S.I. 610 or conc. assignment.
005 625. Beef Cow Herd Unit Operation. (2-4) S, I. Principles of management in a beef cow unit involving direct contact in physiology, reproduction, breeding programs, nutrition, ranch accounting and other management procedures. Two hours credit will be given for each four weeks of study with a maximum of four total credits. Pr.: A.S.I. 415 or consent of instructor.
005 630. Genetics Seminar (1) I. Study and criticism of genetic experiments with animals and plants and of the biological and mathematical methods employed. One hour rec. a week. Pr.: A.S.I. 400 or Zool. 645.

005 635. Environmental Physiology of Farm Animals. (3) II. A detailed study of the effects of the environment on animal physiology and performance efficiency. Two hours lecture and two hours lab per week. Pr.:Physiol. Sci. 740431 , or consent of instructor.
005 650. Animal Science and Industry Literature. (1) I, II. Introduction to use of biological and chemical references in the University libraries, preparation and reporting of abstracts and literature from scientific journals on research in area of student interest. One hour rec. each week. Graduate standing or consent of instructor.
055 660. Animal Science and Industry Problems. Credit arranged. I, II, S. Pr.: A.S.I. 230 and other courses; consult instructor. Work offered in:

Animal Breeding, Animal Nutrition, Beef Cattle Production, Horse Production, Livestock Evaluation, Meats, Sheep Production, Swine Production.
005 670. Institutional Meats. (2) II. 1970-71 and alt. years. Particular attention to grades, brands, wholesale cuts, institutional cuts, fabricated meats, serving portions, shrinkage and variety meats; emphasis given to costs and prices as related to menus; field trip required. One hour rec. and three hours lab. a week. Pr.: A.H. 280 and Junior standing.
005 676. Meat Technology. (3) II. Muscle and bone anatomy, growth, meat composition and nutritive value, meat processing techniques, microbiology and sanitation, food additives, meat color, packaging and quality control. Two hours lec. and three hours lab. a week. Pr.: A.H. 250 and 260 or consent of instructor, senior or graduate standing.
005 690. Meat-Packing Plant Operation. (2-6) S. A minimum of four weeks of supervised study, for each two hours credit, in a commercial meat-packing plant.
005 710. American Livestock and Meat Industries. (3) I, II, S. A study of the industries, their evolutionary progress leading to current organization and economic structure and future developments; reports on selected readings. Pr.: A.S.I. 101, 230, 250, senior or graduate standing.
005 715. The Wool Industry. (3) II. Supply and demand, production, marketing and manufacturing. Two hours rec. and three hours lab. a week. Pr.: A.S.I. 425.

## GRADUATE CREDIT

005 805. Animal Breeding Seminar. (1) II. Evaluation of animal experimentation as related to reproduction and breeding. Pr.: Consent of instructor.
005 830. Advanced Meat Science. (2) II. Basic biochemical, physiological, and histological properties of muscle and related tissues; muscle contraction, rigor mortis and muscle hydration; maturation; processing by thermal, dehydration and cold sterilization techniques; meat flavor chemistry; meat research techniques. Two hours rec. a week. Pr.: A.H. 250 and 260 Biochem. 420 or consent of instructor.
005 835. Research Techniques in Animal Reproduction. (3) II. Study of experimental techniques used in animal reproduction. Current literature studies and laboratory experiments. Pr.: Background in anatomy and physiology or consent of instructor.
005 840. Research in Animal Science and Industry. Credit arranged. I, II, S. Pr.: Consult instructor.

005 850. Analytical Techniques in Animal Science and Industry. (3) I, II. Principles of analytical procedures used in research in Animal Science and Industries. One hour rec. and 6 hours lab. a week. Pr.: Consent of instructor.
005 890. Graduate Seminar in Animal Science and Industry. (1) I, II. Discussion of research and technical problems in the discipline. Attendance required of all departmental graduate students. Maximum of two hours may be applied toward an advanced degree.

## Biochemistry

HOWARD L. MITCHELL,* Head of Department
Professors Burkhard,* Clegg,* Mitchell,* Nordin,* Parrish ${ }^{*}$ and Ruliffson;* Associate Professor Hedgcoth;* Assistant Professors Cunningham,* Klopfenstein,* and Mueller;* Emeritus: Professor Whitnah.
Biochemistry is a study of the most intricate of all chemical systems - the chemistry of living matter. It attempts to decipher the chemical nature of protoplasm, the basic material of all living matter, and the principles of metabolism. There are two broad divisions of biochemistry, plant biochemistry and animal biochemistry, though they have much in common.
Biochemistry as a profession offers many opportunities in teaching, research, industry, and public service. Biochemistry also is excellent preparation for other areas of basic and applied science, for work in many of these fields depends on biochemical knowledge and methods. Employment in the biochemistry research laboratories while one is an undergraduate offers unusual opportunities to become acquainted with and gain experience in various aspects of biological and agricultural chemistry.
The Department of Biochemistry offers work leading to the degrees Bachelor of Science and, as a participant in the Graduate Biochemistry Group, the Master of Science and Doctor of Philosophy with a major in biochemistry (See Graduate Biochemistry Group, page 265). The department also participates in interdepartmental programs in animal nutrition leading to the Doctor of Philosophy degree (see Animal Nutrition, page 265) and in Food Science leading to Master of Science and Doctor of Philosophy degrees (see Food Science, page 266).

The Department of Biochemistry strives to develop scientists with a strong background in chemistry and biochemistry capable of independent research and teaching. To ac-
complish these objectives, the Department of Biochemistry has many well-equipped laboratories, instruments, animal rooms, and auxiliary facilities for investigations in biochemistry. The department offers a wide range of courses in various areas of biochemistry and nutrition. There is excellent interdepartmental cooperation in graduate programs and research in basic sciences and agriculture.

## Courses in Biochemistry

## undergraduate credit

020 099. Biochemistry Seminar. (0) I, II. Lectures, discussions, and activities of biochemical interest.
020 100. Biochemistry Orientation. (1) I. Discussion of biochemistry as a discipline in the life sciences.
020 120. Introductory Organic and Biological Chemistry. (5) II. For students in home economics, nursing, and other areas desiring an integrated organic and biochemistry course to provide an understanding of carbohydrates, proteins, lipids and of digestive and metabolic systems. Three hours lec. and six hours lab. a week. Pr.: Chem. 110.
020 200. Elementary Biochemistry. (5) II. An elementary treatment of the chemistry and metabolism of carbohydrates, lipids, proteins and nucleic acids. Pr.: Chem. 190.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

020 410. General Plant Biochemistry. (4) I. Occurrence, properties, functions and metabolism of the organic compounds of plants. Three hours lec. and three hours lab. a week. Pr.: Chem. 190 or 350.
020 421. General Biochemistry. (3) I, II, S. A basic study of the chemistry and metabolism of carbohydrates, lipids, proteins and nucleic acids, but at a more advanced level than Biochem. 200. Pr.: Chem. 350.
020 422. General Biochemistry Laboratory. (2) I, II, S. A one semester laboratory course with experiments relating to carbohydrates, lipids, proteins, nucleic acids and enzymes. Six hours lab. a week. Pr.: Quantitative chemical analysis, Chem. 351 and Biochem. 421 or conc. enrollment, or Biochem. 665 or conc. enrollment.

## UNDERGRADUATE AND GRADUATE CREDIT

020 655. Biochemistry I. (3) I. An introduction to physical methods, kinetics and thermodynamics of biochemical reactions and bioenergetics, chemistry of proteins and amino acids, carbohydrate chemistry and metabolism and lipid chemistry. Biochem. 655 and 665 are for students interested in two semester comprehensive coverage of biochemistry. For one semester course, enroll in Biochem. 42l. Pr.: *Quantitative chemical analysis, one year of organic chemistry, differential and integral calculus.

[^7]020 656. Biochemistry I Laboratory. (2) I. An intensive laboratory course to accompany Biochem. 655. Biochem. 656 and 666 are sequential courses for students interested in a two semester comprehensive coverage of experiments in biochemistry. For a one semester laboratory course, enroll in Biochem. 422. Six hours lab. a week. Pr.: "Biochem. 655 or conc. enrollment.
020 665. Biochemistry II. (3) II. A cont. of Biochem. 655 ; lipid metabolism, a mino acid metabolism, nutrition, nucleic acid chemistry and metabolism, integration of biochemical pathways and metabolic control mechanisms. Pr.: *Biochem. 655.
020 666. Biochemistry II Laboratory. (2) II. A cont. of Biochem. 656. Six hours lab. a week. Pr.: *Biochem. 656 and 665 or conc. enrollment.
020 670. Principles of Animal Nutrition. (3) II. The nutrients, nutrient requirements, functions and utilization of nutrients; nutrient balances; methods for animal nutrition studies and evaluation of feeds. Pr.: Biochem. 655 and 656.
020 680. Biochemistry of Toxic Materials. (2) I. Offered 1971-72 and alt. years. The chemistry of drugs, antimetabolites, metals and agricultural chemicals; their absorption, distribution, mode of action and effect on biochemical systems, metabolism and detoxication. Pr.: - Biochem. 665.

020 690. Lipids. (2) II. Offered 1971-72 and alt. years. Chemistry of plant and animal lipids, their occurrence, metabolism and industrial uses. Pr.: *Biochem. 665.
020 705. Vitamins. (2) II. Offered 1971-72 and alt. years or on demand. A survey of the avitaminoses, chemical properties, biochemical roles, metabolic pathways and methods of assay of the vitamins. Pr.: *Biochem. 665.
020 706. Animal Nutrition Techniques. (2) II. Laboratory investigations on vitamins, amino acids, minerals and energy. Practical experience in laboratory animal care, diet preparation, data collection and analysis. Pr.: *Biochem. 655 and 656.
020 710. Intermediary Metabolism. (3) II; $S$ on sufficient demand. Metabolic role of carbohydrates, lipids, proteins and amino acids, purines, pyrimidines, vitamins, minerals and hormones; biological oxidations: mechanisms of energy production and utilization. Pr.: ${ }^{\prime}$ Biochem. 656 and 665.
020 715. Nucleic Acids. (2) II. Chemistry, function, metabolism, and biological roles of nucleic acids, purines, pyrimidines, nucleosides, nucleotides, and related compounds. Pr.: *Biochem. 665.
020 725. Advanced Biochemistry Laboratory. (2) II. Specialized laboratory techniques for advanced biochemical investigations. Pr.: *Biochem. 666.
020 745. Hormones. (2) I. Offered 1970-71 and alt. years or on demand. A study of the structure, biosynthesis, biochemical role, metabolism and interrelations of internal secretions. Pr.: Biochem. 665.
020 799. Problems in Biochemistry. Credit arranged. I, II, S. Problem may include laboratory and-or library work in various phases of biochemistry, agricultural chemistry or nutrition. Pr.: *Background adequate for problem undertaken.

## GRADUATE CREDIT

020 806. Biochemistry Seminar. (0-1) I, II. Seminar for graduate students in biochemistry.

020 812. Proteins. (2) I. Offered 1971-72 and alt. years. Lectures and readings on the chemical nature of proteins; fractionation; purification, structure, chemical and physical properties of proteins and amino acids. Pr.: Biochem. 656 and 665.
020 815. Plant Biochemistry. (3) I. A more advanced treatment of the material of Biochem. 410, with greater emphasis on the chemistry involved. Two hours lec. and three hours lab. a week. Pr. : *Biochem. 655 and 656.
020 816. Chemistry of Carbohydrates. (2) I. Offered 1970-71 and alt. years. Lectures and readings on structural chemistry of carbohydrates, their general properties, biological and chemical reactions and the methods of characterization. Pr. : 'Biochem. 656 and 665.
020 818. Enzyme Chemistry. (2) II. Offered 1970-71 and alt. years. Lectures and readings on the chemical nature of enzymes, their reactions and assay. Pr.: *Biochem. 665.

020 819. Enzyme Laboratory. (2) II. Offered 1970-71 and alt. years. A laboratory course to accompany Biochem. 818. Pr.: " Biochem. 656 and 818 or conc. enrollment.

020 825. Advanced Animal Nutrition. (3) I. Offered 197071 and alt. years or on sufficient demand. Lectures and readings on protein and amino acid requirements, metabolism, evaluation of protein quality, energy metabolism, nutrient interrelationships. Pr.: *Biochem. 655,656 , and a course in nutrition.
020 890. Theoretical Biochemistry. (2) I. Offered in 1971-72 and alternate years. Applications of thermodynamics to biological energy transformations, solution properties of macromolecules, titrations of proteins, multiple equilibria, physical methods for determination of the size and shape of macromolecules. Pr.: Biochem. 665 and Physical Chemistry I and II or equivalent.
020 891. Conformational Analysis of Biopolymers. (2) II. Offered in 1971-72 and alternate years. Studies of the forces responsible for the maintenance of a conformation in solution, applications of physical and chemical techniques to the study of secondary and tertiary structures of biological macromolecules with emphasis on hydrogen-deuterium exchange and optical methods. Pr.: 'Biochem. 665 and Physical Chemistry I and II or equivalent.
020 999. Research in Biochemistry. Credit arranged. I, II, S. Research in biochemistry, agricultural chemistry and nutrition, which may be used for preparation of the M.S. or Ph.D. thesis. Pr.: "Sufficient training for research undertaken.

## Dairy and Poultry Science

## C. L. NORTON, ${ }^{*}$ Head of Department

Professors Bartley, Claydon," Craig,* Farmer," Larson, Norton, Sanford,* and Ward;* Associate Professors Adams,* Bassette,* Bonewitz,* Call,* Cunningham,* Mickelsen,* Morrill*: Assistant Professors Mugler and Roberts; Instructor Kahrs; Emeritus: Professor Martin*

## Undergraduate Study

A wide application of science to the problems of poultry production, milk

[^8]production, and dairy foods processing requires technically-trained men. Courses in bacteriology, chemistry, mathematics, accounting, engineering, and business provide excellent background for training in the dairy industry.

Instruction in dairy production includes dairy cattle nutrition, management, breeding, milk secretion and judging. University-owned herds involving four breeds provide animals for class work and for research projects.

In Dairy Foods Science and Industry the student studies manufacturing, distributing and merchandising milk and milk products, including fluid milk, ice cream, butterconcentrated products and cheese. Teaching and research facilities include a modern automated dairy-processing plant.

The Avery Poultry Research Center, comprising 10 new buildings with floor space of approximately 33,000 square feet and capable of handling 13,800 birds, provides excellent facilities for the breeding, rearing and management of stock for the classroom and experimental work. In addition, modern laboratory and teaching facilities are available for both poultry and dairy training in Call Hall, constructed and dedicated in 1964.

## Graduate Study

Major work leading to the degree Master of Science is offered in the fields of dairy cattle management, physiology, nutrition, and breeding. The Master of Science degree is offered in dairy foods processing, which emphasizes chemical and bacteriological aspects of dairy products processing, development, and control. Major work leading to the degree Master of Science is offered in the fields of poultry management, poultry products technology, poultry nutrition, and genetics.

Major work leading to the degree Doctor of Philosophy is offered in the fields of animal nutrition, animal breeding, genetics, and food science.

Prerequisite to major graduate work in these fields is the completion of a four-year curriculum substantially equivalent to that required of undergraduate students majoring in poultry science, dairy production, or dairy foods processing. This will include not only several courses in the major field, but also
sufficient physical and biological science courses to prepare the student for advanced work in the chosen field.

## UNDERGRADUATE CREDIT

025 102. Principles of Animal Science. (3) I, II. Basic principles which apply to the broad field of animal agriculture; survey of the industry; types, purposes and products of livestock; principles of breeding, selection, nutrition, lactation, reproduction, management and marketing. Three hours lec. a week. Taught in cooperation with the Department of Animal Science and Industry. (A. S. I. 103, Dy. and Pl. Sc. 103 and 104 are companion courses in the respective departments. Students cannot apply credit for both Dy. and Pl. Sc. 102 or A.S.I. 102 and A.S.I. 101 toward a B.S. degree.)
025 103. Dairy Science. (1) I, II. Application of basic principles of animal agriculture to dairying. Two hours lab. a week. Pr.: Dy. and Pl. Sc. 102 or A. S. I. 101 or consent of instructor.
026 104. Poultry Science. (1) I, II. Application of basic principles of animal agriculture to the poultry industry. Two hours lab. a week. Pr.: Dy. and Pl. Sc. 102 or A. S. I. 101 or consent of instructor.
025 196. Dairy Cattle Judging. (2) II. Six hours lab. a week. Pr.: Dy. and Pl. Sc. 102 and 103.
025 200. Fundamentals of Nutrition. (3) I and II. Elementary principles of comparative nutrition of farm animals. Three hours rec, a week. Pr.: Chem. 110 or 210. 026 210. Poultry Judging. (3) I. Production characteristics and evolution of present breeds and types. Judging the standard breeds and varieties by comparison; judging hens for egg and meat production on the basis of certain physical characteristics. One hour rec. and six hours lab. a week. Pr.: Dy. and Pl. Sc. 102 and 104.

025 221. Dairy Products Evaluation I. (2) II. Fundamentals of organoleptic examination of dairy products according to official standards and commercial grades; introduction to sampling techniques, consumer testing and data processing. One hour lec. and three hours lab. a week.
025 350. Dairy Bacteriology. (4) II. Offered even academic years. Application of the principles of bacteriology to the production and processing of quality milk and dairy products. Consideration of the general characteristics of microorganisms in dairy products. Relationship of bacteria in milk to public health. Two hours lecture and two 2 hr . labs per week. Pr.: Biochem. 120 or equiv.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

025 400. Market Milk and Dairy Inspection. (4) II. A study of the problems of the milk-plant operator, including production, procurement, processing, selling, and quality control; inspection of farms and milk plants. Two hours rec. and six hours lab. a week. Pr.: Bact. 220. 025 420. Advanced Dairy Cattle Judging. (1) I. Three hours lab. a week. Pr.: Dy. and Pl. Sc. 196.
025 460. Dairy Products Evaluation II. (1) I. Advanced judging of dairy products to qualify for intercollegiate contests. Three hours lab. a week. Pr.: Junior standing, Dy. and Pl. Sc. 221, or consent of instructor.

025 500. Dairy Seminar. (1) II. Study of dairy periodicals, bulletins, books, other dairy literature. One hour rec. a week. Pr.: Junior standing in dairy science. 025 510. Dairy Technology. (3) I. The relationship of physical and chemical properties of the various components of milk to handling and processing of dairy products. Two hours rec. and three hours lab. a week. Pr.: Biochem. 120.

## UNDERGRADUATE AND GRADUATE CREDIT

026 600. Poultry Products Technology. (3) II. Offered in even years. Emphasis on the technological problems that exist between producer and consumer in the production and distribution of poultry and eggs. Poultry processing, tenderness, shelf-life and packaging. Egg grading, preservation, chemical changes, bacterial problems, and egg products. Two hours rec. and three hours lab. a week. Pr.: Dy. and Pl. Sc. 102, 104; Biochem. 200, Bact. 220, or consent of instructor.
025 601. Milk Secretion. (3) II. Offered in odd years. Anatomy and histology of mammary gland. Physiology of lactation, milk constituents and management practices that alter qualitative and quantitative aspects. Contemporary milking practices and mastitis control. Pr.: Junior standing or consent of instructor.
025 605. Artificial Breeding of Farm Animals. (3) I. Study of the reproductive processes in farm animals, factors affecting reproductive efficiency, and artificial breeding practices. Two hours rec. and three hours lab. a week. Pr.: Consent of instructor.
025 610. Dairy Cattle Nutrition. (3) I. Application of principles of nutrition to feeding of dairy cattle; exercises in practical feeding problems; designing and balancing rations. Two hours lec. and three hours lab. a week. Pr.: Dy. and Pl. Sc. 200, or 102 and 103, or consent of instructor.
026 612. Nutrition of the Fowl. (3) II. Designed for advanced students. The nutritive requirements of the fowl are considered together with metabolism of nutrients, digestion, and excretion. Poultry feeds, the compilation of rations, and feeding practices are discussed. The feeding and care of chicks on deficient diets for a period of several weeks provide practical application of nutrition problems. Two hours rec. and three hours lab. a week. Pr.: Dy. and Pl. Sc. 102 and 104. 025 615. Chemistry of Foods. (3) I. Relationship of chemical composition to properties and to physical and chemical stability of foods. Special attention will be given to dairy and poultry products, red meats, vegetables and cereal grains. Pr.: Biochem 421, 422.
026 620. Avian Metabolism. (3) I. Offered in even years. Special emphasis on the physiological processes in reproduction, digestion, absorption, circulation, respiration, excretion and internal secretions. Three hours rec. a week. Pr.: Dy. and Pl. Sc. 102 and 104, Zool. 205.

025 621. Dairy Cattle Management. (3) II. Offered in even years. Dairy farm layout planning and analysis, integration of agronomic, physiologic and economic aspects of dairying, field study trip. Three hours rec. a week. Pr.: Dy. and Pl. Sc. 102 and 103 and junior standing.
026 630. Poultry Problems. (2) I, II. Investigations of a practical nature which may be continued into the next
semester if necessary. The area of study might include incubation, brooding, feeding, management, breeding, survey of literature, or closely related subjects. Pr.: Dy. and Pl. Sc. 102 and 104 or consent of instructor.
025 636. Dairy Cattle Genetics.(4) I. Introduction and application of quantitative genetic principles to the improvement of economically important traits in dairy cattle with emphasis upon selection, variation, heritability estimates, breeding systems and estimates of breeding values of sires and dams through pedigree analysis. Three hours rec. and three hours lab. a week. Pr.: One semester each of elementary genetics and statistics or consent of instructor.
026 640. Poultry Management. (3) II. Offered in odd years. A detailed study of all phases of farm and commercial flocks, including cost of production. Two hours rec. and three hours lab. a week. Pr.: Dy. and Pl. Sci. 102 and 104, senior or graduate standing, or consent of instructor.
026 645. Quantitative Genetics and Poultry Improvement. (4) II. Major concepts, experimental verification and applications of quantitative genetics to improvement by breeding. Special emphasis on evaluation of genetic gains, genotypic-environmental interactions, selection plateaus, heterosis, selection for combining ability and special techniques in relation to poultry breeding. Lectures, discussion and laboratory experiments. Pr.: One semester each of genetics and statistics.
026 650. Poultry Seminar. (1) I. Required of all juniors majoring in poultry science and continued into the senior year. Also required of graduate students. One hour rec. or conference a week. Pr.: Dy. and Pl. Sc. 102 and 104.
026 655. Behavior of Domestic Animals. (3) I. Behavior associated with domestication. Effects of selective breeding, physical and social environments, and developmental stage on social organization, aggressive behavior, sexual behavior, productivity and training of domestic animals. Physiology of behavior and abnormal behavior considered briefly. Pr.: Biol. 198 or 205 and junior standing.
026 660. Poultry Industry Training. (3) S. Eight weeks of supervised practical experience in an approved commercial poultry plant, hatchery, or farm. The employer and resident instructor will collaborate in arriving at a grade. Open to upperclassmen and graduate students. Pr.: Dy. and Pl. Sc. 102 and 104.
025 665. Dairy Production Problems. Credit arranged. I, II, S. Pr.: Junior standing.
025 670. Quality Control of Dairy Products. (3) II. Offered even years or on demand. The role of the control laboratory in maintaining standards and quality of dairy foods and ingredients; bacteriological, physical and chemical techniques for evaluating quality and sanitation. One hour rec. and five hours lab. a week. Pr.: Bact. 220 and 520.
025 675. Dairy Manufacturing Problems. Credit arranged. I, II, S. Pr.: Junior standing in dairy manufacturing.
025 681. Dairy Foods Processing I (Butter). (2) I. Offered odd academic years. Principles and theory of manufacture of butter and modified butter products. Chemical, physical, bacteriological, and processing factors affecting quality and acceptability; recent
processing developments. Two hours lec. a week. Pr.: Dy. and Pl. Sc. 510 or consent of instructor.
025 682. Dairy Foods Processing II (Cheese). (2) I. Offered odd academic years. Milk protein classification, rennet action, isoelectric precipitation of milk proteins; chemical, physical, and bacteriological factors affecting ripening and quality; factory operations, Pr.: Bact. 520, Dy, and Pl. Sc. 510 or consent of instructor.
025 683. Dairy Foods Processing III (Concentrated Products). (2) II. Offered odd academic years. Evaporation, spray and roller drying, processing, packaging and storage of concentrated and dried milk products; properties of dried milk. Pr.: Dy. and Pl. Sc. 510 or consent of instructor.
025 684. Dairy Foods Processing IV (Frozen Desserts). (2) II. Offered odd academic years. Formulations, composition and properties; manufacturing of ice cream, ice milks, sherbets, and ices; quality factors, defects. Pr.: Dy. and Pl. Sc. 510 or consent of instructor.
025 686. Dairy Foods Processing Laboratory A. (1) I. Application of processing techniques used in the manufacture of butter and cheese; field trips; one three hour lab. a week. Pr. : Bact. 220 and consent of instructor. 025 687. Dairy Foods Processing Laboratory B. (1) II. Application of processing techniques used in the manufacture of dehydrated and concentrated dairy products and frozen desserts; field trips; one three hour lab. a week. Pr. : Bact. 220 and consent of instructor.
025 695. Dairy Plant Management. (2) II. Offered odd years or on demand. Trends in the dairy industry, types of organizations, location of plants, plant design and construction, selection of equipment, plant operation, plant records, inventory control, production planning, purchase of supplies, sales, profit and loss statements and legal aspects of plant management. Pr.: Consent of instructor
025 710. Dairy Fermentations. (3) I. Offered even academic years. Isolation and culture of bacterial species causing desirable and undesirable changes in dairy products; special characteristics of the organisms as evidenced by growth in milk; typical changes produced in other dairy products and conditions affecting development. One hour lec, and six hours lab. a week. Pr.: Bact. 220 and 520 .
025 720. Processing and Chemical Analysis of Fats and Oils. (2) I. Offered odd academic years. Classification, chemical and physical properties, methods of analysis, stability and refining of fats and oils; commercial methods of manufacturing lard, butter, margarine, shortening, salad oils and mayonnaise. One lec, and one two-hour lab. a week. Pr.: Biochem. 421, 422 or equiv.

## GRADUATE CREDIT

025 805. Animal Breeding Seminar. (1) II. Evaluation of animal experimentation as related to reproduction and breeding.
025 810. Graduate Seminar in Dairy Science. (1) I, II. A study of current literature in the field of dairy science. One hour rec, a week.
025 820. Rumen Metabolism. (3) II. Metabolism, absorption, digestion and passage of nutrients in the rumen of dairy cattle; factors affecting the environment of the rumen; certain aspects of rumen function and dysfunction; techniques used in rumen research. One hour rec.
and three hours lab. a week. Pr.: Dy. and Pl. Sc. 200; Biochem. 402 or 655 , or consent of instructor.
025 830. Mammalian Reproduction. (3) II. Comparative anatomy, histology, and cytology of mammalian reproductive systems, with emphasis on study of endocrine control and cyclic changes. Two hours rec. and three hours lab. a week. By appointment. Pr.: Consent of instructor.
025 998. Research in Dairy Science. Credit arranged. I, II, S. Special investigation of dairy production or manufacturing which may be used as a basis for a master's thesis. Credits obtained may also be applied toward the degree Doctor of Philosophy. Pr.: Consent of instructor.
026 999. Research in Poultry Science. Credit arranged. I, II, S. Investigations which may form the basis of a master's or doctor's thesis. Conferences by appointment. Pr.: Dy. and Pl. Sc. 102 and 104; consent of instructor.
Avian Anatomy. (See Anatomy 801.)
Genetics Seminar. (See A.S.I. 630.)

## Entomology

HERBERT KNUTSON,* Head of Department
Professors Knutson,* Gates, Harvey, ${ }^{*}$ Hopkins, ${ }^{*}$ Horber;" Associate Professors Blocker, ${ }^{*}$ Elzinga, ${ }^{*}$ Mills, ${ }^{*}$ Pitts,* Rettenmeyer,* and Thompson;* Assistant Professors Boling,* Brooks, DePew, Eshbaugh, Kadoum,* and Wilde;* Emeritus: Professors Wilbur* and Smith.*

## Undergraduate Study

Entomology is the study of insects and their near relatives. Applied entomology stresses their relations to plants and animals, including man. The courses fall into two groups: (1) broad, general, cultural courses suitable for any student, such as 200,211 , and (2) professional courses which include most of the remainder, and provide training for research, resident and extension teaching and administration in the services of colleges, experiment stations, health services, and agencies of the states and the federal government, industry, foundations, and private practice, at home and abroad.

Courses listed for alternate years may be given in unscheduled years if requested by a sufficient number of students.

Students majoring in other fields may be particularly interested in Entomology. Courses 200 or 211 and at least five additional credits are recommended.
For majors, professional courses and a broad, basic training in agriculture or the biological and physical sciences are needed to provide a satisfactory foundation for graduate work.

## Graduate Study

The M.S. and Ph.D. degrees are offered. Facilities for research at Manhattan include field insectaries; greenhouses; programmed environmental chambers; rearing rooms, sound recording room, and experimental fields.

The Department is located in Waters Hall and Annex. Facilities include several tem-perature-and humidity-controlled rooms for rearing insects and laboratories for use of radioisotopes.

Major laboratories are provided for study of insect behavior, host plant resistance to insects, taxonomy, toxicology, physiology and biochemistry, and for biology, ecology and control of insects attacking man, animals and stored products, and isolated laboratories for insecticide testing and for chemical and bioassay determination of insecticide residues. Facilities for investigation of biology and control of insects attacking trees, shrubs and ornamental plants, fruits and vegetables, grasslands, and field crops also are provided.

Facilities are further enhanced by the location at Manhattan of a large branch research laboratory of the United States Department of Agriculture, at which work is conducted on stored-product pests.

There is a department library and a good insect collection. All rooms and laboratories are air conditioned.

The staff is engaged in numerous federal, state, commercial, and special projects including projects sponsored by the National Science Foundation and the U. S. Public Health Service.

Entomologists are stationed at the Fort Hays Branch Agricultural Experiment Station and the Garden City Branch Station.

Approximately six Ph.D. and six M.S. degrees have been awarded annually during the past few years.

The Kansas State Entomology Club is student-managed. The Department helps support the Kansas Entomological Society and its publication, the Journal of the Kansas Entomological Society.

Several graduate research assistantships, fellowships and graduate teaching assistantships are available, and other students are employed for work on research projects and teaching by the hour or month.

UNDERGRADUATE CREDIT
030 100. Milling Entomology. (4) II. Elementary structure, life histories, classification and control of insects with emphasis on insects infesting flour mills, granaries, elevators, warehouses, and bakeries. Three hours rec. and 3 hours lab. a week.
030 200. Economic Entomology. (3) I, II. Elementary anatomy, physiology, and classification of insects; life histories, habits, and control of the more important insects. Two hours rec. and 3 hours lab. a week.
030 211. General Entomology. (3) I, II. Basic study of insects and related arthropods, their classification, behavior, and relations to plants and animals, including man. Two hours rec, and 3 hours lab. a week.

## UNDERGRADUATE AND GRADUATE CREDIT

030 610. Insects of Stored Products. (3) I. Taxonomy, ecology and behavior of stored-product insects and current practices involved in their control. Pr.: Entom. 100 , or 200 , or 211 or consent of instructor.
030 620. Medical Entomology. (3) I. Insects and other arthropods as parasites and disseminators of disease; life cycles, biology, and control of insect parasites of man and animals. Two hours rec. and 3 hours lab. a week. Pr. : Entom. 200 or 211.
030 630. Insect Ecology. (3) I. Offered 1970-71 and alt. years. Influence of biotic, physical and edaphic factors of environments on insects. Two hours lec. and 4 hours lab. a week. Pr.: Entom. 200 or 211, or equiv. in zoology.
030 640. Entomological Methods. (3) Offered on demand. Methods, materials, and techniques used in entomological research. Pr.: Entom. 200 or 211 or equiv. 030 650. Insect Control by Host Plant Resistance. (2) I. Resistance of varieties of crop plants to insect attack and utilization in insect control; insect habits and physiology in relation to the cause of resistance and methods of breeding resistant varieties of crops. Pr.: Entom. 200 or 211, and a course in either plant or animal genetics.
030 656. Properties of Insecticides (2) I. Physical, chemical and biological properties of insecticides and acaridies; symptoms and treatment in mammals and insects; formulations and methods of preparation and analysis. One lec. and 3 hours lab. a week. Pr.: Organic chemistry or consent of instructor.
030 660. External Insect Morphology. (3) I. External form, structure and anatomy; leading theories of form and structure from generalized to specialized conditions. One hour rec. and 6 hours lab. a week. Pr.: Entom. 200 or 211.

030 670. Internal Morphology. (3) II. Offered 1970-71 and alt. years. Internal anatomy of representative insects; plan and structure of internal systems. One hour rec. and 6 hours lab. a week. Pr.: Entom. 660.
030 675. Insect Physiology. (3) I. Offered 1971-72 and alt. years. Processes of growth, maturation and reproduction; sensory perception, nervous and hormonal control systems, locomotion, biorhythms and diapause; nutritional requirements, digestion, circulation, respiration, water regulation and excretion. Pr.: Entom. 670 or consent of instructor.
030 690. Principles of Taxonomy. (1) II. The methods and principles of systematic entomology and zoology; characterization of taxomomic categories; international
rules of zoological nomenclature. Pr.: Entom. 200 or 211 and 701, or equiv. in Zool. Entom. 850 may be taken concurrently.
030 701. Insect Taxonomy. (3) II. Families in all orders and some lower categories; principles of insect collecting and collection management; introduction of principles of phylogeny and classification for students not specializing. in taxonomy. One hr. rec. and six hours lab. a week. Pr.: Entom 660. Collection at least equivalent to that submitted for Entom. 200 or 211 , is required prior to enrollment.
030 711. Taxonomy of Immature Insects. (3) II. Offered 1971-72 and alt. years. Classification and bionomics of immature stages; practice in their identification. Six hours lab. a week. Pr.: Entom. 690 and 701.
030 750. Entomological and Zoological Literature. (2) On demand. Bibliographies, biological journals, and keys to the literature; preparation and publication of technical papers. Emphasis on best time saving aids and methods for library work needed for thesis preparation. Pr.: Entom. 200 or 211 , and beginning biology courses.
030 770. Advanced Applied Entomology I. (3) I. Offered 1971-72 and alt. years. Representative insects from horticultural, forest and shade tree entomology; insecticides; application equipment; methods of evaluation; regulations and residue problems associated with use of insecticides. Two hours rec. and 3 hours lab. a week. Pr.: Entom. 200 or 211.
030 780. Advanced Applied Entomology II. (3) II. Offered 1971-72 and alt. years. Representative insects of field and forage crops; biological controls; experimental design and procedures; sampling methods; evaluation of all control methods. Two hours rec. and 3 hours lab. a week. Pr. : Entom. 200 or 211; Entom. 770 desirable.
030 795. Entomology Seminar. (1) I, II, S. Pr.: Consult seminar committee. Required of all entomology graduate students once yearly.
030 799. Problems in Entomology. Credit arranged. I, II, S. For non-thesis studies. Work in various fields of entomology. Pr.: Consent of instructor.

## GRADUATE CREDIT

030 800. Advanced Economic Entomology. (1 to 3) I, II, S. Specialized study of the biology and control of selected insects of economic importance. Pr.: Consent of instructor.
030 820. Advanced Physiology of Insects. (4) II. Offered 1971-72 and alt. years. Metabolism and utilization of carbohydrates, lipids and nitrogen compounds; energy production, neuromuscular mechanisms, hormones and morphogenesis; special topics. Pr.: Entom. 675 and a course in biochemistry.
030 850. Taxonomy of Insects II. (1 to 3) Offered on demand. Intensive study of a selected group of insects; evolutionary and systematic considerations necessary prior to conduct of a taxonomic study. Pr.: Entom. 660, 701; consent of instructor; Entom. 690 should be taken concurrently.
030 855. Arachnology. (3) I. Offered 1971-72 and alt. years. Arachnids, with emphasis on spiders and mites: their classification, structure, and relationships to plants and animals, including man. One hour lec. and 6 hours lab. a week. Pr.: Entom. 200 or 211 and consent of instructor.

030 856. Action and Metabolism of Insecticides. (2) II. Offered 1972-73 and alt. years. Toxic action and metabolism of insecticidal chemicals in insects and vertebrate animals; insect resistance to insecticides; special topics. Two lec. a week. Pr.: Entomol. 656 and a course in biochemistry.
030 860. Insect Behavior. (3) II. Offered 1971-72 and alt. years. Major behavior patterns of insects and other arthropods. Two hours lec. and 4 hours lab. a week. Pr.: Entom. 630.
030 999. Research in Entomology. I, II, S. Credit arranged. Thesis or dissertation credit for students majoring in entomology. Pr.: Knowledge in special area and consent of instructor.

## General Agriculture

CARROLL V. HESS, Dean, College of Agriculture FRANK R. CARPENTER, Assistant Dean

## UNDERGRADUATE CREDIT

035 100. Agriculture in Our Society. (2) I. The development of the agricultural industry in the United States. The role of the land-grant colleges and universities in the development of the agricultural industry. The purposes of higher education in agriculture. Career opportunities for graduates in agriculture.
035 101. Introductory Food Science and Technology. (3) I. Introduce and survey relationships of food raw materials and their methods of handling, manufacturing, distribution and consumption.
035 110. Agricultural Student Magazine (1-2) I, II. Planning, interviewing, preparing stories, headlines, layouts, editing, etc., for Kansas State Agriculturist published by students in the College of Agriculture.
035 398. Honors Colloquium in Agriculture. (1) I, II. Open to students in the Honors Program for the College of Agriculture. Discussion of current topics related to agriculture. Discussion to be led by students, instructors, and invited guests.

## UNDERGRADUATE AND GRADUATE CREDIT

035 610. Problems in Agricultural Publications. (1-3) I, II. Writing for trade and popular agricultural publications in area of individual student's competence, with emphasis on content of stories and principles involved in understanding and accepting content expressed. Appt. Junior standing.

## GRADUATE CREDIT

035 888. Scientific Writing. (1) I, II. Instruction in reporting research results, as in a scientific journal article (thesis, dissertation). Course attempts to show how to organize and communicate scientific findings logically, clearly and precisely. Students who use results of their research should benefit most from the course. Pr.: at least one semester graduate school.

## Grain Science and Industry

william hoover,* Head of Department
Professors Deyoe, ${ }^{*}$ Farrell,* Finney,* Hoover,* Johnson, ${ }^{*}$ Pfost, ${ }^{*}$ Schoeff, Tsen, ${ }^{*}$ Ward, ${ }^{*}$ and Wilcox; Associate Professors Hoseney,* Lineback,* and Seib;* Assistant Professors Miller, ${ }^{*}$ and Robinson;* Instructors Balding and Sanchez.

## Undergraduate Study

The Department of Grain Science and Industry offers three curriculums leading to Bachelor of Science degrees in Bakery Science and Management, Feed Science and Management, and Milling Science and Management. In each curriculum an option is selected in Administration, Chemistry, or Operations.

## Graduate Study

Major work leading to the degrees Master of Science and Doctor of Philosophy is offered in specialized administration, chemical and engineering fields related to baking, feed and grain milling. Prerequisite to major study in these fields is a Bachelor of Science degree from this department or equivalent degree in chemistry, engineering, physics, agriculture, or business administration.

Modern teaching and research facilities include a pilot bakery, feed mill and pilot flour mill. Associated laboratories permit the study of the physical, chemical, and biochemical properties of cereals and related products.

Graduates are prepared for positions of responsibility in the baking, feed, and milling industries such as business administration, plant management, quality control, nutrition, sales and services. Those students graduating with advanced degrees are especially qualified for positions in administration, teaching, research, and production of a wide variety of foods.

## UNDERGRADUATE CREDIT

045 100. Principles of Milling. (3) I, II. Introduction to flour and feed milling processes. Two hours lec. and three hours lab. a week.
045 210. Flow Sheets. (2) I, II. The construction and assembling of a flow sheet. Six hours lab. a week. Pr.: Gr. Sc. 100, M. E. 212.
045 220. Bakery Layout and Flow. (2) I. Introduction to bakery science. Scientific approach to problem solving is emphasized; i.e., use units and dimensions, unit equations, graphical methods. Principles and techniques of physical measurement such as temperature, pressure, humidity, and flow rates are taught along with
familiarization with baking processes and equipment used in baking. One hour lec, and three hours lab. Pr.: Math. 100, Chem. 230.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

045 400. Milling Technology I. (4) II. Principles and practices of wheat flour milling with full scale equipment including grain storage, blending, cleaning, conditioning plant, and a modern pneumatic 200 hundred weight flour mill, with instrumentation and air conditioning, etc. Two hours lec. and six hours lab. a week. Pr.: Gr. Sc. 100 and 210 , or consent of instructor.
045 410. Feed Technology I. (4) II. Introduction to the engineering aspects of formula feed manufacture; including, principles of conveying, grinding, mixing, pelleting, and the formulation of concentrates, premixes, and rations using a digital computer. Three hours lec. and three hours lab. a week. Pr.: Dy. Sc. 200 and Gr. Sc. 210.

045 490. Feed Manufacturing Processes. (3) I. Study of the technical phases of formula feed manufacturing, equipment design and function, effect of processing and ingredients on nutritional acceptability of feeds and quality control. Two hours lec. and three hours lab. a week. Pr.: Math. 100, 150; A. S. I. 230 or consent of instructor.

## UNDERGRADUATE AND GRADUATE CREDIT

045 610. Flour and Feed Analysis. (5) II. Methods of analysis and quantitative tests of flour and feed composition. Two hours lec. and nine hours lab. a week. Pr.: Chem. 230 or 271, Biochem. 120.
045 620. Advanced Wheat and Flour Testing. (3) I. Physical and chemical methods used in testing wheat and flour. One hour lec. and six hours lab. a week. Pr.: Gr. Sc. 610.
045 630. Experimental Baking I. (4) I. Introduction to properties of ingredients used in baking, reactions of ingredients during processing into baked products. Two hours lec. and six hours lab. a week. Pr.: Biochem. 120. 045 631. Experimental Baking II. (4) II. Advanced study of the basic properties, chemical and biological reactions of ingredients used in production of bakery products. Special emphasis is placed on the fundamental principles of biological and chemical leavening and the rheological properties of dough batters and ingredients. Two hours lec. and six hours lab. a week. Pr.: Gr. Sc. 630. 045 633. Bakery Technology. (3) II. Physical and engineering principles involved in baking processes. Study of materials handling, fluid flow, and heat transfer as related to the bakery operation. Two hours lec. and three hours lab. a week. Pr.: Gr. Sc. 220 and Phys. 211. 045 640. Advanced Flow Sheets. (2) II. Designing flow diagrams for flour mills, corn mills, or feed mills. Six hours lab. a week. Pr.: Gr. Sc. 400 or 410 or consent of instructor.
045 650. The Qualities of Wheat and Flour. (3) II. The qualities of wheat and flour as affected by class, growth, storage, physical, chemical and biological factors. Three hours lec. a week. Pr.: Biochem. 120 or equivalent.
045 651. Food and Feed Plant Sanitation. (4) II. Sanitation in relation to processing, handling and storage of human and animal foods. Emphasis on contaminants,
control of causative agents, equipment and plant design, applicable laws and regulations. Three hours lec. and three hours lab. a week. Pr. : Minimum of eight hours of biological sicence; junior standing.
045 660. Qualities of Feed Ingredients. (3) II. Physical and nutritional properties of feed ingredients and the effects of origin, processing, storage and other factors upon them. Three hours lec, a week. Pr.: Biochem. 120. 045 670. Milling Technology II. (4) I. Advanced studies of the entire gradual reduction system of wheat flour milling and the many unit process systems that constitute the milling system. The theory and practices of wheat conditioning, drying and aeration, are elaborated upon. The processes for milling other grains such as corn, oats, sorghum, rice and rye are studied in theory and by practice on small scale laboratory milling units. Two hours lec. and six hours lab. a week. Pr.: Gr. Sc. 400 or consent of instructor.
045 680. Feed Technology II. (4) I. Advanced study of engineering principles of feed plant production, materials handling, grinding, pelleting and other major processing operations. Three hours lec. and three hours lab. a week. Pr.: Gr. Sc. 410, Phys. 212 or 311.
045 710. Fundamentals of Grain Storage. (2) I. Interrelationships of moisture, molds and insects in grain and products in storage; changes occurring in storage; proper drying, storage, control of insects, rodents, birds. Pr. : Gr. Sc. 650 or 660 or consent of instructor.
045 711. Principles of Food Analysis. (3) II. Principles of instrumentation and analysis, with emphasis on applications to quality control and research in the food industry. Pr.: Chem. 271 or Gr. Sc. 610, Biochem. 120 or equivalent or consent of instructor.
045 720. Advanced Flour and Feed Technology. (3) II. Study of fluid flow and heat transfer in relation to grain processing. Introduction to distillation and extraction processes involved in grain processing. Two hours lec. and three hours lab. a week. Pr.: Gr. Sc. 670 or 680.
045 730. Flour and Feed Mill Construction. (3) I. Mill engineering practices including sheet metal drafting, design of power transmission drives with belts, chains and gears and layout of new installations in existing plants. Design and layout of a grain or feed mill. Nine hours lab. a week. Pr.: Gr. Sc. 400 or 410 or consent of instructor.
045 790. Grain Science Problem. Credit arranged. I, II, S. Pr.: Consent of staff.

## GRADUATE CREDIT

045 800. Graduate Seminar in Grain Science. (1) I, II. Discussion of technical problems in the cereal industry. One hour rec, a week. Attendance required of all graduate students in Grain Science.
045 801. Enzyme Applications. (2) I. Theories of enzyme action and function; commercial methods of manufacture and industrial uses, with special emphasis on the role of enzymes in the food industries. Two hours lec. a week. Pr.: Biochem. 421, 422 or consent of instructor.
045 810. Research in Grain Science. Credit arranged. I, II, S. Research may be used as basis for the graduate thesis. Pr.: Consent of staff.

## Horticulture and Forestry

## R. W. CAMPBELL, ${ }^{*}$ Head of Department

Professors Campbell,* Gallaher, Greig,* Hall,* and Keen;* Associate Professors Morrison,* Odom,* and Strickler; Assistant Professors Abmeyer, Biswell, Dainello, Deutsch, Funsch, Gaylor, Geyer, Grey, Hadle, Marr,* Mattson, Miles,* Moyer, Naughton, Nighswonger, Pair, Pinkerton, Rowland, and Winzer; Instructors Atchison, Biles, Bratton, Geisler, Gould, Jones, Leuthold, Long, Loucks, and Shreve: Emeritus: Professors Amstein, Filinger* and Pickett* and Assistant Professor Willis.

Horticulture is a science, business, profession, art, industry, and way of life. There are positions and careers in horticulture in the city as well as on the farm.

## Undergraduate Study

Four-year undergraduate programs of study in horticulture are available in horticultural science, production, services, business and industry, and horticultural therapy.
The horticultural science program is intended for students preparing for graduate study or for employment as horticulturists in the many fields associated with horticultural plants, products and services. Employment opportunities are provided by universities, industry and the federal government. Training in agricultural, biological and physical sciences and general education is given.

The horticultural production program is designed primarily for students wishing to have a broad knowledge of agriculture, especially the production and management of horticultural crops. Graduates of this option manage orchards, vegetable farms, greenhouses, flower shops, nurseries, landscape services, processing firms, municipal and public grounds, parks, golf courses, athletic fields and other recreational areas. Emphasis is placed on applied agricultural and general education courses; biological and physical sciences are included.
The horticultural business and industry program is created for students seeking a career with the many businesses and industries related to agriculture. The demand for trained horticulturists in the sales and development of products and equipment is strong. Prominence is given to agriculture and business courses but biological, physical
and social sciences are provided for background.
The horticultural services option prepares students to work with people, both rural and urban. Demands are great for individuals trained in horticulture to work in youth, poverty, recreational and international agricultural programs. The student receives broad training in social and biological sciences, technical agriculture and communications.
Horticultural therapy is recognized as an important part of treatment and rehabilitation of mental, medical, handicapped and geriatric patients, and is an aid in the mental and physical well-being of all age groups. Hospitals, psychiatric institutions, rehabilitation centers, correctional institutions, geriatric homes and retirement communities have need for people trained in horticultural therapy. Students get a good background in horticulture with supporting courses in psychology, sociology and related areas. Clinical application of this knowledge is provided by the Menninger Foundation, Topeka, Kansas.

The Pre-Forestry program combines the basic introductory courses of the Curriculum in Agriculture with the introductory courses in Forestry. Upon its completion after the sophomore year, students may transfer to a university offering a professional forestry degree.
A two-year short course in Retail Floriculture (p.39) is available for students interested in floral arrangement and retail flower shop management.

## Graduate Study

Graduate study leading to the degrees Master of Science and Doctor of Philosophy is offered in the department. Research may be pursued in floriculture, fruit and nut crops, ornamental horticulture, turfgrass and vegetable crops. Areas of proficiency include plant breeding and genetics, horticultural crop physiology, plant environmental relationships, horticultural crop marketing and weed control. A B.S. degree from a recognized college or university whose undergraduate program is substantially equivalent to the program at this university is prerequisite to admittance to graduate work in this department.

The department has a variety of facilities for both undergraduate and graduate study and research. These include the orchards and vegetable plots at the horticultural farm, nut research farm, turf farm, forestry plots, greenhouses, cold storage units, controlled atmosphere chambers, and research laboratories equipped for scientific plant studies. Many horticulture courses require student visitations and work at these facilities.

## UNDERGRADUATE CREDIT

040 130. Floral Arrangement. (3) I, II. Floral arrangement for the home and commercial flower shop. Basic fundamentals of floral design are emphasized. Two hours rec. and three hours lab. a week. For non-major students.
040 131. Floral Arrangement. (3) I. Floral arrangement for commercial flower shop. Basic fundamentals of floral design are emphasized. Two hours rec. and three hours lab. a week. For major students.
040 140. Advanced Floral Arrangement. (3) II. Stylized floral design for the commercial flower shop, including corsages, wedding designs, funeral pieces and party and banquet decorations. Two hours rec. and three hours lab. a week. Pr.: Hort. and For. 131.
040 150. Home Horticulture. (2) I, II. An introductory course which presents the various aspects of horticultural activity. Discussions of all phases of horticulture and how they relate to modern living. Two hours rec. a week.
040 160. Horticulture and Forestry Seminar. (0) I, II. A discussion of current topics in horticulture, forestry and closely related fields by students, faculty and invited speakers. Required of all horticulture and forestry majors the first semester in attendance.
040 170. Natural Resources and Man. (3) I, II. An introductory course that assesses the environment to acquaint students with the kinds and extent of natural resources, their availability and utilization. The course is also listed in the Departments of Agricultural Economics and Agronomy
040 200. Plant Science. (4) I, II. Study of the principles of the production of economic plants, including morphology, taxonomy, physiology, ecology, propagation, preservation, storage, and utilization. Three hours lec. and one two-hour lab. a week. Taught in cooperation with the Department of Agronomy. Pr.: Not open to Juniors and Seniors except by consent of instructor.
040 220. Plant Propagation. (3) II. Designed to develop proficiency in the various skills and techniques necessary for propagation of horticultural plants. Basic fundamentals of seed structure and vegetative makeup of plants are emphasized. Two hours rec. and three hours lab. a week. Pr.: Biol. 210.
040 230. Greenhouse Construction and Management. (3) I. Greenhouse construction, heating, air conditioning, and crop planning. Two hours rec. and three hours lab. a week.
040 260. Plant Materials I. (3) I. Perennials, annuals, and conifers for landscape planting. Field trips and
planting plans required. Two hours rec. and three hours lab. a week. Pr.: Biol. 210.
040 270. Plant Materials II. (3) II. Trees, shrubs, woody vines for landscape planting. Field trips and reports required. Two hours rec. and three hours lab. a week. Pr.: Biol. 210.
040 280. Forest Conservation. (3) I. An introduction to American forestry-what it is and what foresters do. Distribution of the forest resource includes establishment, management practices, protection, harvest, utilization, and policy. Three hours rec. a week.
040 290. Dendrology. (4) II. Identification, classification, silvical characteristics, distribution, and economic significance of important North American angiosperm and gymnosperm tree forms. Three hours rec. and three hours lab. a week.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

040 410. Landscape Horticulture. (3) I, II. Fundamental principles of producing, planting, and maintaining ornamental plantings of trees, shrubs, perennials, and turf in the nursery, home grounds, parks, and similar areas. Two hours rec. and three hours lab. a week. Pr.: Biol. 210.

040 420. Fruit Production. (3) I. Discussion of principles of cultivation of long term, perennial, woody plants and the systems of cultivating important fruit and nut crops. Orchard planning, propagation, and management and fruit production, harvesting, and marketing discussed. Two hours rec. and three hours lab. a week. Pr.: Hort. and For. 200 or equiv.
040 430. Forestry Practices. (3) I. Principles of forestry techniques and their application to Great Plains woodland areas. Laboratory provides introduction to tree identification, forestry instrument use, forest industries, and management of timber tracts. Two hours rec. and three hours lab. a week. Pr.: Hort. and For. 200 or consent of instructor.

## UNDERGRADUATE AND GRADUATE CREDIT

040 610. Turf Management. (2) I. Methods and principles of establishing and maintaining special purpose turf. Pr.: Hort. and For. 200, Agron. 270 or consent of instructor.
040 620. Arboriculture. (3) II. Principles and practices of maintaining shade and ornamental trees under urban environments. Two hours rec. and three hours lab. a week. Pr.: Hort. and For. 200, Agron. 270 or consent of instructor.
040 625. Floriculture. (3) II. Principles and commercial practices for producing greenhouse crops. The relationship between a plant's physiological response and its greenhouse environment is stressed. Three hours rec. a week. Pr.: Hort. and For. 200.
040 640. Horticultural Problems. Credit arranged. I, II, S. Problems and reports in floriculture, olericulture, ornamental horticulture, and pomology. Pr.: Advanced undergraduates and consent of instructor.
040 641. Forestry Problems. Credit arranged. I, II, S. Work is offered in various fields of forestry. Pr.: Consent of instructor.
040 661. Greenhouse Clinical Practices. (3-6) I, II, S. Supervised training in the application of greenhouse
practices and the use of plants and flowers in the treatment of institutional patients. Pr.: Consent of instructor. 040 662. Garden and Landscape Therapy. (3-6) I, II, S. Training in supervision of patients in flower and vegetable gardening as a therapy. The use of landscape to better the trainees' understanding of how institutional landscape maintenance can be used in therapy. Pr.: Consent of instructor.
040 670. Systematic Olericulture and Pomology.(3) I. Study of characteristics of vegetable and fruit varieties, especially as related to their maintenance, adaptation and identification and to classification systems. Two hours rec. and three hours lab. a week. Pr.: Hort. and For. 200.
040 675. Storage and Post-Harvest Physiology. (3) I. Storage structures, harvesting and handling in relation to storage. Post-harvest physiological changes associated with the storage of fresh flowers, fruits, nursery stock, and vegetables. Three hours rec, a week. Pr.: Junior standing and consent of instructor.
040 680. Plant Protection. (3) II. Development of pest control program for crops with emphasis on pesticide application equipment, chemicals, and procedures. Two hours rec. and three hours lab. a week. Pr.: Ent. 200 or Plant Path. 400.
040 690. Vegetable Crop Ecology. (3) II. Study of ecological principles involved in the production of vegetable crops, as influenced by environmental conditions. Two hours lec. and three hours lab. or field trips a week. Pr.: Ent. 200 or Plant Path. 400.
040 700. Vegetable Crop Physiology. (3) II. Study of applied physiological responses of selected vegetable crops on grade, quality, storage and marketing of these products. Three hours lec. a week. Field trip required. Pr.: Hort. and For. 200.
040 720. Horticultural Crop Breeding. (3) II. Problems and breeding practices related to fruit, ornamental, or vegetable plants. Pr.: One course in genetics and consent of instructor.
040 730. Fruit Science. (3) I. Detailed discussion of fruit plant hardiness, nutrition, light utilizations, growth regulators and rootstocks. Laboratory exercise emphasis on research topics. Two hours rec. and three hours lab. a week. Pr.: Hort. and For. 200 or equiv.

## GRADUATE CREDIT

040 800. Research in Horticulture. Credit arranged. I, II, S. Investigations in pomology, olericulture, floriculture, and ornamental horticulture. Data collected may form basis for a thesis or dissertation. Pr.: Consent of instructor.
040 820. Advanced Vegetable Crops. (1-3) I. A specialized study related to the physiological development and handling of selected vegetable crops. Pr.: Hort. and For. 690 or 700 and consent of instructor.
040 830. Advanced Pomology. (1-3) II. Morphological and physiological changes occurring in fruit plants. Pr.: Consent of instructor.
040 845. Plant Science Literature. (2) I. Review of the history and forms of literature summary in plant sciences. Preparation of the thesis and the scientific report for technical journals stressed. Two hours rec. a week.

040 851. Horticulture and Forestry Graduate Seminar. (1) I, II. A discussion of investigational works in the various branches of horticulture and forestry.
040 885. Controlled Plant Environment. (3) II. The capabilities and limitations of greenhouse and plant growth chambers as instruments for plant science research. The operation of equipment and procedures for measurement of the controlled plant environment. Three hours rec. a week. Pr.: Consent of instructor.
040 861. Dormancy and Regeneration. (2) I. Physiological, anatomical basis of dormancy, rest and regeneration in seeds, buds, and stems. Manipulation and use in research. Pr.: Hort. and For. 220 or consent of instructor.

## Plant Pathology

JOHN F. SCHAFER,* Head of Department


#### Abstract

Professors Hansing,* King, and Schafer;* Associate Professors Dickerson,* Edmunds,* Johnson, ${ }^{*}$ Stuteville,* and Willis; Assistant Professors Browder,* Burleigh, Niblett,' Paulsen," Sauer," and Schwenk; Emeritus: Professors Elmer* and Melchers.


Plant pathology is the study of plant diseases, their economic effects, causes, nature, and control. Opportunities for graduates in plant pathology include research and development for many types of agencies, teaching, extension, sales, and commercial service. Industry, government, educational institutions, and private foundations employ plant pathologists on a world-wide basis.

## Undergraduate Study

The undergraduate program of study in plant pathology is one of the majors of the science option in the curriculum in agriculture. It is designed to provide a broad background in the biological, physical, and agricultural sciences. Many plant pathology majors continue in graduate study.

## Graduate Study

A graduate major in plant pathology is also available, leading to the Master of Science and Doctor of Philosophy degrees. Prerequisite to graduate study is the holding of a bachelor's degree from an accredited college. Students often enter advanced work in plant pathology following an undergraduate major in biology, botany, agronomy, horticulture, or similar course of study as well as from plant pathology. Specialized areas of study include epidemiology, disease physiology, nematology, virology, host-parasite relationships, ecology of disease development, biochemistry of pathogenicity, disease
resistance, and chemical control. Research is conducted on diseases of grain crops, forage crops, fruits, vegetables, ornamentals, turf, and stored grain.
Departmental facilities include physiological laboratories, environmental chambers, greenhouses, and experimental field plots. Students have access to the electron microscope laboratory, Computing Center, herbarium, and science libraries. Graduate research assistantships or employment in departmental research projects may be available to outstanding students.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

050 400. Plant Pathology. (2) I, II (S on demand). An introductory course on the nature, cause, and control of crop diseases. One hour rec. and two hours lab. a week. Pr.: Biol. 210 or equiv.

## UNDERGRADUATE AND GRADUATE CREDIT

050 600. General Plant Pathology. (3) II. A study of the fundamental principles and techniques of phytopathology, with critical consideration of crop diseases caused by fungi, bacteria, viruses and nematodes. One hour rec. and six hours lab. a week. Pr.: Biol. 640 or equiv., or consent of instructor.
050 605. Literature of Plant Pathology. (1) I. Study and analysis of recent important developments in plant pathology. One hour rec. a week. Pr.: Plant Pathology 600 or consent of instructor.

050 620. General Nematology. (3) I. The morphology, taxonomy, biology of, and techniques used in the study of plant parasitic and soil and freshwater free-living nematodes. Six hours of combined rec. and lab. a week. Pr.: Plant Pathology 400 or consent of instructor (consent implies some background in zoological science).
050 630. Principles of Plant Disease Control. (3) II. Offered in 1972-73 and alt. years. Methods of control of fungi, bacteria, viruses, and nematodes. Methods included are cultural, physical, biological, chemical, and host resistance. Two hours rec. and three hours lab. a week. Pr.: Plant Pathology 400 or consent of instructor. 050 640. Diseases of Horticultural Crops. (3) I. Offered in 1971-72 and alt. years. Identification, classification, epidemiology and control of diseases of vegetable, fruit, and ornamental plants. Two hours rec. and three hours lab. a week. Pr.: Plant Pathology 400, its equivalent, or consent of instructor.
050 650. Diseases of Field Crops. (3) II. Offered in 197172 and alt. years. Diseases of cereal, forage, and fiber crops; their causes, symptoms, life histories, hostparasite relationships, and control. Two hours rec. and three hours lab. a week. Pr.: Plant Pathology 400 or consent of instructor.
050 730. General Virology. (3) II. (Same as Biol. 730). The theoretical and experimental bases of virology, with special emphasis on the role of the virus as a controlling force in cellular biology; principles of host-virus interactions; introduction to use of plants and mam-
malian cell cultures as the host for virus propagation. Pr.: Twelve hours of biological sciences, including Biol. 220 or equiv. and Biochem. 420 or equiv. Consent of instructor. (Taught in cooperation with the Division of Biology)
050 751. Methods in Plant Pathology. (3) I. Offered 197273 and alt. years. The methods of isolation, culture, and inoculation used in studying the causal organisms of plant diseases. One hour rec. and six hours lab. a week. Pr.: Plant Pathology 400 or equiv., or consent of instructor.
050 782. Plant Virology. (3) I. Offered 1972-73 and alt. years. A study of the virus diseases of plants with emphasis on the chemical, physical, and biological properties of the causal agents. Two hours rec. and three hours lab. a week. Pr.: Plant Pathology 600 or 751, Biochem. 421 or equiv., and consent of instructor.
050 790. Problems in Plant Pathology. Credit Variable, (1-3) I, II, S. Work is offered in general plant pathology, plant virology, plant nematology, disease physiology, and epidemiology. Pr.: Background of courses needed for problem undertaken.

## GRADUATE CREDIT

050 800. Advanced Nematology. (3) II. Offered in 197172 and alt. years. Emphasis on taxonomy with discussions on the general biology, ecology and physiology of plant parasitic and associated nematodes. Six hours of combined rec. and lab. a week. Pr.: Plant Pathology 620 or equiv.
050 810. Physiology of Plant Disease. (3) II. Offered in 1971-72 and alt. years. A discussion of changes in the physiology and biochemistry of the host and the pathogen, and their interaction during infection and disease development. Examples from fungal, bacterial, and viral diseases will be utilized. Resistant and susceptible interactions will be considered. Two hours rec. and 3 hours lab. per week. Pr.: Biology 600 and a course in Biochemistry, or consent of instructor.
050 970. Seminar in Plant Pathology. (1) I, II. Reports in the field of plant pathology. Pr.: Consent of instructor. 050 990. Research in Plant Pathology. Credit variable. I, II, S. Work is offered in general plant pathology, plant virology, plant nematology, disease physiology and epidemiology. Pr.: Sufficient background to conduct the line of research undertaken.

## The Kansas

## Agricultural Experiment Station

FLOYD W. SMITH, Director
KEITH HUSTON, Associate Director LOWELL BRANDNER, Editor
GRACE MUILENBERG, Assistant Editor GILBERT R. DODGE, Administrative Assistant
The Kansas Agricultural Experiment. Station is supported by both federal and state funds. Acts of Congress authorizing grants (always subject to state legislative assent)
have included the Hatch Act of 1887, the Adams Act of 1906, Purnell Act of 1925, Bankhead-Jones Act of 1935, an amendment to the Bankhead-Jones Act, Agricultural Marketing Act of 1946, the 1955 act to consolidate previous acts pertaining to state agricultural experiment stations, and the McIntire-Stennis Act of 1962.
Each session of the Kansas legislature and each session of the U.S. Congress provide funds to operate the experiment station. Fees and commercial organizations also provide some support, as do sales of experimental crops and animals.
The unique responsibility of the Agricultural Experiment Station is to conduct original research in the broad field of agriculture and to publish and disseminate the results of agricultural research. Attention is devoted largely to the solution of problems related to agriculture, including farm homes.
Departments of the Agricultural Experiment Station are as follows: Agricultural Engineering, Agricultural Economics, Agronomy, Animal Science and Industry, Biochemistry, Biology, Business Administration, Center for Student Development, Chemical Engineering, Chemistry, Economics, Entomology, Dairy and Poultry Science, Grain Science and Industry, Geology and Geography, Home Economics, Horticulture and Forestry, International Agriculture, Nuclear Engineering, Physics, Plant Pathology, Political Science, Statistics and Computer Science, Sociology and Anthropology, and Veterinary Medicine, and the five branch stations-Colby, Fort Hays, Garden City, Southeast Kansas and Tribune.
Research of the various departments is conducted in eight divisions of the Kansas Agricultural Experiment Station. The eight divisions include Animal Sciences, Food Sciences, Home Economics, Pesticides, Plant Sciences, Social Sciences, Soil and Water Sciences, and Veterinary Medicine.
An annual budget of about $\$ 8.8$ million and many positions for graduate research assistants make the Kansas Agricultural Experiment Station a strong ally of the Graduate School. The Experiment Station has research projects in six colleges of the University. Interested graduate students are encouraged to seek graduate research assistantships to supplement their graduate study programs.

Research by scientists in the experiment station is organized into more than 500 projects that cover nearly all phases of agriculture in its broadest context. Among the projects are physiology and nutrition of plants and animals; diseases of plants and animals; chemical composition of soils, plants, and animal products; plant and animal breeding; crop rotations and fertilizers; acclimatization of new plants and trees; grasses and forage plants; feeds for livestock; production, processing, marketing, distribution, and use of agricultural products and machinery and equipment; farm management and other economic problems; sociological problems; area development; human nutrition and family living.

Farms, branch stations, well-equipped laboratories, and scientific equipment are available for use by Experiment Station researchers.

Results of research are published in scientific journals, station bulletins, circulars, pamphlets, leaflets, reports of progress, research papers, popular journals, news releases to the press and to radio and television stations, and reports at field days and other special events. All bulletins and other publications of the Agricultural Experiment Station are sent without charge to citizens of the state. Any person in the state may have his name placed on the permanent mailing list of the station to receive announcements of station publications.

Letters of inquiry and general correspondence should be addressed to the Kansas Agricultural Experiment Station, Kansas State University, Manhattan 66502.

## Branch Agricultural Experiment Stations

## Fort Hays Branch Station

W. W. DUitsman, Superintendent

Professors Duitsman, Hackerott, Harvey, Launchbaugh and Livers; Associate Professors Brethour and Phillips; Assistant Professors Baxter, Stegmeier and Thompson.

Land occupied by this station is 3,700 acres of the former Fort Hays military reservation. A bill was approved by Congress March 28, 1900, setting aside this reservation for experimental and educational purposes. It was accepted by the state legislature February 7, 1901. The same session of the legislature
passed an act providing for the organization of a branch experiment station and appropriating funds for preliminary work.

Investigations are primarily related to problems peculiar to the western half of the state where rainfall is limited. They include beef grazing, feeding, and breeding studies; crop improvement, with special emphasis on wheat, sorghum, legumes, and grasses; soil management; weed control; and insects as related to crops and livestock.

## Garden City Branch Station

## A. B. ERHART, Superintendent

Professor Erhart; Associate Professor Arnett, Assistant Professors Condray, DePew, Herron, Kyle, Penas and Witt; Instructor Diebert.

A 99-year lease from the Finney County commissioners to the State Board of Regents beginning June 14, 1907, provided 320 acres for agricultural research. Additional adjoining tracts totaling 235 acres were purchased in 1937 and 1939. An 80-acre irrigated tract was made available by The Garden City Company in 1948.

Current investigations involve extensive irrigation research, livestock feeding, dairying, dryland soil management, crop improvement, weed control, horticultural and specialty crops, insect control, and soils and fertilizer relationships. One of the two state soils laboratories is located at the Garden City Branch Station.

## Colby Branch Station

E. E. BANBURY, Superintendent

Associate Professor Banbury, Assistant Professors Arehart, Lawless and Warrington
The Kansas legislature of 1913 provided for a branch experiment station near Colby. It is located on a tract of 715 acres. The original tract of land was purchased by Thomas County and deeded to the state. In 1941 the state purchased an additional 320 acres. In 1963 additional land was acquired through an exchange of 39 acres of the original tract for an adjoining quarter section. Operations at the Colby station were begun in March, 1914. Investigations include crop improvement, soil and crop management, irrigation, sheep production, and adaptation studies with fruit and shade trees, shrubs and flowers.

## Tribune Branch Station

R. E. GWIN, Jr., Superintendent and Assistant Professor

The Tribune Branch Station was established in 1911 by an act of the Kansas legislature.

At the Tribune station experimental work is conducted for the benefit of the surrounding western territory. Special attention is paid to the problems of producing field and specialty crops under conditions of limited rainfall and under irrigation.

## Southeast Kansas Branch Station

## F. W. BOREN, Superintendent

Professor Boren; Assistant Professors Helmer, Kilgore and Perry; Instructor Beason

Following World War II, a 242-acre tract of land, near Mound Valley used as an auxiliary landing field, was declared surplus property. Ownership was transferred to Kansas State University in 1948. In 1949 the Kansas legislature authorized the establishment of the Mound Valley Branch Experiment Station and appropriated funds for its development and operations.

The 1966 Kansas legislature transferred 485 acres of land formerly operated by the Parsons State Hospital and Training Center to Kansas State University and authorized consolidation of the Mound Valley, Parsons, and Columbus Experiment Field land into a single unit, the Southeast Kansas Branch Experiment Station, with headquarters at Mound Valley.

Soil studies in relation to yield and quality of crops, field crop investigations, dairy cattle production, beef cattle investigations and extensive forage research are being conducted at this station.

## Experiment Fields and

## Irrigation Development Farms

The Kansas Agricultural Experiment Station includes 11 experimental fields of from 20 to more than 500 acres each. Six are operated by the Department of Agronomy. They are on different soil types and under different climatic conditions. Field crops and soil investigations are specially pertinent to local conditions. Two fields are supervised jointly by the Departments of Agricultural Engineering and Agronomy and include
irrigation studies. Fields (most leased) are: Cornbelt (Powhattan), North Central Kansas (Belleville and Mankato), Irrigation (Scandia), Southwest Kansas (Minneola), Sandyland Irrigation and Dryland (St. John), South Central Kansas (Hutchinson), Newton, East Central (Ottawa).
Three fields for horticultural and forest crops operated by the Department of Horticulture and Forestry are Northeast Kansas (Wathena), Sedgwick County (Wichita), and Southeast Kansas (Chetopa).

## The Kansas Water Resources Research Institute

HYDE S. JACOBS, Director
Cooperating Water Resources Institute, University of Kansas

The Kansas Water Resources Research Institute was established by the Board of Regents October 31, 1964, at Kansas State University after Congress passed the Water Resources Research Act of 1964. By Regents stipulation Kansas State University and the University of Kansas are partners in the Institute for maximum benefit to the citizens of Kansas. Consequently, the Institute can support water resources research in any department at either university. The policy committee governing the Institute is composed of representatives from both Kansas State University and the University of Kansas.

The purpose of the Institute is to conduct basic and applied research and to train scientists in areas related to water resources. Research and educational interests include the hydrologic cycle; supply and demand for water; conservation and best use of available supplies of water; methods of increasing such supplies; and economic, legal, social, engineering, recreational, biological, geographical, ecological, and other aspects of water problems.

## Evapotranspiration Laboratory

Established by the 1968 Kansas legislature, this laboratory is concerned with conserving Kansas' limited water resources by reducing both evaporation from soil and plant surfaces and transpiration from plant leaves.

## The Food and Feed Grain Institute

WILLIAM J. HOOVER, Director
LEONARD W. SCHRUBEN, Associate Director
The Institute is based on the faculty in the Grain Science and Industry Department and utilizes some faculty in other departments. Its goals are to develop methods of milling and processing grains; to evaluate and improve their quality and nutritional properties; to find new uses for them; and to improve the handling, transporting, storing, and domestic and international marketing of grains and foods.

## The Statistical Laboratory

H. C. FRYER, Director

This Laboratory was established in 1946 to provide consulting and computational services to the faculty and students of Kansas State University, especially those associated with the Kansas Agricultural Experiment Station. It is under the administration of the Department of Statistics and Computer Science whose faculty are available by appointment for statistical and computational assistance on a twelve-months basis to assist in the designing of experiments.


1. Irrigation experiment field to be in the river valley.
2. Southeast Kansas Branch includes acreaqes near the indicated towns.


# THE COLLEGE OF ARCHITECTURE AND DESIGN 

BERND FOERSTER, Dean<br>ROBERT P. EALY, Associate Dean<br>WILLIAM R. JAHNKE, Assistant Dean

The College of Architecture and Design provides professional study in Architecture, Architectural Structures, Interior Architecture, Landscape Architecture, Building Construction and Regional and Community Planning. The undergraduate and graduate programs are carefully designed to develop understanding and sensitivity for the needs of man and his physical environment. The curriculum in Architecture is accredited by the National Architectural Accrediting Board.

The Landscape Architecture Curriculum is accredited by the American Society of Landscape Architects in cooperation with the National Commission on Accrediting. The Planning Curriculum is accredited by the American Institute of Planners in cooperation with the Association of Collegiate Schools of Planning.
Men and women associated with these professions are responsible for the design of our churches, schools, homes, business and public buildings, recreational areas as well as our cities, and require a well-rounded education to equip them to become responsible leaders in their respective professional areas. An outstanding faculty and excellent studio and library facilties provide a stimulating environment for professional development.
The College of Architecture and Design consists of five administrative Departments of Architecture, Construction Science, In-
terior Architecture, Landscape Architecture and Regional and Community Planning. Bachelor's degrees are offered in each of the following areas:

Architecture - Curriculum on page 66.
Architectural Structures - Curriculum on page 67.
Interior Architecture - Curriculum on page 68.
Landscape Architecture - Curriculum on page 68.
Building Construction - Curriculum on page 67.
General descriptions of these curriculums, course offerings and graduate programs are presented on pages 69-78.

## GRADUATE PROGRAMS

The College of Architecture and Design offers work at the graduate level in Architecture, Architectural Structures, Interior Architecture, Environmental Technology and Urban Design leading to the degree Master of Architecture. The graduate degrees Master of Landscape Architecture and Master of Regional and Community Planning are also offered. Additional information on the graduate programs is included under Graduate School, page 257.

## HONORS PROGRAM

The Honors Program in the College of Architecture and Design is integrated with similar programs in other Schools and Colleges of the University and provides the eligible student with an excellent opportunity for interdisciplinary study. Students ranked in the top five percent of entering freshmen
and transfer students with superior academic records are eligible to participate. Final approval is based upon an interview with the Assistant Dean of the College of Architecture and Design and acceptance of the program by the student.

Participation in the Honors Program will permit students to enroll in Honors Sections of courses, if offered, and participate in a variety of seminars and stimulating discussions in several fields.

## SUMMER SCHOOL

Entering freshmen and transfer students will find that many of the courses may be taken during the summer session. This is especially advantageous for those who wish to remove deficiencies in mathematics, physics, or applied mechanics.

Summer work is also offered in Architectural Design, Landscape Architecture, Theory of Structures, and Regional and Community Planning.

Detailed information on specific courses is contained in the Summer School Catalog, which may be obtained from the Director of Admissions of Kansas State University.

## ELECTIVES

Students in Architecture and Design are encouraged to select their electives from one or two of the areas of secondary interest as noted below as well as Departments in a College other than their own. A complete list of recommended courses in each area is maintained by the college office and each adviser.

Art
Art History
Business Administration
English
Geology and Geography
History
Humanities
Modern Language
Philosophy
Psychology
Sociology and
Anthropology
All students in the 5 -year professional curricula (Architecture, Architectural Structures, Interior Architecture and Landscape Architecture) shall enter the Basic Studies Program (which is the first two years) with emphasis upon his chosen field. During the two-year Basic Studies, a student
will be counseled and take a number of professionally related courses which underlie all of the design disciplines. During this preprofessional period a student will demonstrate his professional aptitude and accumulate sufficient credit hours to permit an evaluation of his academic record.
As each student nears completion of the pre-professional two-year Basic Studies program, the work of each student will be reviewed and evaluated and the student will be counseled before entering his Professional curriculum beginning with the 3rd year. Enrollment is limited in the 3rd, 4th and 5th year classes of the five-year Professional curricula.
Students in Community Colleges who plan to transfer to the College of Architecture and Design should take (if at all possible) prearchitecture courses in Freehand Drawing, Water Color, Mechanical Drawing, Physics, Calculus, as well as English, History, Psychology, etc., so that they may be eligible for admission to our comprehensive course for transfer students. Inquiries regarding suggested programs for students planning to transfer should be directed to the Assistant Dean of the College.

## Curriculum in Architecture

Bachelor of Architecture


THIRD YEAR (Professional Program)

## Fall Semester

| Architecture | 105 | 431 | Arch. Design 1 | 5 |
| :---: | :---: | :---: | :---: | :---: |
| Con. Science | 106 | 434 | Thermal Systems | 3 |
| Applied Mechanics | 510 | 220 | Str. Materials A. | 3 |
| Applied Mechanics | 510 | 224 | Str. Matls Lab. |  |
| Architecture | 105 | 433 | Arch. Constr. I | 3 |
| Architecture | 105 | 375 | History of Arch. II | 2 |
|  |  |  |  | 17 |
| Spring Semester |  |  |  |  |
| Architecture | 105 | 432 | Arch. Design II | 5 |
| Con. Science | 106 | 421 | Timber Structure | 2 |
| Con. Science | 106 | 420 | Theory of Structure | 3 |
| Con. Science | 106 | 435 | Lighting Systems | 2 |
| Architecture | 105 | 434 | Arch. Constr. II. | 3 |
| Architecture | 105 | 378 | History of Arch. 111 | 2 |

FOURTH YEAR (Professional Program)

| Fall Semester |  |  |  |
| :---: | :---: | :---: | :---: |
| Architecture | 105 | 541 | Arch. Design III |
| Con. Science | 106 | 422 | Theory Struc. II |
| Con. Science | 106 | 436 | Sanitation Systems |
| Architecture | 105 | 379 | History of Arch. IV |


| Spring Semester |  |  |  |
| :---: | :---: | :---: | :---: |
| Architecture | 105 | 542 | Arch. Design IV |
| Con. Science | 106 | 428 | Theory of Struc. III |
| Con. Science | 106 | 437 | Acoustic Systems |
| Architecutre | 105 | 413 | Environ. Seminar Elective |

FIFTH YEAR (Professional Program)

| Fall Semester |  |  |  |
| :---: | :---: | :---: | :---: |
| Architecture | 105 | 651 | Arch. Design V |
| Planning | 109 | 215 | Intro. to Planning |
| Architecture | 105 | 653 | Prof. Practice Elective |
| Architecture | 105 | 654 | Inspect. Trip |
| Spring Semester |  |  |  |
| Architecture | 105 | 652 | Arch. Design VI |
| Planning | 109 | 635 | City Planning I or |
| Planning | 109 | 645 | Urban Design 1. |

There are 25 hours of electives.
Number of hours required for graduation, 160.

Twenty-five hours are elective. Of these, only four hours of Basic Military Science may be counted as electives. Select electives from areas of secondary interest. These need not be taken in order listed in curriculum.

## Curriculum in Architectural Structures

Bachelor of Architecture


SECOND YEAR (Basic Studies)
Fall Semeste
Physics
Mathematics
Architecture
$\begin{array}{ll}265 & 310 \\ 245 & 222 \\ 525 & 212 \\ 104 & 321\end{array}$
Engineering Phys. I
Anal. Geom. \& Calc. ..........
El. Survey Engr. . . . . . . . . . . . . . .
Design Analysis . . . . . . . . . . . .
al a mavon

| Spring Semester |  |  |  |
| :--- | :--- | :--- | :--- |
| Physics 265 311 | Engineering Phys. II |  |  |
| Mathematics | 245 | 240 | Series \& Diff. Eq. ... |
| Applied Mechanics | 510 | 305 | Statics $\ldots . . . . . . . . . . . . . . . ~$ |

THIRD YEAR (Professional Program)
Fall Semester
Applied Mechanics 510415 Mech. of Materials............... 3



| Spring Semester |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Civil Engineering | 525 | 331 | Stat. Deter Str. |  |
| Con. Science | 106 | 421 | Timber Structures |  |
| Architecture | 105 | 434 | Arch. Const. II |  |
| Architecture | 105 | 432 | Arch. Design II |  |
| Economics | 225 | 110 | Economics I. |  |

FOURTH YEAR (Professional Program)


FIFTH YEAR (Professional Program)


Number of hours for graduation, 160
There are 15 hours of electives.
Only four hours of these electives may be taken in Basic Military Science.

See Minor Curricula for electives. These need not be taken in order listed in curriculum.

## Curriculum in Building Construction

B.S. in Building Construction




Number of hours for graduation, 130.
There are 19 hours of electives.
Only four hours of elective may be taken in Basic Military Science.
See Minor Curricula for Electives. These need not be taken in order listed in Curriculum.

## Curriculum in Interior Architecture

Bachelor of Interior Architecture

FIRST YEAR (Basic Studies)


| SECOND YEAR (Basic Studies) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Fall Semester |  |  |  |  |
| Physics | 265 | 211 | General Physics I | 4 |
| Modern Lang. | 253 | 131 | French I | 4 |
| Architecture | 104 | 321 | Design Analysis | 4 |
| Clothing \& Textiles | 611 | 340 | Int. Design II .. | 3 |
|  |  |  |  | 15 |
| Spring Semester |  |  |  |  |
| Clothing \& Textiles | 611 | 640 | Int. Design III | 3 |
| Economics | 225 | 110 | Economics I | 3 |
| Architecture | 104 | 322 | Prin. Envir. Des. | 4 |
| Physics | 265 | 212 | General Physics II | 4 |
|  |  |  | Elective .......... | 3 |
|  |  |  |  | 17 |
| THIRD YEAR (Professional Program) |  |  |  |  |
| Fall Semester |  |  |  |  |
| Architecture | 015 | 431 | Arch. Design I | 5 |
| Inferior Arch. | 107 | 307 | Des. Workshop I | 3 |
| Architecture | 105 | 433 | Arch. Const. I | 3 |
| Architecture | 104 | 374 | History of Arch. 1 | 2 |
| Clothing \& Textiles | 610 | 260 | Textiles ... | 3 |
|  |  |  |  | 16 |
| Spring Semester |  |  |  |  |
| Archifecture | 105 | 432 | Arch. Design II | 5 |
| Interior Arch. | 107 | 308 | Des. Workshop II | 3 |
| Architecture | 105 | 434 | Arch. Const. II . | 2 |
| Architecture | 104 | 375 | History of Arch. II | 2 |
| Con. Science | 106 | 434 | Thermal Systems | 3 |
|  |  |  |  | 16 |
| FOURTH YEAR (Professional Program) |  |  |  |  |
| Fall Semester |  |  |  |  |
| Interior Arch. | 107 | 541 | Int. Arch. Design I | 4 |
| Interior Arch. | 107 | 309 | Finishing | 2 |
| Con. Science | 106 | 435 | Lighting Systems | 2 |
| Architecture | 104 | 378 | History Arch. Ill . | 2 |
| Clothing \& Textiles | 611 | 740 | History of Fab. Des Elective | 3 3 |
|  |  |  |  | 16 |
| Spring Semester |  |  |  |  |
| Interior Arch. | 107 | 542 | Int. Arch. Des. II | 4 |
| Bus. Ad. | 305 | 440 | Marketing ..... | 3 |
| Clothing \& Textiles | 611 | 645 | History Furn. Des. | 3 |
| Con. Science | 106 | 437 | Acousic Systems | 2 |
| Architecture | 105 | 379 | History of Arch. IV Elective | 2 3 |

FIFTH YEAR (Professional Program)

| Fall Semester |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Interior Arch. | 107 | 651 | Int. Arch. Des. III | 5 |
| Architecture | 105 | 654 | Inspection Trip | 2 |
| Interior Arch. | 107 | 653 | Cont. Des. Prac. | 2 |
| Bus. Ad. | 305 | 425 | Business Law I | 3 |
|  |  |  | Elective ..... | 4 |
|  |  |  |  | 16 |
| Spring Semester |  |  |  |  |
| Interior Arch. | 107 | 652 | Int. Arch. Des. IV | 5 |
| Interior Arch. | 107 | 683 | Cont. Furn. Des. Elective | 4 |

Number of hours for graduation, 160.
Twenty-two hours are electives. Only four fours of electives may be taken in Basic Military Science. See minor curricula list for electives. These need not be taken in order listed in curriculum.

## Curriculum in Landscape Architecture

## Bachelor of Landscape Architecture

FIRST YEAR (Basic Studies) Fall Semester

|  |  |  | Course | Semester Hours |
| :---: | :---: | :---: | :---: | :---: |
| Landscape Arch. | 110 | 200 | Landscape Design | 3 |
| Architecture | 104 | 207 | Arch. Graphics I | 2 |
| Architecture | 104 | 211 | Fund. Design I | 2 |
| English | 229 | 100 | English Comp. I | 3 |
| Botany | 215 | 210 | General Botany | 4 |
| Physical Education | 261 | 011 | Physical Education | 0 |
|  |  |  | Elective | 2 |
| Landscape Arch. | 110 | 201 | L. A. Assembly | 0 |



A total of 160 hours required for graduation.
Twenty hours are electives. Of these only four hours of Military Science may be counted.

## Architecture

F. GENE ERNST, Head of Department

Professors Chadwick,* Fischer,* Heintzelman,* Krider," and Miles;* Associate Professors Chang,* Christensen,* Hall and Slack; Assistant Professors Butke, Cool, Ernst, Lippenberger, Sanner,* Selfridge, Shepard and Wendt; Adjunct Professor Shaver; Emeritus Professors Helm, Weigel.*

For Curriculum, see pages 66-67.
The curriculum in Architecture involves students in preparatory learning for the professions related to the Design, Planning, and Construction of the Physical Environment. The education of the Architect is centered on problem programming and the problem solving exercise. A cumulative experience is provided through a series of Design problems concerning the needs of Man, with emphasis upon the physiological, psychological, and sociological parameters. The Design experience provides a framework for application of the student's expanding knowledge of materials, construction systems, and environmental technology, as well as development of his judgment and creative abilities. By developing his ability to analyze and synthesize, the student is prepared to understand and design any facility in the Physical Environment. The student is prepared for effective participation in the building industry, business, education, and government.

## Graduate Work

The degree Master of Architecture is offered in Architectural Design, Urban Design and Environmental Technology, and is available to students holding a bachelor's degree from a recognized college or university with an undergraduate program substantially equivalent to that at this University.

Facilities for graduate work include a wellequipped library of architectural reference material, a large slide collection, exhibition gallery, and well-lighted design studios.

## Courses in Architecture

## (for First and Second Year Students)

## UNDERGRADUATE CREDIT

104 110. Architectural Lectures. (0) I. Presentation and discussion of the professions of Architecture, Architectural Structures, Building Construction, Interior Architecture, Landscape Architecture, Regional and

Community Planning. One hour lec. a month. The dean, members of the faculty, and representatives of the above professions will present the lectures.
104 207. Architectural Graphics I. (2) I, II. Introduction to architectural drawing; preparation for visualizing and graphically presenting subsequent drawing and design problems; emphasis placed on proper use of instruments, lettering, analyzing, and recording architectural ideas accurately. Six hours lab. a week. Pr.: Plane Geometry.
104 208. Architectural Graphics II. (2) I, II, S. introduction of third dimensional aspect in drawing perspective, shades, and shadows. Six hours lab. a week. Pr.: Arch. 207 or equiv.
104 211. Fundamentals of Design I. (2) I, II. Exercises in three-dimensional visualization and expression related to spatial organization in Architecture and Landscape Architecture. Six hours lab. a week.
104 212. Fundamentals of Design II. (2) II, S. Cont. of Arch. 131. Experiments and exercises related to the effect of color on spatial design in Architecture and Landscape Architecture. Six hours lab. a week. Pr.: Arch. 211.
104 321. Design Analysis. (4) I. Exercises in the analysis and synthesis of design principles related to threedimensional spatial concepts. Problems include experiments demonstrating the effect of color, texture, materials and structure on the organization of space in Architecture and Landscape Architecture. Twelve hours lab. a week. Pr.: Arch. 212.

104 322. Principles of Environmental Design. (4) II, S. Exercises emphasizing a creative approach to the design of architectural spaces. Problems involve an analysis of the interaction of man's functional, material, and aesthetic needs in Architecture and Landscape Architecture. Twleve hours lab. a week. Pr.: Arch. 321.

## Courses in Architecture

(Professional and Supporting Courses)
UNDERGRADUATE CREDIT
105 221. Architectural Materials and Design. (3) I. Elementary introduction, to the nature of building materials and principles of Architectural Design. For Landscape Architecture majors only. Six studio hours per week. Pr.: Arch. 212, 208.
105 222. Elementary Architectural Construction. (3) II. Elementary introduction to technology of building materials; application of construction principles and methods of assembly. For Landscape Architecture majors only. Six studio hours per week. Pr.: Arch. 221. 105 301. Appreciation of Architecture. (3) I, II, S. An analysis of the evolution of architectural styles to determine the relation of architectural expression to the needs of society. Three hours rec. a week. May not be taken for credit by students enrolled in the architectural design and interior curricula.
105 366. Problems in Architectural Design. Credit arranged. S. Study of specific design problems under the direct supervision of a member of the architectural faculty. Pr.: Approval of instructor.
105 374. History of Architecture I. (2) I. Pre-classical and classical architecture and allied arts. Two hours rec. a week.

105 375. History of Architecture II. (2) II. Medieval architecture and allied arts. Two hours rec. a week.
105 378. History of Architecture III. (2) I. Renaissance architecture and allied arts. Two hours rec. a week.
105 379. History of Architecture IV. (2) II. Cont. of Arch. 378 through modern architecture and allied arts. Two hours rec. a week. Pr.: Arch. 378.
105 399. Honors Seminar in Architecture. Credit arranged. On sufficient demand. Selected topics in architecture. Primarily for honors students.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

105 413. Environmental Seminar. (3) I, II. Discussion of the influences of environmental technology upon design concepts. Three hours rec. a week. Pr.: Approval of instructor.
105 431. Architectural Design I. (5) I, II. Correlation of the basic physiological variables of Man's environmental needs. Amplification of design process. Development of communicative skills - graphic, oral, and written. Nine hours studio per week. Pr.: Arch. 322.
105 432. Architec tural Design II. (5) I, II. Continuation of Arch. 331. Intuitive integration of structural and material systems. Relating Environmental Technology to total design. Nine hours studio per week. Pr. : Arch. 431.
105 433. Architectural Construction I. (3) I, II. Study of the physical characteristics of building materials, and their assembly into building systems. Detailing as a means of graphic communication. Nine hours studio a week. Pr.: Arch., Arch. Str., and Interiors majors arch. 322 ; Bldg. Con. majors, Arch. 208.
105 434. Architectural Construction II. (3) I, II, S. Cont. of Arch. 311. Development of working drawings of a selected building. Working drawings as a means of graphic communication. Nine hours studio a week. Pr.: Arch. 431 and 433.
105 460. Mosaic. (2) I, II. Design and execution of mosaic compositions in glass, stone and other materials; study of historic and modern examples of mosaic and related media, with particular reference to their architectural uses and techniques. Six hours lab. a week. Pr.: Arch. 212, or approval of instructor.
105 475. Problems in Architectural Presentation. Credit arranged. I, II, S. Study of various methods of graphically representing architectural problems to develop professional office techniques. Pr.: Third-year standing and approval of instructor.
105 541. Architectural Design III. (5) I, II. Continuation of Arch. 432. Integration of the basic physiological and psychological parameters in the design of Man's environmental needs. Increased complexity of function and space definition systems. Relating Environmental Technology to total design. Fifteen hours studio per week. Pr.: Arch. 432 and Con. Sci. 420 and 421.
105 542. Architectural Design IV. (5) I, II. Continuation of Arch. 541. Increased complexity of function and space definition systems. Relating Environmental Technology to total design. Fifteen hours studio per week. Pr.: Arch. 541 and Con. Sci. 422.

## UNDERGRADUATE AND GRADUATE CREDIT

105 651. Architectural Design V. (5) I, II. Integration of the Physiological, psychological, and sociological
parameters in the design of Man's environmental needs. Analysis, programming, and design of urban problems and-or large scale site planning problems, increased complexity of function and space definition systems. Relating Environmental Technology to total design. Fifteen hours studio per week. Pr.: Arch. 542 and Con. Sci. 422, and 428.
105 652. Architectural Design VI. (5) I, II. Terminal project: Analysis, programming, and development of a selected project approved by the faculty. Complete integration of Function, Space Definition Systems, and Environmental Technology if applicable. Fifteen hours studio per week. Pr: Arch. 434 and Senior classification.
105 653. Professional Practice. (2) I, II. Study of the ethics and practice of Architecture; interpretation of building codes, legal and contract documents of A.I.A.; office procedures; architect, client, and contractor relationships. Two hours rec. per week. Pr.: Arch. 434 and Senior classification.
105 654. Inspection Trip. (2) I, II. An architectural field trip, planned by students and faculty, to selected areas of the United States (or approved equal), to observe and study outstanding examples of design and construction. Requirement may be fulfilled during any semester of the three year professional program. Pr.: 3rd, 4th, or 5th year standing.
105 655. Foreign Seminar. Credit arranged. I, II, S. Group observation of design examples (ancient or modern) of a selected region, conducted in Situ, to study significant aspects of environment, culture and technology as relating to Design solutions.
105 660. Environmental Aesthetics. (3) II. Problems involving aesthetics in areas related to student's major field. Three hours per week. Pr.: Senior standing in Architecture, Landscape Architecture, Interior Design, Architectural Structures, Urban Design.
105 690. Advanced Environmental Seminar. Credit arranged. I, II. Environmental systems related to human perception, reactions and behavior. Pr.: Senior standing in Architecture, Landscape Architecture, Interior Design, Architectural Structures, Urban Design.
105 765. Problems in Architecture. Credit arranged. I, II, S. A study of specific architectural problems under the direction of a member of the department staff. Pr.: Approval of instructor.

## GRADUATE CREDIT

105 810. Research in Architecture. Credit arranged. I, II, S. Study in architecture and related fields leading to thesis or non-thesis project. Pr.: Approval of instructor.
105 815. Theory of Design (3) I. Analysis of theories and philosophies in the design professions including those in related societal and technological fields. Pr.: Degree in Architecture, Landscape Architecture, Interior Design, Architectural Structures, Urban Design.
105 830. Advanced Architectural Design. Credit arranged. I, II, S. Studies related to a comprehensive program in architecture. Pr.: Arch. 652.

## Construction Science

## I. EUGENE THORSON,* Head of Department

Professor Thorson;* Associate Professors Jahnke;* Bissey,* and Blackman, and Instructors Burton and Bell.

The department of Construction Science administers the curriculum leading to the Bachelor of Science Degree in Building Construction and the Bachelor of Architecture Degree in Architectural Structures. This department is primarily concerned with providing the course work in the technical and management areas of the above programs and offers service courses in these areas to other departments in the College.

The Building Construction curriculum is designed to prepare graduates for a responsible position in one of the many phases of the construction industry. Courses include an introduction to preparation of construction drawings and specifications, design of structural, mechanical and electrical systems and business practices and management techniques directly related to building construction. Courses in management, building materials, estimating of building costs, methods of construction scheduling and field erection procedures prepare the student for positions as construction supervisors and project managers, estimators, sales engineers and related positions in the construction industry. This curriculum terminates with the degree Bachelor of Science in Building Construction.

The Architectural Structures option is offered for the student who is particularly interested in the Engineering aspects of Building Design. After a thorough instruction in basic mathematics and science the student applies these principles to structural, mechanical and electrical problems in Building Design. The undergraduate curriculum terminates with the degree Bachelor of Architecture-Architectural Structures Option.

## Graduate Work

The degree Master of Architecture in Architectural Structures is available to students holding the bachelor's degree from a recognized college or university with an undergraduate program substantially equivalent to that at this University.

## UNDERGRADUATE CREDIT

106 116. Constr. Seminar. (0) I, II. Presentation of professional problems and practices by students, faculty, contractors, architects, and various organizations associated with the building industry. One hour lecture per month.
106 210. Intro. to Construction Programming. (2) II. Application of digital computer techniques to the solution of elementary problems in the field of Construction Science and Architecture. Pr.: Math. 150. 4 hours per week.
106 250. Site Construction. (3) I. Study of site construction procedures, beginning with soil investigation, review of site plans, layout for construction, excavation calculations for earth moving, calculations using the computer for areas and volumes of earth work. Pr.: Con. Scı. 210, C. E. 212 concurrent with Geol. 100. 3 hours per week.

106 313. Construction Drawings. (3) II. Production of a set of construction drawings. Emphasis on Construction procedures. Introduction to shop drawings. For Building Construction Majors. Pr.: Arch. 433, C. E. 212 or C. E. 212 taken concurrently. Nine hours lab per week.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

106 410. Senior Project - Architectural Structures. (3) II. Student working individually with laboratory support will prepare and present a thesis of appropriate scope and complexity and be required to defend the thesis before a selected jury. Nine hours lab. a week. Pr.: Terminal semester.
106 420. Theory of Structures I. (3) I, II. Bar stresses in trusses; solid and framed arches; mathematical and graphical solutions of stresses and deflections in beams under static and moving loads. Six hours a week. Pr. : Ap. M. 220 .

106 421. Timber Structures. (2) I, II. Analysis and design of timber structures using solid and laminated materials. Two hours rec. a week. Pr.: Ap. M. 224 or 415. Pr. or Conc.: Con. Sci. 420 or C. E. 330.
106 422. Theory of Structures II. (4) I, II. Analysis and design of metal structures; emphasis on buildings. Six hours a week. Pr.: Con. Sci. 420 and 421.
106 428. Theory of Structures III. (4) I, II, S. Design of reinforced concrete building frames; footings, columns and floor systems, attention being given to costs and economical design. Six hours a week. Pr.: Con. Sci. 420 and 422 .
106 434. Thermal Systems. (3) I, II. Man's physiological needs, principles of heat transfer, principles of building thermal balance, comfort systems and space use relationships, involving heating, ventilating and cooling as integral parts of architectural design. Three hours a week. Pr.: Phys. 211 or 311.
106 435. Lighting Systems. (2) I, II. Vision, human psychophysical and psychological response, color, natural and artificial lighting design and light sources, lighting techniques and spatial relationships, as integral parts of architectural design. Two hours a week. Pr.: Phys. 212 or 312.

106 436. Sanitation Systems. (3) I, II. Stream and water pollution, sewage disposal systems, building piping systems, space relationships, equipment requirements
as related to architectural design, structural systems, construction materials and techniques. Three hours a week. Pr.: Gen. Phys. 211, or Engg. Phys. 311.
106 437. Acoustic Systems. (2) I, II. Hearing and the ear, sound generation, acoustical correction, noise reduction, sound transmission all as integral parts of architectural design. Two hours a week. Pr.: Gen. Phys. 211, or Engg. Phys. 311.
106 440. Construction Problems I. (3) I. Practical problems encountered in the erection of buildings and use of construction equipment. Pr.: Const. Science 250 and 313.

106 441. Construction Estimating. (3) I. Principles, theories and methods of building estimating. Nine hours lab. a week. Pr.: Con. Sci. 313 and 440.
106 442. Construction Management I. (3) I. Construction Safety; Project Planning, Scheduling and Cost Accounting Techniques. Computer applications to pert and critical path scheduling and cost records. Pr.: Arch. 653 and concurrent with Const. Science 441.
106 443. Construction Management II. (3) II. Construction planning and scheduling techniques. Computer applications to Pert and Critical Path. Three hours lecture per week. Pr.: Con. Sci. 441 and 442.
106 444. Problems in Construction Science. Credit arranged. I, II, S. A study of specific design problems under the direct supervision of a member of the Construction Science faculty. Pr.: Approval of the instructor.

## UNDERGRADUATE AND GRADUATE CREDIT

106 680. Theory of Structures IV. (3) II. Cont. of Theory I, II, and III, with special emphasis being placed on the complete problem of the structure as a whole. Three hours a week. Pr.: Con. Sci. 428.

## GRADUATE CREDIT

106 885. Structural Systems Design. (3) I, II. A study of integrated structural, mechanical and electrical systems; economic evaluation. Two hours rec. and three hours lab. a week. Pr.: Con. Sci. 680 or consent of instructor.

## Interior Architecture

## JACK C. DURGAN,* Head of Department

Professor Durgan;* Assistant Professor Reid;* Instructor Murphy.

The curriculum in Interior Architecture is specifically for those who plan a professional career in space planning related to the particular fields of commercial, institutional, and industrial interior design. After a thorough introduction in basic design, students develop studio exercises, programming and designing spaces related to these particular needs. Special emphasis is placed upon space organization, furnishings construction and design, the integration of environmental systems, and the preparation of contract documents.

Students are encouraged to secure practical experience during the summer vacation, as well as devoting their senior year to actual projects.

Graduates may be employed by professional architectural offices, space planning and interior design firms, and corporate organizations.

## Graduate Work

The degree Master of Architecture in Interior Architecture is available to students holding a bachelor's degree from a recognized college or university with an undergraduate program substantially equivalent to that at this University.

## Courses in Interior Architecture

## UNDERGRADUATE CREDIT

107 307. Design Workshop I. (3) I. Introduction to various materials, construction methods, and applications of principles related to furniture design. Nine hours lab. a week. Pr.: Arch. 322.
107 308. Design Workshop II. (3) II. Design and construction of special projects related to interior furnishings. Nine hours lab. a week. Pr.: I. A. 307.
107 309. Finishing. (2) I, II. Methods of finishing various materials for interiors. Six hours lab. a week. Pr.: Arch. 322.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

107 541. Interior Architectural Design I. (4) I. Discussion and analysis of spaces of various simple building types; emphasis on selection and application of materials for specific uses; graphical presentation of their spatial relationship. Fifteen hours lab. a week. Pr.: Arch. 432.
107 542. Interior Architectural Design II. (4) II. Cont. of Arch. 481. Discussion and analysis of more complicated spaces; relation of interior-exterior and verticalhorizontal spaces; graphical presentation of these problems. Fifteen hours lab. a week. Pr.: I. A. 541 .

## UNDERGRADUATE AND GRADUATE CREDIT

107 651. Interior Architectural Design III. (5) I. Discussion and analysis of spaces from the 15th century to the present; the characteristics of period design as related to the need and technological development of the time; graphical presentation of historical examples. Fifteen hours lab. a week. Pr.: I. A. 542.
107 652. Interior Architectural Design IV. (5) II. Analysis, development and presentation of complex spatial organization integrating such factors as sound control, mechanical equipment, and lighting; problems coordinated with Arch. 542. Fifteen hours lab. a week. Pr.: I. A. 651.
107 653. Contract Design Practice. (2) I. The preparation of specifications, contract documents, and purchasing procedures related to institutional and commericial materials and furnishings. Two hours rec. a week. Pr.: Fifth year classification.

107 683. Contemporary Furniture Design. (4) II. Student will develop studies, models and technical drawings of furniture for various building types. Problems will include the coordination of materials, design and structural techniques. Availability of shops will permit the development of full-scale projects. Twelve hours lab. a week. Pr.: I.A. 308 and 309.
107 765. Problems in Interior Architecture. Credit arranged. I, II, S. Study of specific interior architectural problems under direct supervision of a member of the departmental staff. Pr.: approval of instructor.

## GRADUATE CREDIT

107 820. Advanced Interior Architectural Design. (4) I, II. Problems in synthesizing and integrating environmental and structural systems with interior space and furnishings. Pr.: Degree in Architecture, Landscape Architecture, Interior Architecture, Architectural Structures, Urban Design.

## Landscape Architecture

ROBERT P. EALY,* Head of Department

Professors Ealy* and Parks;* Associate Professor Oblinger;* Assistant Professors Day* and Page; Instructor Tuomey; Professor Emeritus Quinlan.

The degree Bachelor of Landscape Architecture is conferred upon those who successfully complete this course of study at Kansas State University. The curriculum is designed to prepare students for the field of professional landscape architecture and is a carefully balanced program drawing from several related areas. Special emphasis is placed upon space organization, land planning, topographical manipulation, landscape planning and construction, and the role of adapted plant materials in the landscape. Field trips may be required of students in all courses numbered 100-431 and above.

The Curriculum in Landscape Architecture is accredited by the American Society of Landscape Architects in cooperation with the National Commission on Accrediting.

Graduates may be employed by professional firms of landscape architects, and by municipal, state and national governmental agencies working with housing, parks, highways and other landplanning areas. Many graduates later establish their own professional offices and some enter the teaching field. Others go on to do graduate work in landscape architecture or city and regional planning.

## Graduate Work

A program leading to the degree Master of Landscape Architecture is available to those holding a bachelor's degree from a recognized college or university with an undergraduate program substantially equivalent to the program in landscape architecture at this University.

## Courses in Landscape Architecture

 UNDERGRADUATE CREDIT110 100. General Landscape Design. (3) I, S. An introductory course in the fundamental principles of landscape design, and an appreciation of man's natural environment for non-majors. Three hours rec. a week. 110 200. Landscape Design. (3) I. An introduction to the basic principles of landscape design as they relate to man's natural environment and his improvement of the landscape. Role of the L.A. on the design team. For landscape architecture and architecture majors only. Three hours lec. a week.
110 201. Landscape Architecture Assembly. (0) I, II. Required of all landscape architecture majors in first, second and third years. Presentations related to the profession and the program of study. One hour lec. a month.
110 204. Landscape Architectural Delineation Techniques. (2) II. A study of delineation media and techniques that are related to the practice of landscape architecture in professional offices. Four hours lab. a week. Pr.: Arch. 132 and 208.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

110 431. Landscape Architectural Design I. (4) I. Graphic expression of landscape architectural site developments; emphasis on site analysis, program analysis and the resultant development of concept as a point of departure in landscape architectural design. Twelve hours lab. a week. Pr.: L.A. 200, Arch. 322.
110 432. Landscape Architectural Design II. (4) II. Cont. of L.A. 431. Twelve hours lab. a weekk. Pr.: L.A. 431 and 436.

110 433. History and Theory of Landscape Design. (3) I. The influences of social, political, economic and climatic factors on historic landscape styles; theory of landscape design. Three hours rec. a week. Pr.: Second year classification in L. A.
110 434. Planting Design I. (3) I. Use of plants as design elements in landscape architectural developments; preparation of sketches and plans. Eight hours lab. a week. Pr.: Hort. 260 and 270, Arch. 322.
110 435. Planting Design II. (3) II. Cont. of L. A. 442. Eight hours lab. a week. Pr.: L. A. 434.
110 436. Landscape Construction I. (3) I. Problems in the basic aspects of land construction to include topography, site grading, earthwork estimating and vehicular requirements. Eight hours lab. a week. Pr.: C. E. 212, Arch. 221, and third year classification or consent of instructor.
110 437. Landscape Construction II. (3) II. Cont. of L. A. 436. To include site layout, road alignment, construction
detailing and cost estimating. Eight hours lab. a week. Pr.: L. A. 436.
110 440. Problems in Landscape Design. Credit arranged. I, II, S. Assigned problems and reports in the area of landscape architecture. Pr.: Junior classification.
110 501. Landscape Architecture Seminar. (1) I, II. Required of all fourth- and fifth-year landscape architecture majors. Meets second and fourth Thursdays of each month. Discussion of current trends in landscape architecture and related fields by students, faculty and invited speakers.
110 541. Landscape Architectural Design III. (4) I. Investigations of more complex site developments, with emphasis on the interrelations among land forms, simple structures and man. Twleve hours lab. a week. Pr.: L. A. 432 and 437.

110 542. Landscape Architectural Design IV. (4) II. Cont. of L. A. 541. Twelve hours lab. a week. Pr.: L. A. 541 and 547.

110 543. Planting Design III. (3) I. Preparation of planting plans and their use as working drawings; specification writing, contractor relationships and maintenance procedures. Nine hours lab. a week. Pr. : L. A. 435 .

110 544. Community Planning. (3) II. Growth and development of cities and towns; land subdivision. Eight hours lab. a week. Pr.: Planning 215 or consent of instructor.
110 545. Professional Internship. (0) II, S. Confirmed employment in a professional physical planning office for a minimum of 10 weeks; subject to approval of L. A. Department Staff. Pr.: L. A. 432 and 437.
110.546. Landscape Architecture Inspection Trip. (0) II. Required for graduation. May be taken during any semester offered. Pr.: Third, Fourth or Fifth year standing.
110 547. Landscape Construction III. (3) I. Cont. of L. A. 472 to include utilities routing, area lighting, irrigation systems and construction specification writing. Eight hours lab. a week. Pr.: L. A. 437.

## UNDERGRADUATE AND GRADUATE CREDIT

110 651. Landscape Architectural Design V. (5) I. Design and development of large-scale sites, with emphasis on massing studies of all the elements of the landscape and their relation to health, welfare and safety of, and enjoyment by man. Fifteen hours lab. a week. Pr.: L. A. $544,435,542$, and 547.
110 652. Landscape Architectural Design VI. (5) II. Cont. of L. A. 651. Fifteen hours lab. a week. Pr.: L. A. 651.
110 653. Professional Practice. (2) II. Ethics, office practice and procedure, contracts and specifications. A professional resume is required. Two hours rec. a week. Fifth-year classification.
110 655. Site Analysis and Planning. (3) II. An ecological approach to analysis of the earth's surface as a base plane for the projects of the architect, landscape architect and planner. Six hours lab. a week. Pr.: L. A. 200, C. E. 213, or consent of instructor.

110 656. Design of Parks and Recreation Areas. (3) I. Site planning of national, state, municipal and private parks and specialized recreation areas. Nine hours lab. a week. Pr.: L. A. 542 and 547.

110 741. Problems in Landscape Architecture. Credit arranged. I, II, S. Specific problems and-or reports in the area of landscape architecture. Pr.: Advanced undergraduate standing or graduate standing.

## GRADUATE CREDIT

110 870. Problems in Advanced Landscape Architecture. (1-3) I, II, S. Special studies and designs in advanced landscape architecture. Pr.: L.A. 652.
110 880. Problems in Advanced Landscape Construction. (1-3) I, II. Specialized study of large-scale landscape planning involving landscape construction and grading. Pr.: L. A. 547.
110 890. Research in Landscape Architecture. Credit arranged. I, II, S. Investigations in landscape architecture and related areas, of such caliber as to form the basis for a graduate thesis. Pr.: Graduate standing in landscape architecture.

## Regional and Community Planning

VERNON P. DEINES,* Head of Department
Professor Deines;* Associate Professors Edmonds,* McGraw,* and Weisenberger;* Instructor Keithley; Adjunct Lecturers Eurman, Halligan.

Study leading to the two-year professional graduate degree Master of Regional and Community Planning requiring a minimum of 48 graduate credit hours has been offered on an inter-departmental basis since 1957 by the Department of Regional and Community Planning in cooperation with the Departments of Architecture, Civil Engineering, Economics, Geography, Landscape Architecture, Political Science and Sociology and the Colleges of Agriculture, Commerce, Education and Home Economics. The program is directed towards providing broad interdisciplinary training in the social sciences and the design professions for directors of planning and development in cities, counties, regions and states; schools, colleges and universities; business firms, industrial plants, and military installations; and other relevant organizational frameworks.
Graduate students with undergraduate degrees in administration, agriculture, architecture, commerce, economics, ecology, education, engineering, geology and geography, government, home economics, landscape architecture, law, planning, political science and sociology, who meet the requirements of the Graduate School for admission, are fully acceptable. Students with other academic backgrounds may be accepted upon approval of the in-
terdepartmental committee and subject to such conditions as they may impose.
Undergraduate students may elect to take planning courses either in preparation for graduate study or in fulfillment of undergraduate minors options and electives.
The following list indicates suggested undergraduate study in Planning:

Introduction to Planning<br>Planning and Development Codes<br>City Planning I<br>Regional Planning I<br>Housing and Renewal<br>Institutional Plan. \& Development<br>Introduction to Economics and Urban Regional Economics<br>Urban Geography<br>Introduction to Sociology and Urban Sociology<br>Introduction to Political Science and Urban Politics<br>a course in Statistics<br>a course in Data Processing

The following list indicates a suggested undergraduate option in Urban Design and Planning for engineers and architects:
Introduction to Planning
Planning and Development Codes
City Planning I
Urban Design I
Housing and Renewal
Urban Visual Analysis
Introduction to Economics and Urban and Regional
Economics
Urban Geography
Introduction to Sociology and Urban Sociology
Urban Transportation Analysis I
Site Planning and Analysis
Environmental Aesthetics
Introduction to Political Science and Urban Politics
a course in Statistics
a course in Data Processing

Graduate students may also work towards the traditional one-year Master of Arts or Master of Science degree in their discipline or profession with a minor in planning. Select a minor from the following courses:
Planning Principles
Housing and Renewal
Institutional Planning and Development
Planning Theory
City Planning I
Seminar in Palnning
Advanced Planning Theory
Regional and community planning requires the application of the planning process to the total development of cities, counties, regions, states and the nation. This encompasses both the understanding of the physical environment, traditional in city planning, as
well as the recognition of the economic, social and political forces of the society. Professional planners prepare plans and set policies to guide community and regional growth. The design techniques and principles of architecture, landscape architecture, and civil engineering are combined with the knowledge of the social sciences, such as economics, geography, political science and sociology, as well as the allied professions, such as agriculture, commerce, education, government, law and home economics.
Since 1945, rapidly increasing awareness of the impact of urbanization has created a demand for professionally trained planners. Although some positions have been filled by allied professionals from other fields, the more responsible positions require professional graduate training. Graduate planners are employed as staff members or directors of city, county, regional, metropolitan, state and national planning agencies (including housing and urban renewal, recreation and open space, transportation, and economic and social development); practice as planning and design consultants in these fields; and work in business, government, education, industry and the military in the planning and development of large-scale institutional projects (including shopping centers, civic centers, college campuses, industrial parks, and military facilities).

## Courses in Regional and Community Planning

## UNDERGRADUATE CREDIT

109 215. Introduction to Planning. (3) I, II. The origins and evolution of planning in response to economic, social, political and physical problems. The planning process and its relationship to the design professions and the social and behavioral sciences. Three hours rec. a week. Pr.: Sophomore standing.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

109 415. Planning and Development Codes. (3) I, II. Introduction to federal, state and local legislation and interpretation of codes related to planning, design and construction. Pr.: Plan. 215 or equivalent and Junior standing.

## UNDERGRADUATE AND GRADUATE CREDIT

109 605. Planning Graphics. (2) I. Study and application of visual communication media utilized in regional and community planning to simulate the spatial and aspatial aspects of the environment. Pr.: Senior standing and approval of instructor.

109 615. Planning Principles. (3) I, S. Examination of principles and elements of regional and community planning, including growth forms, physical patterns, planning stages, standards, control measures and procedures. Pr.: Senior standing and approval of instructor.
109 625. Planning Theory. (3) I. Review of basic theories of regional and community growth and change; analysis of the process of urbanization in relation to societal determinants and environmental constraints, and the synthesis of a process of planning. Pr.: Senior standing and approval of instructor.
109 635. City Planning I. (3) I, S. Review of the principles and elements of city growth and change. Criteria and methodology for city analysis and planning are examined and applied to the elements of cities. Pr. or conc.: Plan. 615 or 625.
109 645. Urban Design I. (3) I, II. Review of recent historical developments of urban form and space. Criteria and methodology for urban design and planning are examined and applied to the elements of cities. Pr. or conc.: Plan. 615 or 625.
109 655. Regional Planning I. (3) II. Review of the principles and elements of regional growth and change. Criteria and methodology for regional analysis and planning are examined and applied to the elements of regions. Pr.: Plan. 615 or 625.
109 695. Topics in Planning. Credit arranged. I, II, S. The study of selected concepts and trends in regional and community planning and development. Pr.: Plan. 615 or graduate standing.
109 710. Urban Visual Analysis. (2) II. Survey and analysis of urban form and space in relation to aesthetic theories and values. Methods of visual perception and analysis are reviewed and applied to contemporary urban form and space. Pr.: Plan. 645 or equiv.
109 720. Institutional Planning and Development. (3) II. Examination of institutional functions, administrative structures, resources and policies in the planning and development of physical facilities. Pr.: Plan. 615 or equivalent and nine other credit hours in planning andor administration courses.
109 750. Housing and Renewal. (3) II. Review and evaluation of federal, state and local policies and programs of urban renewal and housing. Pr.: Plan. 615 or 625.

109 770. Planning Administration and Implementation. (3) I, II. Considerations for the planning director in the administration of the planning function and the implementation of the planning process. Pr.: Completion of one semester of graduate study in planning.
109 790. Research Methods in Planning. (3) I, II. Considerations in the selection, collection, analysis and interpretation of data. Introduction to modeling, information systems, planning studies, forecast techniques, and computer programs. Pr.: Plan. 615 or equivalent and one course each in graphics, statistics, and computer programming.

## GRADUATE CREDIT

109 805. Internship in Planning. (0) I, II, S. Assignment to a planning staff for a period of at least 10 weeks; supervision by a professional planner with periodic
reports of activities to planning faculty. Pr.: Completion of two semesters of graduate study in planning.
109 815. Seminar in Planning. (3) I, II, S. Discussion of contemporary issues in planning within the framework of professional education as a basis for planning practice. Pr.: Completion of one semester of graduate study in planning or urban design.
109 825. Advanced Planning Theory. (3) II. Review of Empirical and normative theories of regional and community planning; analysis of principles, hypotheses, concepts and law of planning and synthesis of a theory of planning. Pr.: Plan. 770 and completion of two semesters of graduate study in planning.
109 835. City Planning II. (3) I. Synthesis of city growth and change in relation to planning theory and socio-economic-political determinants. Criteria and methodology for city analysis and planning are reviewed and applied to the elements of the contemporary city. Pr.: Plan. 635 or equiv
109 845. Urban Design II. (3) II. Synthesis of urban form and space in relation to aesthetic theories and values and socio-economic-political determinants. Criteria and methodology for urban design and planning are reviewed and applied to contemporary urban form and space. Pr.: Plan. 645 or equiv.
109 855. Regional Planning II. (3) I. Synthesis of regional growth and change in relation to planning theory and socio-economic-political determinants. Criteria and methodology for regional analysis are reveiwed and applied to the elements of the contemporary region. Pr.: Plan. 655 or equiv.
109 890. Research in Planning. Credit arranged. I, II, S. Original research and advanced study in regional and community planning, urban design, and related fields for thesis or master's report. Pr.: Registration in Graduate School and completion of two semesters of graduate study in planning.

## Center for Community and <br> Regional Planning Services

VERNON P. DEINES, Director<br>LELAND R. EDMONDS, Associate Director

The Center for Community and Regional Planning Services, a joint function of the Interdepartmental Program in Regional and Community Planning of the Graduate School and the Department of Regional and Community Planning of the College of Architecture and Design at Kansas State University, has as its goal increased public awareness of community and regional planning and development. The Center for Community and Regional Planning Services at Kansas State University has a threefold function: the creation of public understanding of comprehensive planning, the supply of basic information about new techniques and programs in planning, and the conduct of
research on planning problems and methods. These functions of the Center are closely related to the graduate program in community and regional planning.
The public understanding of comprehensive planning is accomplished through the community development short courses which have been held since 1961 (six two-hour sessions presented to communities embarking on a planning program), the annual Kansas planning conference which has been held since 1954 (jointly sponsored by the University of Kansas, Kansas State University, The Kansas Planning and Development Association, and the Kansas Department of Economic Development), and through cooperative action with other state and university extension programs (such as the Office of Education (Title I) program with the Division of Continuing Education). The supply of basic information about new techniques and programs in planning is achieved through a planning information service (inquiries are handled on an individual basis and pamphlets of general information are distributed), a planning procedures and programs library (manuals and technical references are available for use), and the annual Kansas planning conference (special exhibits and brochures are available for viewing). The conduct of research on planning problems and methods is accomplished through the directed research of the faculty and graduate students in the interdepartmental planning program (supported by state and federal agencies), and by cooperative action with other state and university research efforts (the state planning program is a recent example).
From 1961-69 some 2300 individuals in 120 Kansas communities have received the sixlesson short course in "Community Development" with sponsorship from cities, counties or local civic groups. This has resulted in the application by a number of cities and counties for planning assistance. These grants, administered through the Planning Division of the Kansas Department of Economic Development, have resulted in studies leading to comprehensive planning for a number of Kansas communities. As a result of the short courses and meetings, local leaders have had a better understanding of the planning process and have undertaken planning programs with strong local support.

The responsibility for the community industrial survey program was transferred in the fall of 1967 to the Center for Community and Regional Planning Services from the Division of Engineering and Industrial Extension. This program has, since its inauguration in the fall of 1947, made a significant contribution to the local development efforts in the state with the completion of more than 100 surveys for Kansas communities. The community surveys are studies of the assets and liabilities of a community, aimed at the formulation of a program of local expansion and stabilization for the community. As a general rule, the local Chamber of Commerce is the sponsoring organization, although other civic groups and local governing bodies have acted in that capacity. The study is conducted under the direction of Center personnel, using local people in the gathering of data and circulation of questionnaries. The report is then compiled and published at the University.

Recent research studies have included neighborhood analysis of metropolitan areas,
the evolution of urban design, cluster design in residential development, regional planning and substate delineation, comprehensive planning for the rural community, the redevelopment of central business districts, land use inventory methods, low-cost selfhelp housing and public relations in planning. These studies are reported in the Engineering Experiment Station bulletin. Current research studies include regional and community planning, variable perception of urban aesthetics, campus planning, regional public investment planning, urban extension modeling, systems analysis, planning education, interpersonal communications, central business district redevelopment, state planning and gaming simulation.

In the future, the Center will continue to serve as the focus for community and regional planning and development services at Kansas State University in cooperation with other extension, research, and education units of the University, and with private organizations and foundations and state and federal agencies in Kansas.


# THE COLLEGE OF ARTS AND SCIENCES 

WILLIAM L. STAMEY, Dean

PAIGE E. MULHOLLAN, Associate Dean
ORVAL EBBERTS, Assistant Dean
MARJORIE ADAMS, Assistant Dean
MARJORIE CLELAND, Assistant to the Dean

The College of Arts and Sciences through its 23 departments and one division offers programs of study which enable the student to acquire a broad preparation for life in a democratic society, to obtain a sound basis for his professional training, or to receive training in the specific skills required for his chosen field of endeavor.
The courses offered in the College of Arts and Sciences provide the student an opportunity to develop his skill in communication, to appreciate the heritage of the past, to understand the laws of nature, to participate in the arts, and to maintain a healthy body. Courses in specific subject matter provide the professional training for scientists, research workers, teachers, technicians, and writers.
Students who enter the College of Arts and Sciences with a potential for unusual scholastic attainment will be invited to participate in the Honors Program. This selection is based on the performance of the
student in high school and an evaluation of his ability in comparison with all entering students at Kansas State. The evaluation is determined by a study of performances on entrance tests which are administered to each student. Students participating in the Honors Program will have the requirements of their curriculums adjusted to their individual abilities and thus will be offered the opportunity of obtaining a more individualized program of study in consultation with an Honors Program adviser. Students previously enrolled in the College of Arts and Sciences who have demonstrated outstanding scholastic achievement may also be invited to participate in the Honors Program.
The College of Arts and Sciences offers all students an opportunity to undertake independent study and thereby to strengthen their capacity for independent judgment. This program provides for independent reading in areas of general interest. (199, Arts and Sciences, two semester hours). It offers summer reading of selected important books in natural sciences, social sciences, and humanities with an examination in early fall. Prerequisite: Pre-registration in May to enroll the following fall.

A list of the areas in which a student in the College of Arts and Sciences may major, together with the degree offered is given in the following table. The specific requirements for a degree in the various curriculums are indicated on subsequent pages.
In each of the curriculums there are requirements in general education that are to be fulfilled by courses chosen by the student in consultation with his adviser. The aim of these requirements is to provide breadth in the student's program through some study in each of the major areas of knowledge outside the field of specialization. Introductory and intermediate level courses are available for this purpose in departments in the natural sciences, social sciences, and humanities.

Degrees and Majors
A. B. ${ }^{1}$

Anthropology
Art
Biology
Chemistry
Computer Science
Economics
English
General (Area Major)
Geology
Geography
History
Journalism and Mass
Communications
Mathematics
Modern Language
Music
Philosophy
Political Science
Psychology
Sociology
Speech
Statistics
Pre-Professional
Physical Therapy
Pre-Medicine
Pre-Dentistry
Pre-Law
Pre-Social Work
B. F. A.

Art
B. of Music

Music
B. S. ${ }^{1}$

Anthropology
Biology
Chemistry
Computer Science
Economics
General (Area Major)
Geology
Geography
History
Journalism and Mass
Communications
Mathematics
Physics
Political Science
Psychology
Sociology
Speech
Statistics
Pre-Professional
Physical Therapy
Medical Technology
Pre-Elementary Education ${ }^{2}$
Pre-Secondary Education ${ }^{2}$
Pre-Dentistry
Pre-Law
Pre-Medicine
Pre-Nursing ${ }^{3}$
Pre-Pharmacy ${ }^{4}$
Pre-Social Work
Pre-Veterinary ${ }^{5}$
B. S. in Physical Education

Physical Education
B. S. in Music Education Music

1. Students working toward an A. B. or B. S. degree may if they wish teacher certification for secondary schools fulfill requirements for a major in most departments in the College of Arts and Sciences and teacher certification requirements in the College of Education. (See page 180).
2. Requirements for a degree to be completed in the College of Education (See page 182)
3. Requirements for a degree to be completed in a professional school of
4. Requirements for a degree to be completed in a professional school of pharmacy.
5. Students who complete pre-veterinary medicine requirements in the College of Arts and Sciences will be eligible for the Bachelor of Science degree from the College of Arts and Sciences upon completion of the second professional year in the College of Veterinary Medicine. (PreVeterinary medicine requirements may also be completed in the College of Agriculture. See 34).


## Bachelor of Arts Degree ${ }^{* * *}$

120 hours required for graduation
I. General Requirements
A. English Composition I and II
B. Oral Communication I (or Oral Communication II, Argumentation and Debate, or Language and Communication as recommended by Department of Speech).

One course
C. Modern Languages

Two years in 1 language (or equivalent competence)
D. Mathematics

- One course
E. Humanities (from Departments of Art, English, History, Modern Languages, Music, Philosophy, and Speech).

Three courses, including one course above the introductory level ( 400 level or above)
F. Social Science (from Departments of Economics, Geography (excluding Geography 150 and 151), History, Political Science, Psychology, Sociology and Anthropology, Journalism and Mass Communications.

Three courses, including one course above the introductory level ( 400 level or above)
G. Natural Science from Division of Biology and Departments of Chemistry, Computer Science, Geography (courses 150 and 151 only), Geology, Mathematics, Physics, or Statistics.

Four courses, including one laboratory course and one course above the introductory level (a course which has a prerequisite in the same department in which it is located).
H. Physical Education (or marching band or varsity sports).

Two courses ${ }^{* * *}$
II. Major Requirements: Remaining hours in major and additional tool and related courses and electives.

Pre-professional programs are administered by the appropriate department or, where not applicable, by the Office of the Dean of Arts and Sciences.

## Bachelor of Science Degree ***

120 hours required for graduation
I. General Requirements
A. English Composition I and II
B. Oral Communication I (or Oral Communication II, Argumentation and Debate, or Language and Communication as recommended by Department of Speech).

One Course
C. Humanities and Social Sciences (from Departments of Art, Economics, English, Geography (excluding Geography 150 and 151), History, Modern Languages, Music, Philosophy, Political Science, Psychology, Sociology and Anthropology, Speech, Journalism and Mass Communications.

Seven courses, taken from at least two departments, including 1 course in Philosophy and 2 advanced level courses (400 level or above or second year of a foriegn language).
D. Natural Science from Division of Biology and Departments of Chemistry, Computer Science, Geography (courses 150 and 151 only), Geology, Mathematics, Physics, or Statistics.

Four courses, including one laboratory and one course above the introductory level (a course which has a prerequisite in the same department in which it is located)
E. Physical Education (or marching band or varsity sports).

Two courses
II. Major Requirements: Remaining hours in major and additional tool and related courses and electives.

Pre-professional programs are administered by the appropriate department or, where not applicable, by the Office of the Dean of Arts and Sciences.

## Bachelor of Fine Arts

The Bachelor of Fine Arts Degree is the more professionally oriented undergraduate degree in art. It is designed primarily for

[^9]those planning to become professional artists or artist-teachers. Greater emphasis is placed on actual practice in the creative art disciplines. The degree is considered the appropriate preparation for the Master of Fine Arts degree which is recognized as the terminal degree in studio arts. The BFA in Art is a 4 -year 120 -hour program with majors possible in Painting, Sculpture, Ceramics, and Printmaking. The degree requirements are as follows:
I. General Education ( 45 hours)
A. Communications, English Composition, 2 courses; and Oral Composition I, 1 course.
B. Social Science (6 hours)
C. Humanities ( 9 hours)
D. Philosophy, Aesthetics, or Mathematics (3 hours)
E. Natural Sciences (8 hours)
F. General Electives (11 hours)
II. Art Courses ( 75 hours)
A. Core ( 36 hours)
B. Major ( 20 hours)
C. Art Electives and Related Courses (19 hours)

## Bachelor of Music Degree

128 hours required for graduation
Majors offered in this curriculum are: Applied Instruments, Voice, or Theory, and Composition. An applied minor is also required.
I. General Requirements
A. English Composition I and II
B. Oral Communication I or Ia
C. Physical Education (or marching band).

Two semesters
D. Physics for Musicians
E. General Education

General Psychology, 3 semester hours
Non-Music Courses, 8 semester hours
G. Modern Language, 8 to 20 semester hours.
II. Remaining hours in major, additional tool and related courses, and free electives. For major requirements, see catalog statement for Department of Music, page 133.

## Bachelor of Science <br> in Music Education Degree

The Bachelor of Science in Music Education is intended for those who plan to teach vocal or instrumental music on the elementary and secondary levels of the public schools. It also prepares one for graduate work in the field of Music Education.

## Requirements

I. General Education

1. English Composition I and II
2. Oral Communication I or Ia
3. Literature or Language - 6 hours
4. Social Science - 12 hours (including General Psychology)
5. Natural Science - 12 hours (including Physics for Musicians and at least one Biological Science)
6. Humanities electives as needed for degree and certification

## II. Professional Education

1. Educational Psychology I and II, 6 hours
2. Music Education Professional Semester (includes student teaching, and other required courses from the College of Education.)
III. Physical Education, 2 semesters (may be satisfied by Marching Band)
IV. Remaining hours in major, additional tool and related courses and electives: Music 201, 202, 304, 305, 503, 506, 507, 516, 517 (Theory of Music); Music 421, 422, 651, 652 (Music History and Literature) ; Music 233, 234 (Applied Music); Music 412 (Music Education). Vocal majors include Music 413 (Music Education); Instrumental majors include two of the following (depending on specific major), Music 530, 531, 532 (Applied Music) and Music 630 (Music Education). Vocal majors are required to have eight hours of Applied Keyboard as a minor. Instrumental majors complete four additional hours of Applied Music, of which two hours of Music 203 (Voice Class) is required, as well as a minimum of two hours from Music 206-209 (Piano Class). Both vocal and instrumental majors are required to pass Music 403 (Piano Proficiency) before admission to
student teaching. Participation in at least one major musical organization is required during each semester until graduation. A maximum of eight semester hours for this participation is allowed toward degree requirement.

Music 050 (recital attendance) is required each semester of the program.

## Bachelor of Science

## in Physical Education Degree

The theoretical and practical instruction given in this curriculum, with a major in physical education for men or physical education for women, prepares the student for teaching physical and health education and for coaching athletic games. By proper selection of electives, the student may qualify to teach one or more subjects outside the field of specialization.

## Requirements

I. General Education

1. English Composition I and II
2. Oral Communication I
3. Social Science -12 hours (including General Psychology)
4. Literature or language -6 hours
5. Natural Science - 4 courses
6. Electives
II. Professional Education
7. Educational Psychology I and II, six hours
8. Physical Education Professional Semester

Teaching Participation - 8 hours
Principles of Secondary Education - 3 hours

Educational Sociology - 3 hours
Methods of Teaching in Secondary Schools - 2 hours
III. Physical Education, two semesters
IV. Remaining hours in major, additional tool and related courses, and electives. In certain cases, some of the major requirements may be substituted for some of the General Education certification requirements:

For Women: Physical Education 158, 206, 290, 306, 320, 331, 351, 356, 366, 380, 461, 481, 486,506 , or $560,515,526,555,566,575,580$.

For Men: 206, 217, 218, 225, 230, 235, 241, $245,290,351,356,450,455,460,461,486,615$. Sports Option (six hours to be chosen from Physical Education 415, 420, 426, 430) ; and Physical Education Option (two hours to be chosen from Physical Education 111, 116, 481, and course not selected in Sports Option).

For Minor: A student should enroll in the following courses: Physical Education 206, 218, 230, 235, 356, 450, 455, 481, physical education elective, four hours, sports elective, four hours chosen from 415, 420, 426, 430.

For Minor in Health Education: Biology 121, 122, Foods \& Nutrition 132, Physical Education 356, 375, 461, 481, 486.

## General Curriculum

(Undeclared Major or Area Major)
A. Biological Science
B. Humanities
C. Physical Science
D. Social Science

Fulfill General Requirements for the A.B. or B.S. degree (p. 81) and one of the following four major requirements:
A. Biological Science: Public Health Bacteriology, General Botany, and General Zoology; or Principles of Biology and Organismic Biology, plus three additional courses from the fields of biology, microbiology, entomology or psychology, two of which must be above the introductory level. 30 hours.
B. Physical Science: Chemistry I and II, Physical Geology, Plane Trigonometry, and General Physics I and II; in addition, at least three courses taken from two or more of the following fields: chemistry, geology, mathematics, and physics. At least two of these courses must be above the introductory level. 34 hours.
C. Humanities: Appreciation of Architecture, Survey of Art History I or II, Shakespeare, and Appreciation of Music; in addition, at least six courses taken from two or more of the following fields: art, English, history, languages (above the required proficiency), music, philosophy, and speech. At least four of these courses must be above the introductory level. 30 hours.
D. Social Science: One course each in four of the six following areas: Anthropology, Economics, Geography, Sociology, History, and Political Science; in addition, at least six courses taken from two or more of the following fields: anthropology, economics, geography, political science, history, psychology, and sociology. At least four of these courses must be above the introductory level. 30 hours.

## Pre-Professional Programs

A. Pre-Veterinary Curriculum: Sixty-four semester hours are required for application to enter the College of Veterinary Medicine. Pre-Veterinary students will fulfill General Requirements for the B.S. degree including English Composition I and II, Oral Communication, six hours of social sciences, and six hours of humanities. For the natural science requirements the following courses should be used: College Algebra and Plane Trigonometry, Chemistry I and II, General Organic Chemistry and Laboratory, Chemical Analysis, General Physics I and II, General Zoology or Principles of Biology, Genetics of Heredity and Evolution. Animal science course requirements may be satisfied by completing Principles of Animal Science as well as Animal Science and Industry, Dairy Science, and Poultry Science laboratories. Upon satisfactory completion of these courses and those of the first two years in Veterinary Medicine, the student will be eligible for a Bachelor of Science degree through the College of Arts and Sciences. PreVeterinary requirements may also be completed in the College of Agriculture (See p. 34) .

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Fall Semester
    Chemical Analysis
    Heredity and Evolution
        or Genetics
    General Physics I
    Social Science elective or
        Principles of Animal Science
    Animal Husbandry
    Dairy or Poultry Science
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Spring Semester
General Physics II
Humanities electives
Dairy or Poultry Science
General Organic Chemistry

64 semester hours required for admission to College
of Veterinary Medicine.
B. Pre-Medicine Curriculum: Fulfill General Requirements for the A.B. (p. 81) or B.S. degree (p. 81) except the natural sciences. The following courses are to be used to satisfy the natural sciences and major requirements: College Algebra, Plane Trigonometry, General Physics I and II, Chemistry I and II, Chemical Analysis, Organic Chemistry I and II, Organic Chemistry Laboratory I and II, General Zoology or Principles of Biology, Heredity and Evolution, and Embryology. For additional information consult an adviser in the Office of the Dean of Arts and Sciences.
C. Pre-Dentistry Curriculum: Students who wish to enter a dental school at the end of the junior year or after graduation should fulfill General Requirements for the A. B. degree (p. 81) or the B.S. degree (p. 81) except the natural sciences. The following courses are to be used to satisfy the natural sciences and major requirements: Chemistry I and II, Chemistry II laboratory, General Organic Chemistry and laboratory, College Algebra, Plane Trigonometry, General Physics I and II, General Botany and General Zoology or Principles of Biology and Organismic Biology, Microbiology, Genetics or Heredity and Evolution, Human Physiology. (One year's work ( 30 hours) will be granted toward the degree for completion of the first year at dental school for students who enter dental school at the end of their junior year).
D. Pre-Law Curriculum: Students may major within one department or major within the General Curriculum. They may graduate with a B.S. or A.B. degree. Students should consult with the pre-law adviser.

[^11]E. Medical Technology Curriculum: In addition to the general requirements of the College of Arts and Sciences, the following courses must be taken: College Algebra (3 hrs.), Trigonometry ( 3 hrs. ), Chemistry I (5 hrs.), Chemistry II Lecture ( 3 hrs .), General Organic Chemistry ( 5 hrs ), General Biochemistry ( 5 hrs ), Chemical Analysis (4 hrs.), Descriptive Physics (4 hrs.), Principles of Biology ( 5 hrs .), or General Zoology (4 hrs.), Microbiology (4 hrs.), Human Physiology ( 4 hrs .), Genetics ( 3 hrs .), Bacteriology of Human Diseases ( 5 hrs .), Immunology ( 5 hrs .), Human Parasitology (4 hrs.), and Introduction to Medical Technology ( 1 hr .). Thirty hours of credit is granted for fulfilling an approved Medical Technology internship. Upon completion, this program provides both a bachelor's degree and eligibility for professional certification.
F. Physical Therapy Curriculum: In addition to the general requirements of the College of Arts and Sciences, students should take the following: Chemistry I (5 hrs.), Chemistry II Lecture (3 hrs.), Descriptive Physics ( 4 hrs .), General Zoology (4 hrs.), Human Physiology ( 4 hrs .), Human Anatomy ( 5 hrs. ), Public Health Bacteriology (3 hrs.), Introduction to Physical Therapy ( 1 hr .), General Psychology (3 hrs.) ; plus two of the following four courses: Abnormal Psychology (3 hrs.), Psychology of Childhood and Adolescence ( 3 hrs .), Social Psychology (3 hrs.), and Psychology of Exceptional Children ( 3 hrs .). This curriculum includes an off-campus period of instruction at an approved medical institution for which the student earns 30 hours of credit toward the bachelor's degree and which qualifies the student for professional certification.
G. Pre-Pharmacy Curriculum: Students wishing to enter a school of pharmacy at the end of the sophomore year should partially fulfill the General Requirements for the B.S. degree ( p .81 ), making certain to include English Composition I and II, Chemistry I and II, Chemical Analysis, Algebra, Trigonometry, Oral Communication I, General Physics I and II, Economics and three courses from the Division of Biology.
H. Pre-Secondary Education: Students preparing to teach in the junior and senior high schools are usually enrolled in a PreSecondary Education Curriculum in the

College of Arts and Sciences for the freshman and sophomore years. Students fulfill requirements for the B. S. Degree in the College of Education (p. 183). Prior to acceptance in the College of Education, students are advised by College of Education advisers in the Dean's Office of the College of Arts and Sciences and by advisers in their major fields. When students are accepted into the College of Education they are reassigned to advisers in the College of Education and retain their advisers in the majors who assist in the selection of courses in their majors and teaching fields.

Students should make application to the Teacher Education Program during the sophomore year. Fifty-three semester hours are required for application to enter the College of Education and admission to the Teacher Education Program. (p. 180).
I. Pre-Elementary Education: Students desiring to teach in elementary schools are enrolled in the College of Arts and Sciences for the freshman and sophomore years in the Pre-Elementary Education Curriculum. PreElementary Education students fulfill requirements for the B. S. in Elementary Education Degree in the College of Education (p. 182). Prior to acceptance into the College of Education, Pre-Elementary Education students are advised by the College of Education advisers in the Dean's Office of the College of Arts and Sciences. When students are accepted into the College of Education they are reassigned to advisers in the College of Education.

Students should make application to the Teacher Education Program during the sophomore year. Fifty-three semester hours are required for application to enter the College of Education and admission to the Teacher Education Program (p. 180).
J. Pre-Nursing Programs: For students who wish to enter the three-year diploma program in an accredited nursing school, 30 hours of course work are usually required. These normally include one course in English or Speech, General Psychology, one course in Child Psychology or Personality Development, Introduction to Sociology, General Chemistry, General Zoology or Principles of Biology, Anatomy and-or Physiology, Public Health Bacteriology and Basic Nutrition.

For students who wish to enter baccalaureate degree programs in nursing
education, two years of course work as prescribed by the university granting the degree are required. The pre-nursing adviser will assist students in selecting appropriate courses.
K. Pre-Social Work Curriculum. Students interested in preparing for the field of Social Work may enroll for the Pre-Social Work option in the Department of Sociology. The requirements are similar to those for a major in sociology with a selection of courses recommended for pre-professional training in Social Work.

## Interdisciplinary Programs

## SOUTH ASIA LANGUAGE

AND AREA STUDIES
The South Asia Center is an interdisciplinary language and area center focusing the course offerings of several departments on this important world area with whose development Kansas State University programs have been concerned for more than a decade. It receives support through the NDEA program of the Department of Health, Education and Welfare of the Federal Government. South Asia, as a linguistic and cultural area, includes Afghanistan, Pakistan, India, Nepal, Ceylon, Bhutan, Sikkim and the Maldive Republic. Of their principal languages, the Center currently offers three years of Urdu and one year of Hindi at the intermediate level, and one year of Tamil. While the Center does not offer a major, it affords the undergraduate an opportunity to give his major study an international emphasis through concentration on South Asia. The Center's "core offering," "Introduction to the Civilizations of South Asia," may be offered for credit in the Departments of Anthropology, Art, Economics, History, Geography, Political Science and Sociology.

Undergraduates majoring in these departments, with a South Asia concentration, are eligible for any of various group study tours in South Asia as, for example, those conducted by the Great Lakes College Association, Carleton College, etc. Graduate students whose thesis subject is in the area of South Asian studies may elect to apply for any of several federal and private grants enabling research and study in South

Asia. Several of the offerings in the South Asia Language and Area Curriculum are available to graduate students.

As part of its support to the Center's program, the federal government may, as appropriations permit, grant fellowships to graduate students to pursue the study of a South Asian language.

The South Asia Center presents an annual series of colloquia at which faculty members and scholars of Kansas State University and from other campuses present current papers on aspects of South Asia studies. See p. 160 for course list of South Asia Center.

## LINGUISTICS

Graduate study leading to the degree of Master of Arts with concentration in linguistics is offered in the Departments of English, Modern Languages, and Speech. Candidates identify themselves with one or another of the participating departments, but follow individually designed programs of studies with concentration in the area of linguistics, and write the thesis or report on a linguistics topic. Linguistics courses are cross-listed and thus can be designated as for major or minor credit in any of the participating departments, and are available as elective and supporting courses to students from other disciplines. The degree bears the title '"Master of Arts in (name of department) Linguistics."

Major emphasis in the program is on general linguistics, but selective arrangement of the program or studies enables the individual student to obtain equally appropriate training in the teaching of English to speakers of other languages (TESOL), teaching of standard English as a second dialect (SESD), teaching of foreign languages, and teaching of English to native speakers.

Entrance requirements for graduate study in linguistics include the bachelor's degree in English, Modern Languages, or Speech, or equivalent, with course work equivalent to Elements of Phonetics, Language and Communication, 12 semester hours beyond the introductory level in a foreign language (in the case of the foreign student this can be English), and proficiency in the use of spoken and written English. In the case of provisional admission, deficiencies are to be made up
during the first possible semesters in residence.

A listing of available courses in linguistics, as well as further information about the program, can be obtainzd from the participating departments. Minor course work may be conducted in any cognate discipline with the approval of the student's advisory committee.

## Aerospace Studies

CHARLES C. ANDERSON, JR., Head of Department
Professor Anderson; Associate Professors Given, Dillman, McDevitt, and Willming; Assistant Professors Boursaw and Justice; Instructors Holeman, Meares, Tubbs, Wall, Lee, and Harris.

The Air Force Reserve Officers Training Corps (AFROTC) provides the best means for undergraduate and graduate students to become officers in the United States Air Force. Upon completion of their university program they are commissioned second lieutenants, and will either:

1. Enter into Air Force-sponsored graduate study at full pay while serving as Air Force officers, or
2. Be deferred for graduate study, to enter active service after completion for a specified period, or
3. Enter directly upon normal active service for a specified period, taking flying training or performing managerial, research or development tasks.

Any male student, graduate or undergraduate, who is a U.S. citizen may become a cadet. The duration of the program varies between two and four years, depending upon an applicant's previous experience and the availability of different options.

A student electing the four-year program normally will start the General Military Course (GMC) during his freshman or sophomore year. This program consists of one credit hour each semester, will count toward all bachelor's degrees given at KSU, and in no way obligates the student to a military commitment. Students in the GMC are issued uniforms and all texts and other equipment needed for their AFROTC courses. Cadets accepted for the Professional Officers Course (POC), or advanced phase, become members of the Air Force Reserve and are not subject to be drafted through the selective service system.

The Professional Officers Course (POC) consists of four courses of three credit hours each, over a period of four semesters. All cadets in the POC receive $\$ 50$ a month and all necessary AFROTC texts and equipment. Outstanding cadets including freshmen and sophomores may apply for an Air Force ROTC college scholarship and if selected will have their tuition, fees, and book allowance for all courses taken at Kansas State University paid for by the USAF, and will receive the $\$ 50$ monthly.

High school students considering application for the four-year Air Force College Scholarship Program must be highly motivated toward becoming Air Force flying officers. To qualify a student should be an above-average scholar, physically capable, possess leadership potential, and make application in October of his senior year. Financial benefits are the same as mentioned in the preceding paragraph.

POC cadets practice their leadership and management skills in a Cadet Wing. All POC cadets who are in a four-year program attend four weeks of Field Training, which is given in the summer at an Air Force base, usually between the second and third semesters of POC. During training they are paid approximately $\$ 180$, and receive travel pay to and from their training base.

The two-year program consists of the POC phase only and may be taken during a student's final four semesters, undergraduate or graduate, at the university. Prerequisites for selection include Air Force aptitude testing, Air Force physical, and completion of six weeks summer Field Training. Applicants must contact the Department of Aerospace Studies during the spring semester prior to fall semester entry.

For those cadets who plan to become Air Force pilots, AFROTC offers the Flight Instruction Program (FIP). This is taken within 12 months of graduation, is free, and may lead to a private pilot's license. A onesemester one credit hour course provides ground instruction in flight theory and practice needed by student pilots. Cadets who have a private pilot's license are not eligible to receive free flight instruction.

## General Military Courses

## UNDERGRADUATE CREDIT

205 113. Aerospace Studies 1A. (1) I. A study of the doctrine, mission, and organization of the United States Air Force; U.S. strategic offensive and defensive forces: their mission, function and employment of nuclear weapons; civil defense. One hour of class plus one hour of leadership training a week.
205 114. Aerospace Studies IB. (1) II. Aerospace defense; missile defense; U.S. general purpose and aerospace support forces; the mission, resources, and operation of tactical air forces, with special attention to limited war; review of Army, Navy, and Marine general purpose forces. One hour of class plus one hour of leadership training a week.
205 200. Aerospace Studies 2A. (1) I. Defense policies; theories of general war; nature and context of limited war; policies and strategies of the Soviet Union and China; and the role of alliances in U.S. defense policies. One hour of class plus one hour of leadership training a week.
205 201. Aerospace Studies 2B. (1) II. Defense organization and decision-making; organization and function of the Department of Defense; role of the military in the United States' national policies; the elements and process of defense decision-making. One hour of class plus one hour of leadership training a week.

## Professional Officers Courses

## UNDERGRADUATE CREDIT

205 300. Aerospace Studies 3A. (3) I. Astronautics and space operations, and the future development of aerospace power. Includes the U.S. space programs, vehicles, systems, and problems in space exploration. Three hours of class plus one hour of leadership training a week.
205 301. Aerospace Studies 3B. (3) II. Development of airpower, aerospace power today which includes USAF concepts, doctrine, and employment. Three hours of class plus one hour of leadership training a week.
205 380. Weather and Navigation. (1) I. Introduction to weather and navigation. Equivalent to that required for a private pilot's license. Required of AFROTC cadets enrolled in the Flight Instruction Program.
205 381. Briefing for Air Force Commissioned Service. (1) I, II. Ordinarily taken by POC cadets during their last semester of officer training. Provides specific understanding of processes and procedures incident to entering active duty as an of ficer in the USAF.
205 390. The Professional Officer 4A. (3) I. A study of USAF professionalism, leadership, and management. Includes the meaning of professionalism, professional responsibilities, the military justice system, leadership theory, functions and practices, management principles and functions, problem solving, and management tools, practices, and controls. Three hours of class plus one hour of leadership training a week.
205 391. The Professional Officer 4B. (3) II. Continuation of AS 390 . Three hours of class plus one hour of leadership training a week.
205 399. Problem in Aerospace Studies. (3) Credit arranged. I, II. Work offered in any of the AFROTC
general or professional courses for students out of phase for graduation; material covered in a basic or advanced course. Pr.: Consent of Department Head.

## Art

DAN HOWARD,* Head of Department
Professors Garzio,* Howard and Larmer;* Associate Professors Deibler,* Tomasch,* and Vogt;* Assistant Professors Craigie,* O'Shea, and Rex Replogle;* Instructors J. Abraham, Clore, Nushawg, Ogg, Renata Replogle, Swiler and Winegardner; Emeritus: Professor Barfoot; Associate Professors Harris and Hill; Assistant Professor Geiger.

## UNDERGRADUATE STUDY

## Bachelor of Art

The B. A. degree in art consists of three parts: (1) the general education as outlined under the humanities curriculum, (2) a core of beginning art courses to provide prerequisites and a broad range of art experience for the art major, and (3) 16 hours concentration of related subjects which should provide a minimal basis for establishing professional competence. Some of the concentration possibilities will be predominantly in one of the following mediums: painting, printmaking, ceramics, sculpture, art history, art education, interior design, and various forms of commercial art study. Bachelor of Art Degree requires a minimum of 45 semester hours in art.

## Bachelor of Fine Arts

The Bachelor of Fine Arts Degree is the more professionally oriented undergraduate degree in art. It is designed primarily for those planning to become professional artists or artist-teachers. Greater emphasis is placed on actual practice in the creative art disciplines. The degree is considered the appropriate preparation for the Master of Fine Arts degree which is recognized as the terminal degree in studio arts. The B.F.A. in Art is a four-year 120 -hour program with majors possible in Painting, Sculpture, Ceramics, and Printmaking. The degree requirements are as follows:
I. General Education (45 hours)
(1) Communications, English Composition, 2 courses; and Oral Composition I, 1 course.
(2) Social Science ( 6 hours)
(3) Humanities ( 9 hours)
(4) Philosophy, Aesthetics, or Mathematics (3 hours)
(5) Natural Sciences (8 hours)
(6) General Electives (11 hours)

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II. Art Courses (75 hours)
    (1) Core (36 hours)
    (2) Major (20 hours)
    (3) Art Electives and Related Courses (19
        hours)
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## Art Education

Students may satisfy requirements to teach art in public schools by either of two programs: (1) B.A. and teacher certification or (2) B.S. in Education with art concentration. Under the first option students qualify for teacher certification by completion of specified courses in the College of Education. The department offers courses at introductory level, which may be taken by any student. Courses suggested to meet humanities requirements include Art History, basic courses in Drawing and Design. Art students may enroll in Introduction to the Civilizations of South Asia, as a humanities requirement credit.

Studios, laboratories, equipment for creative work are provided and adequate to the needs of the art areas. Student work may be retained at the discretion of the faculty for an indefinite period of time for instructional and exhibition purposes.

## GRADUATE STUDY

Work leading to the Master of Arts is offered in the Department of Art in the fields of Drawing, Painting, Sculpture, Ceramics, Crafts, and Prints.

Candidates for graduate work should have completed an undergraduate curriculum with a broad background in art. Students lacking preparation in certain areas, may be asked to do additional work. Other requirements for the degree Master of Arts include a minimum of 30 semester hours, approximately twothirds of which will be in the major field. The candidate will be encouraged to minor in the study of art history.

The candidate will take an oral examination based in part on the academic thesis, or studio report submitted. The studio project for the thesis or report will consist of a significant creative effort in the candidate's chosen major medium, and must be publicly exhibited.

## Courses in Art

## UNDERGRADUATE CREDIT

209 095. Art Assembly. (0) I, II. Required for all art education majors each semester. By appt. not to exceed one meeting per month.
209 096. Art Education Seminar. (0) I, II. Required each semester for all students majoring in art who plan to participate in the teaching block, an introduction to the attitudes of professional growth in art that will create a relationship between their fine arts training and their teaching experience.
209 100. Design I. (2) I, II, S. Introduction to and laboratory practice in the principles and elements of design. Six hours lab.
209 170. Art for Elementary Schools. (3) I, II, S. Art methods, materials, and philosophy of children's art at different grade levels.
209 190. Drawing I. (2) I, II, S. Fundamentals of drawing as applied to the realistic and expressive representation of objects through the use of a variety of media and approaches. Six hours lab.
209 195. Survey of Art History I. (3) Historical development of art from Pre-History through the Middle Ages.
209 196. Survey of Art History II. (3) Historical development of art from the Renaissance through the nineteenth century.
209 200. Design II. (2) I, II, S. Further work in the principles and elements of design, with emphasis on color, texture, and pictorial composition. Six hours lab. Pr.: Art 100, 190.
209 205. Commercial Art Techniques. (2) I, II, S. Drawing techniques and tools used in various mediums related to commercial art. Six hours lab. Pr.: Art 100, 190.

209 210. Drawing II. (2) I, II, S. Cont. of Drawing I, with strong emphasis on creative expression. Six hours lab. Pr.: Art 100, 190.
209 222. Water Color I. (2) I, II, S. Painting in water color and other water-soluble media; includes both studio and outdoor painting and sketching. Six hours lab. Pr.: Art 100, 190.
209 224. Figure Drawing I. (2) I, II, S. Sustained drawings of the human figure using a variety of media; introduction to human anatomy used by artists. Six hours lab. Pr.: Art 210.
209 230. Sculpture I. (2) I, II, S. An introduction to the problem of sculptural form; fundamental techniques and theory in modeling, casting, assemblage, carving and construction in contemporary and traditional mediums of clay, plaster, metal, wood, stone, plastic. Six hours lab. Pr.: Art 100, 190.
209 235. Printmaking I. (2) I, II, S. Introduction to the intaglio, relief, lithographic and serigraphic printmaking techniques and tools; includes exploratory experience in each medium. Six hours lab. Pr.: Art 100, 190.
209 246. Oil Painting I. (2) I, II, S. Introduction to painting with oil and plastic mediums; stretching and grounding canvas. Problems include both studio and outdoor experiences. Six hours lab. Pr.: Art 200, 210.
209 260. Design in the Crafts. (2) I, II, S. Crafts work in various media, with emphasis on contemporary design.

Six hours lab. May be taken for credit two semesters. Pr: Art 100 .
209265 . Ceramics 1. (2) I, II, S. Introduction to basic hand building techniques and wheel throwing; decoration of ceramic forms using slips, stains, glazes, etc. Student participation in Raku firing procedures: stacking and firing of electrie kilns. Six hours lab. Pr.: Art 100 or consent of instructor.
209 270. Metalerafts and Jewelry. (2) I, II, S. Design and execution of contemporary jewelry in precious metars, including setting of semi-precious and precious stones. Six hours lab. May be taken for credit three semesters. Pr.: Art 100.
209 290. I.ettering. (2) I, II. Study of traditional lettering forms, inchuding Roman, Gothic. Text, Script, and some contemporary adaptations of these. Pr.: Art 100. 190).

209399 . Llomors Seminar in Art. (1) I. Selected topics in art. May be taken for credit more than once. Pr.: For students in the Honors Program only:

UNDER(GRADUATE AND (iRADUATE CREDIT IN NuNOR FIELI)
209 400. Llistory of Sonth Asian Art. (3) I. II. History of Indian art (including Islamic art) from the twelfth to the nineteenth eentury A. D. and history of art of Ceylon. Nepal and Indo-China.
209 406. Problems in Art 1. (1-3) I. II. S. Work offered in drawing, painting. sculpture, printmaking, ceramics. cratts. and commercial art. Pr.: Full sequence of courses related to subject.
209 415. Art for Exceptional Children. (3) I. II. A study of the knowledge and methods of utilizing art concepts and art activities by the elementary teacher to develop and enhance the learning experiences of exceptional children, inchuding the disadrantaged, physically handicapped, mentally retarded and emotionally disturbed. Six hours lab. Pr.: Elementary Education or Art Major and Psychology 110. Same as Educ. 315.
209 420. Ilistory of lndian Art. (3) I. II. History of Indian art from C. 300 B . C. to the twelfth century B. $C$.
209 425. Pictorial Presentation. (1) II. An investigation of suitable materials and methods of matting, glazing. and framing of specific works of art. Matting to include selection of materials, color. texture. proportion, and methods of construction. Framing to include the selection of appropriate moulding styles. color, and finishes. wiring, lighting and installation problens. Three hours lab. Pr.: Art or Art Education Major. Junior standing or equivalent.
209 440. Figure Painting. (2) I. II. Painting from the human figure with oil and plastic media. Six hours lab. Pr.: Art 246.
209 492. Italian Renaissance Art History. (3) I, II. Italian art of the 15 th and 16 th centuries. with a brief discussion of the 14th century origins of Renaissance art. Pr.: Art 195. 196.
209 493. Nineteenth Century Art History. (3) I, II. Painting. sculpture. and architecture of the late 18th and 19th centuries. with emphasis on the art of France. Pr.: Art 196.
209 495. Northern Renaissance Art History. (3) I, II. A study of the art of Northern Europe in the 14th, 15 th and 16th centuries. including the International Style. and
painting of Flanders, Germany, and France. Pr.: Art 195, 196.

209 496. Twentieth Century Art History. (3) Origins and development of twentieth century art. Pr.: Art 195, 196.

## UNDERGRADUATE AND GRADUATE CREDIT

209 600. Design III. (2) I, II. Work in three dimensions in sheet netal, plaster, plastics, paper, wire, etc., using the principles and elements of design. Pr.: Art 200 or consent of instructor.
209 605. Commercial Illustration. (3) I, II, S. Problems in layout and finished illustration for newspapers, magazines and general advertising. Recommended for journalism majors. Nine hours lab. May be taken for four semesters. Pr.: Art 205, 290, or consent of instructor.
209 610. Figure Drawing II. (2) I, II, S. Cont. of Figure Drawing $I$, with emphasis on individual expression. Six hours lab. May be taken for four semester hours. Pr.: Art 224.

209 622. Water Color II. (2) I, II, S. Cont. of Water Color I. Emphasis on individual expression within limitations of medium. Six hours lab. May be taken for two semesters. Pr.: Art 222.
209 630. Sculpture II. (3) I, II, S. Cont. of Sculpture I. Introduction to metallic casting (bronze, iron, aluminum) and welding (gas and electric). Nine hours lab. May not be taken for more than six semesters. Pr.: Art 224, 230.
209 635. Printmaking II. (3) I, II, S. Advanced work in blockprints, serigraphy, or lithography. Nine hours lab. May be taken for four semesters. Pr.: Art 235.
209 636. Etching and Drypoint. (3) I, II. Individual expression in intaglio techniques or printmaking; includes etching, engraving, aquatint, and drypoint. Nine hours lab. May be taken for four semesters. Pr.: Art 235.
209 646. Painting II. (3) I. II. S. Continuation of Painting I. Emphasis on development of personal attitudes in formal structural relationships of line, color, and shape. Nine hours lab. Pr.: Art 246.
209 647. Painting III. (3-5) I, II, S. Continuation of Painting II. Emphasis on individual directions in painting to attain further professionalism. Primarily for undergraduate painting majors. May be taken for four semesters. Pr.: Art 646 and consent of instructor.
209 665. Ceramics II (3) I, II. Advanced work on potter's wheel combined with hand built forms, introduced to study of clay bodies with glaze chemistry and calculations: consideration of kiln designs, firing techniques and procedures using different types of kilns. Nine hours lab. May be taken for a total of twelve hours credit. Pr.: Art 265 or consent of instructor.
209 666. Ceramics III. (2) I, II. Individual exploration of ceramic design and glaze technology; kiln design and construction. Six hours lab. May be taken for three semesters. Pr.: Art 665.
209 667. Ceramics IV. (2) I, II, S. History and development of ceramics; study of the development of pottery and other aspects of ceramics from earliest known records to present day. Use of slides and other sisual materials. Pr.: Art 265.
209 6s0. Drawing III. (2) I, II. Cont. of Drawing II, emphasizing exploration in mixed media. Six hours lab. May be taken for two semesters. Pr.: Art 210.

209 780. Problems in Design. Credit arranged. I, II, S. Advanced work in design-related subjects. Pr.: Full sequence of courses related to problem subject matter. 209: 787. Techniques in Teaching 1 rt. Credit arranged. II, S. Lectures and class discussion of methods, consideration of suitable laboratory equipment, use of illustrative material, and preparation of courses of study. Pr.: Art 200, consent of instructor; 12 eredit hours in Art.
209790. Greek Art History. (3) I, II, S. Study of the art of classical Greece, from its Aegean origins through the IIellenistic period. Pr.: Art 195, 196.
209.799. Problems in ArtHistory. Credit arranged. I, II, S. Independent exploration in selected problems in art history. Pr.: Twelve hours art history.

## GRADUATE CREDIT

209 830. Sculpture III. Credit arranged. I, II, S. Advanced creative work involving appropriate sculptural media and related techniques. Emphasis placed on content of work. Pr.: Consent of instructor.
2098 845. Painting IV. Credit arranged. I, II, S. Advanced study with emphasis on original investigation leading to professional competence in painting. Pr.: Consent of instructor.
209 865. Ceramies V. (3) I, II. Further study of glaze materials and glaze formulations; resolutions of form and decoration problems established by the instruetor and student. One hour lecture and six hours lab. May be taken for a total of twelve hours credit. Pr. : Art 666 .
209 885. Problems in Art II. (1-3) I, II, S. Advanced work offered in drawing, printmaking, painting, sculpture, ceramics, and commercial art.
209 980. Rescarch in Art. Credit arranged. I, II, S. Research which may form the basis for the master's thesis or report. Pr.: Graduate standing.

## Athletics

MR. ERNIE BARRE'TT, Head of Department
Athletic Director Barrett; Assistant Professors Dodds, Knorr and Nelson; Instructors Brasher, Morgan and Wardell; Coaches Gibson and Hartman; Assistant Coaches Branch, Elliott, Floyd, Frazier, Garrett, Jackson, MeDowell, Montgomery, Powell, Robertson, and Weigel; Administrative Assistants Tidd, Head, and Wall.

Kansas State University is a member of the Big Eight Conference. The other members are the University of Colorado, Iowa State University, the University of Kansas, the University of Missouri, the University of Nebraska, the University of Oklahoma, and Oklahoma State University.

Kansas State University, as a member of the conference, participates with member schools in football, basketball, baseball, track (indoor and outdoor), tennis, golf, gymnastics, wrestling, and cross country. In-
tercollegiate competition is open to all men students and is coached by a staff who are specialists in their respective sports.

## Division of Biology

I. IU. IRO'III. Hirector
'T. M. IB^IRKIJ:Y, Associate foirector
J. S. WIEIS, Assistent Director

Professors Ameel, Bode, Consigli, Fisenstark," Fina, (Xier, Hansen, Harris, F'ady, "Pittenger, Robel," IRoth," Piemeier, and Wimmer;" Associate Professors Anderson," Barkley," Buck," (ioss, Hulbert, Kramer," Marzolf," Smith," Wilson," and Virnmerman;" Assistant I'rofessors Center, (i. Conredd, Doezema, "Ferguson," Iretwell, landolo," Kláasen, lockhart,* Marchin," Itodkey," Urban," Weis," and Williams; Instructors A. Conrad, Ditvis, Froiland, Hook, Hopkins, Spiker, Tatschl; Emeritus: Professors F"razier, " Fiancy, " Goodrich," Guhl; " Associate Professors McCracken," Neweomb."

The Division of Biology was formed in 1967 by an amalgamation of the former departments of Bacteriology, Botany, and Zoology in order to strengthen the cooperation between biologists and to reflect the modern trends of biology. The internal organization of the Division consists of four sections: (a) Molecular Biology and Genetics, (b) Microbiology, (c) Physiology and Organismic Biology, and (d) Environmental Biology. Biologists are thus grouped according to their approaches and methodologies regardless of whether their subject organisms are animals, plants, or microbes.

In 1969 the Division received a grant for $\$ 800,000$ from the National Science Foundation for the expansion of the academic program. In 1970 a new building was completed and occupied by the Division of Biology.

## UNDERGRADUATE STUDY

The course offerings and curriculum have been extensively revised since the Division was created. Undergraduate majors are offered in Biology, Microbiology, and Fisheries and Wildlife Biology, plus two professional and pre-professional areas. The course offerings and degree requirements allow considerable latitude in choosing areas of emphasis and electives. Each student majoring in the areas of the Division of Biology is assigned an adviser to assist him in planning his academic program. Undergraduate advisement and curriculum planning is ultimately the responsibility of the
assistant director of the division, and enquiries regarding undergraduate programs may be directed to him.

Biology Degree. This program replaces the former degrees in botany and zoology. In consultation with his adviser, the student may arrange his program to receive either a B.A. or B.S. degree, the essential distinction being that the B.A. degree requires course work in a foreign language while the B.S. degree does not.

In addition to the general requirements of the College of Arts and Sciences, these courses are required for a bachelors degree in biology: Principles of Biology (5 hrs.), Organismic Biology (3 hrs.), Environmental Biology ( 4 hrs.), Microbiology (4 hrs.), Cell Biology ( 4 hrs .), Developmental Biology (4 hrs.), Molecular Genetics (3 hrs.), and Evolution ( 3 hrs .). The following courses given by other departments also are required: College Algebra ( 3 hrs .), Trigonometry ( 3 hrs .), General Physics I \& II ( 8 hrs .) or Engineering Physics I \& II (10 hrs.), Chemistry I \& II ( 10 hrs .), and Organic Chemistry ( 5 hrs .).

Students contemplating graduate school are urged to take course work in Calculus, Statistics, Biochemistry, and a modern foreign language.

Microbiology Degree: This program was formerly called Bacteriology and the degree requirements have been altered to correspond with the changes in course offerings. The actual degree may be either a B.A. or a B.S., depending upon which electives are chosen by the student and his adviser. The major in microbiology consists of the general requirements of the College of Arts and Sciences, plus the following courses in the Division of Biology: Principles of Biology ( 5 hrs.), Organismic Biology (3 hrs.), Microbiology ( 4 hrs .), Molecular Genetics (3 hrs. ), plus 20 hours of microbiology courses to be chosen in consultation with the student's adviser. The following courses given by other departments are also required: College Algebra ( 3 hrs .), Trigonometry ( 3 hrs .), Chemistry I ( 5 hrs .), Chemistry II Lecture (3 hrs.), Chemical Analysis (4 hrs.), General Organic Chemistry (5 hrs.), General Biochemistry ( 5 hrs .), and General Physics I \& II (8 hrs.). Students contemplating graduate school should also consider taking
additional course work in mathematics and a modern foreign language.

Fisheries and Wildlife Biology Degree. This curriculum replaces the former Wildlife Conservation program, and it includes the following three options: Fisheries Biology, Wildlife Biology, and Conservation. Students in each of the three options must fulfill the general requirements of the College of Arts and Sciences, plus the following courses: College Algebra ( 3 hrs .), Elements of Statistics ( 3 hrs .), Chemistry I \& II ( 10 hrs .) and General Organic Chemistry (5) hrs.) or General Chemistry ( 5 hrs .), Elementary Organic Chemistry ( 5 hrs .) and Elementary Biochemistry ( 5 hrs .) for a total of 15 hrs . of Chemistry, Physical Geology ( 4 hrs .) and General Entomology ( 4 hrs .). These courses from the Division of Biology are also required of students in each option: Principles of Biology ( 5 hrs.), Organismic Biology (3 hrs.), Environmental Biology ( 4 hrs .) and Wildlife Conservation ( 4 hrs .).

Major requirements for the Fisheries Biology option include: Biometrics ( 3 hrs .), Physics I \& II ( 8 hrs .), Lower Plants ( 3 hrs .), Lower Vertebrates ( 4 hrs. ), Fisheries Management ( 4 hrs .), Limnology (3 hrs.), Zoophysiology (4 hrs.), Molecular Genetics (3 hrs.), plus two of the following four courses: Cell Biology ( 4 hrs.), Developmental Biology ( 4 hrs .), Microbiology ( 4 hrs ) and Evolution (3 hrs.).

Major requirements for the Wildlife Biology option include: Biometrics (3 hrs.), Physics I \& II (8 hrs.), Higher Plants (4 hrs.), Higher Vertebrates ( 4 hrs. ), Wildlife Management Techniques (3 hrs.), Zoophysiology (4 hrs.), Molecular Genetics (3 hrs.), plus two of the following four courses: Cell Biology ( 4 hrs.), Developmental Biology ( 4 hrs .), Microbiology ( 4 hrs .) and Evolution ( 3 hrs .).

Major requirements for the Fisheries and Wildlife Conservation option include: Descriptive Physics ( 4 hrs .), Land and Resource Conservation (3 hrs.), Zoophysiology ( 4 hrs .), plus two of the following five courses: Cell Biology ( 4 hrs.), Developmental Biology ( 4 hrs.), Microbiology ( 4 hrs .), Molecular Genetics (3 hrs.), and Evolution ( 3 hrs .). Nine to twelve additional elective hours in biology also are required.

## GRADUATE STUDY

The Division offers both the M. S. and Ph.D. in numerous areas of biology. Degrees are specifically offered in Biology and Microbiology, and through interdepartmental programs in Animal Breeding, Biochemistry, Genetics, Parasitology, and Physiology. Graduate programs in the Division generally relate to one of the four sections-Molecular Biology and Genetics, Microbiology, Physiology and Organismic Biology, and Environmental Biology. Graduate studies also are offered in the following areas: animal behavior, bacteriology, biophysics, cell biology, developmental biology, ecology, embryology, endocrinology, limnology, mycology, ornithology, parasitology, physiology, plant anatomy, plant taxonomy, virology, and wildlife biology. It should be noted that a graduate student's training is determined by the student in consultation with his major professor and advisory committee, thereby allowing great flexibility in designing a graduate program to fit the student's interests and needs.

For further information contact the Chairman of the Graduate Selection Committee, Division of Biology.

## Courses in the Division of Biology

UNDERGRADUATE CREDIT
215 198. Principles of Biology. (4) I, II, S. An introductory course concerned with the behavior of molecules, cells, organisms and populations in an ecosystem-bound and evolving world. Audiotutorial format, equivalent to two hours of lec., one hour of rec., and three hours of laboratory per week.
215 200. Public Health Bacteriology. (3) I, II, S. Application of bacteriology to the control of disease in the community, with emphasis on the means of spread of diseases, the impact of disease outbreaks on the functioning of the communal organization, man's fight to reduce disease in his population, and evaluation of known methods of control of disease. Directed toward nonbiology majors. Three hours lec. per week.
215 201. Organismic Biology. (4) I. The animal phyla and plant divisions, illustrating their taxonomy and functional adaptations that affect their survival. Two hours lec. and two three hour labs per week. Pr.: Bio. 198 or equiv.
215 202. Practicum in Nursing. (2). Interim semester only. Designed for students considering professional nursing as a career. Introduction to development of nursing care skills. Lecture, laboratory and clinical experience.
215 205. General Zoology. (4) I, II. Two hours rec. and six hours lab. per week.
215 210. General Botany. (4) I, II. Two hours rec. and six hours lab. per week.

215 215. Human Anatomy. (5) I. General anatomy studies by means of dissectible models, skeletons, and charts. Three hours rec. and six hours lab. per week. Pr.: Bio. 198 or 205.
215 222. Field Ornithology. (1) II. odd years. Identification of bird species in the field and the illustration of attributes of avian behavior and ecology. One 3-hr. lab per week. Pr.: Sophomore standing.
215 230. Introduction to Physical Therapy. (1) II. Designed for Physical Therapy students. An introduction to terminology and techniques used in the profession. Pr.: sophomore standing in the Physical Therapy curriculum.
215 235. Introduction to Medical Technology. (1) II. Designed for Medical Technology students. An introduction to the terminology and procedures used in the profession. Pr.: sophomore standing in Medical Technology curriculum.
215 240. Human Anatomy and Physiology. (5) S. For students in Home Economics and Nursing. Three hours rec. and six hours lab. per week. Pr. : Bio. 198 or 205.
215 303. Ecosystems and Man. (2) II. Designed for nonbiologists. Principles of ecology and their application to such problems as pollution, human population growth, and land use planning, and to show the interdependence of all fields of human endeavor in affecting environment. Two hours lecture and one hour discussion per week. Pr.: Sophomore standing.
215 325. Integrated-Independent Studies in Biology. (16). Offered on demand. A course designed for utilization by single students or groups of students under the guidance of a faculty member that could allow for innovative approaches to biological investigation.
215 398. Junior Honors Colloquium in Biology. Credit arranged. I, II. Open only to juniors in the Arts and Sciences Honors Program.
215 399. Honors Seminar in Biology. (1-3) I, II. Selected topics. Open to non-majors in the Honors Program.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

215 405. Comparative Anatomy of Vertebrates. (4) II. Two hours rec. and six hours lab. per week. Pr. : Bio. 198 or 205.
215 410. Embry ology. (4) II, S. Developmental anatomy and physiology of reproduction of birds and mammals. Three hours rec. and three hours lab. per week. Pr.: Bio. 198 or 205.
215 415. Histology. (4) II. Microscopic Anatomy of the organs and tissues of the mammal as a basis for understanding diversity of function and malfunction. (Two lectures and two two-hour labs per week). Pr.: Bio. 205. 215 425. Human Physiology. (4) I, II, S. Functions of various organ systems of the body. Directed toward nonbiology majors. Three hours rec. and two hours lab. per week. Pr. 198 or 205.
215 430. Wildlife Conservation. (3) II. Methods and techniques in the management and propagation of wildlife. Pr.: Bio. 198 or 205.
215 441. Human Parasitology Recitation. (3) II. Three hours lec. per week. Pr.: Bio. 198 or 205.
215 442. Human Parasitology Laboratory. (1) II. Two hours lab. per week. Pr.: To be taken concurrently with Bio. 441.

215 445. Zoological Microtechnique. (2) I, II, S. Methods in preparation of slides and whole mounts; principles of photomicrography. Six hours lab. per week. Pr.: Bio. 198 or 205.
215 450. Microbiology. (4) I, II. Introduction to microorganisms; their morphology, physiology, classification, and importance. Two hours lec. and four hours lab. per week. Pr.: one course in biology and a course in organic chemistry.
215 500. Principles of Quantitative Microbiology. (5) I. Examination of microbial processes by means of quantitative chemical and physical methods. Three hours rec. and six hours lab. per week. Pr.: Bio. 450 or equiv.
215 512. Principles of Zoophysiology. (4) II. Selected topics in physiology of cells, organ systems, and organisms. Three hours rec. and three hours lab. per week. Pr.: Bio. 198 or 205, two semesters of Chemistry or equiv.
215 515. Developmental Biology. (4) II. A study of development and differentiation in plants and animals. Three hours lec. and one three-hour lab. per week. Pr.: Bio. 535.
215 530. Environmental Biology. (3) II. Structure and function of ecosystems. Abiotic and biotic interrelationships; energetics; population dynamics; community structure and regulation; biogeography; and succession. Three hours lec. Pr.: one course in biology and junior standing.
215 531. Environmental Biology Laboratory. (1) II. Practical experience in gathering and interpreting data for answering questions related to ecology. Designed for majors in the Division of Biology. Pr.: Concurrent enrollment in Bio. 530 .
215 535. Cell Biology. (3) I. Chemistry, structure and function of cellular components and relationships to energy, transport, movement and growth. Three hours lec. per week. Pr.: 8 hours biology and Chemistry 351 or equiv.
215 536. Cell Biology Laboratory. (1) I. One three hour lab per week. Pr. : Concurrent enrollment in Biology 535, status as undergraduate major in the Division of Biology.
215 540. Lower Vertebrates. (4) II. Classification, morphology, physiology, distribution and natural history of the fishes and amphibians. Three hours lec. and three hours lab. per week. Pr.: Bio. 201 or 205.
215 541. Higher Vertebrates. (4) I. Classification, morphology, physiology, distribution, and natural history of the reptiles, birds, and mammals. Three hours lec. and three hours lab. per week. Pr.: Bio. 201 or 205. 215 550. Lower Plants. (3) I. Morphology, adaptive mechanisms, and evolutionary relationships of the cellular and vascular cryptograms. Two hours lec. and one three-hour lab. per week. Pr.: Bio. 201 or 210.
215 551. Higher Plants. (4) I. Morphology, taxonomy, and biogeography of the vascular plants. Two hours lec. and two three-hour labs. per week. Pr.: Bio. 201 or 210.

## UNDERGRADUATE AND GRADUATE CREDIT

215 600. Plant Physiology. (4) I. Three hours rec. and three hours lab. per week. Pr.: Bio. 201 or 210 and a course in organic chemistry.

215 602. Comparative Embryology. (3) II in odd years. Vertebrate embryology and histogenesis, emphasizing the mechanics of development. One hour lec. and six hours lab. a week. Pr.: Bio. 410.
215 610. Bacteriology of Human Diseases. (5) I. Three hours rec. and six hours lab. per week. Pr.: Bio. 450 or equiv.
215 621. Endocrinology. (3) I, S. Survey of the glands of internal secretion and of their physiological and biochemical role in animals. Pr.: Bio. 198 or 205 plus a course in organic chemistry or biochemistry.
215 625. Animal Parasitology. (3) I. Biology, pathology, and prophylaxis of the principal external and internal parasites of domestic animals. Two hours rec. and two hours lab. per week. Pr.: Bio. 198 or 205 and junior standing.
215 630. Invertebrate Zoology. (4) I. Two hours rec. and six hours lab. per week. Pr.: Bio. 201 or 205 and junior standing.
215 634. Soil Microbiology. (3) I in odd years. Microbial population of the soil and its role in soil fertility. Pr.: Bio. 450 or equiv.; Chemistry 351 or equiv.
215 640. Introductory Mycology. (4) I. Comparative morphology, classification, and life cycles of the fungi. Two hours rec. and six hours lab. per week. Pr.: Bio. 201 or 210 .
215 642. Protozoology. (3) II. Taxonomy, morphology, and biology of the free-living and parasitic protozoa. Two hours rec. and three hours lab. per week. Pr.: Bio. 201 or 205.

215 645. Microbiology of Foods. (4) I. Microbial phenomena involved in the bacteriology and sanitation of foods. Two hours rec. and four hours lab. per week. Pr.: Bio. 450 or equiv.
215 646. Heredity and Evolution. (2) I. A study of human genetics and a survey of the principles of evolution of animals including man. Pr.: Bio. 201 or 205. 215 650. Molecular Genetics. (3) I. Structure, function and transmission of genetic material with special emphasis of studies at the molecular level. Pr.: Organic chemistry or concurrent enrollment, 10 hours of biology. 215 655. Microbial Metabolism. (3) II. An advanced treatment of metabolic activities of microorganisms. Pr. Bio. 500.
215 656. Microbial Metabolism Lab. (2) II. Selected laboratory exercises demonstrating the fundamental principles and practices of physiology. One hour rec. and six hours lab a week. Pr.: Bio. 655 or conc. enrollment. 215 660. Evolution. (3) II. A study of the theory of evolution including its historical and social implications. Three hours lec. per week. Pr.: Senior standing in biology or related area.
215 670. Immunology. (5) II. Chemical, genetic and biological properties of the immune response, acquired immunity and antibody production. Pr.: two courses in biology and a course in biochemistry or equivalent.
215 685. Wildlife Management Techniques. (3) I in even years. Ecology and management techniques. Two hours of rec. and three hours lab. per week. Pr.: Bio. 430 and 530.

215 693. Limnology. (3) I. Studies of inland lakes and streams. Emphasis is placed on water as a physical and
chemical environment as it affects the nature of biological interactions and productivity. Two hours lec. and three hours lab. per week. Pr.: two laboratory courses in natural sciences.

215 696. Fisheries Management. (4) I. Methods of fishery biology; population dynamics, aging and growth rates, productivity, physio-chemical conditions of freshwater, survey methods, methods of aquatic environment improvement, and fish-pond management. Three hours rec. and three hours lab. per week. Pr.: Bio. 540.
215 705. Advanced Mycology. (3) II in even years. Study of fungi, with emphasis on structure, identification, classification, phylogeny, and economic importance. One hour rec. and six hours lab. per week. Pr.: Bio. 640.
215 720. Botanical Microtechnic. (3) II in odd years. Preparation of plant materials for histological or cytological study. One hour rec. and six hours lab. per week. Pr.: Bio. 201 or 210.
215 725. Use of Models in Biology. (3) I. Rationale behind the use of models, formal logic and statistical methods of data analysis in biological research. Review of commonly used biological models, exercises in formal hypothesis development and model building. Three hours lec. per week. Pr: Math. 221 or 340 and Stat. 320 (or concurrently).
215 730. General Virology. (3) II. Theoretical and experimental basis of virology, with emphasis on the role of the virus as a controlling force in cellular biology; principles of host-virus interactions; introduction to use of mammalian cell cultures as the host for virus propagation. Pr.: Twelve hours of biological sciences, including Bio. 450 or equiv. and Biochem. 420 or equiv.; consent of instructor.
215 740. Anatomy of Higher Plants. (3) II. Structure and development of the various tissues and organs of seed plants. One hour rec. and six hours lab. per week. Pr.: Bio. 201 or 210.
215 760. Genetics of Microorganisms. (2) I. Structure and function of genes, as revealed by microorganisms; the role of genes in the control of cellular activities. Pr.: Knowledge of genetics and consent of instructor.
215 770. Microorganisms of the Natural Environment. (3) I in even years. A study of representatives of the major groups of bacteria isolated by enrichment methods from natural environments. Six hours lab. per week. Pr.: Bio. 500, Biochem. 420.
215 790. Bacteriology Seminar. (1) I, II. Pr.: Consent of instructor.
215 794. Topics in Developmental Biology. Credit arranged. I, II, S.
215 795. Topics in Environmental Biology. Credit arranged. I, II, S.
215 796. Topics in Molecular Biology and Genetics. Credit arranged. I, II, S.
215 797. Problems in Zoology. Credit arranged. I, II, S.
215 798. Problems in Botany. Credit arranged. I, II, S.
215 799. Problems in Bacteriology. Credit arranged.

## GRADUATE CREDIT

215 800. Mineral Nutrition of Plants. (2) I. Current interpretation of the absorption and transport of mineral nutrients. Pr.: Bio. 600.

215 801. Advanced Topics in Microbiology. Credit arranged. I, II, S.
215 802. Advanced Parasitology. (2) II in even years. Taxonomy of helminths; review of classical and current works of North American and foreign parasitologists; analysis of bibliography, format and drawings relative to manuscripts. Four hours combined rec. and lab. per week. Pr.: Bio. 625 and consent of instructor.
215 803. Introduction to Research in Biology I. (3) I. Participation with faculty in their research laboratories. The semester will consist of involvement in laboratories in Environmental Biology, Microbiology, Molecular and Cell Biology, AND Physiology and Developmental Biology. A student will divide his time in each of these laboratories equally. Pr.: Graduate standing in the Division of Biology.
215 804. Introduction to Research in Biology II. (3) II. Participation with faculty in their research laboratories. The semester will consist of involvement in laboratories in Environmental Biology, Microbiology, Molecular and Cell Biology, OR Physiology and Developmental Biology. At least two areas must be represented. Pr.: Biology 803. 215 811. Advanced Cell Biology I. (3) I. The structure and function of genetic systems in prokaryotic and eukaryotic cells with emphasis on nucleic acids, regulation of mitosis and meiosis, gametogenesis, fertilization and extra-nuclear inheritance. Three hours lec. per week. Pr.: one course in biochemistry.
215812 Advanced Cell Biology II. (3) II. Chemistry, structure, and function of cellular systems with emphasis on biochemical and physiological cytoplasmic phenomena. Three hours lec. per week. Pr.: one course in biochemistry.
215 815. Advanced Endocrinology. (2) I in even years. Pr.: Bio. 621.
215 819. Light and Temperature Relations of Plants. (2) II in odd years. Current concepts of light-energy relations involved in photosynthesis, respiration, growth form, and photoperiodism, and of temperature relations including thermoperiodism. Pr.: Bio. 600.
215 820. Plant Physiological Technique. (2) II. Six hours lab. per week. Pr.: Bio. 600 and a course in biochemistry. 215 824. Paleobotany. (3) II. Fossil plants and their use in elucidating ancient biospheres. Two hours rec. and two hours lab. per week. Pr.: Bio. 201 or 210 and Geol. 430.
215 830. Advanced Virology. (4) I. Application of current biochemical, biophysical, and biological techniques to the study of viruses, including bacterial viruses (bacteriophage), animal viruses and plant viruses. Pr.: Bio. 730 and consent of instructor.
215 833. Plant Growth and Development. (2) II in even years. Current concepts of growth-regulating substances and their effects on growth, differentiation and reproduction in higher plants. Pr.: Bio. 600.
215 835. Recent Advances in Cytogenetics. (3) II. Chromosome structure mechanics, and behavior; their significance for problems of genetics, evolution, and the origin of species. Two hours rec. and three hours lab. per week. Pr.: an understanding of cytology and genetics. 215 840. Advanced Immunology. (3) S. Theoretical and practical antigen and antibody relationships. Pr.: Bio. 670 or equiv.

215 845. Animal Behavior. (3) II in odd years. The study of the mechanisms, ontogeny, and evolution of social and non-social behavior from an adaptive viewpoint. Discussion, lecture, laboratory and field exercises. Pr.: At least one year of biology.
215 850. Structure and Replication of Genetic Material. (3) II in even years. Structure and replication of genetic material in both prokaryotic and eukaryotic systems; physical and biological techniques for studying genetic material; molecular basis of biological function. Pr.: Background in genetics and consent of instructor.
215 851. Mutation. (2) II in even years. The induction and isolation of mutation, the phenotypic expression and the molecular basis of alterations in the genetic material. Pr.: Background in genetics and consent of instructor. 215 852. Genetic Expression and Regulation. (3) I in even years. Gene structure and function, translation and transcription of the genetic information, the genetic code, and the regulation of protein synthesis and activity. Pr.: Background in genetics and consent of instructor. 215 853. Genetic Recombination. (2) II in odd years. An analysis of recombination mechanisms in prokaryotes and eukaryotes. Pr.: Background in genetics and consent of instructor.
215 860. Microbial Genetic Techniques. (4) II. Experiments in multiplication, recombination, and mutation in bacteria and bacteriophage. Pr.: Bio. 760, Biochem. 420 or equiv.
215 865. Advanced Plant Ecology. (4) II in even years. Advanced study of vegetation change and of the relationships of plants and environment at various developmental stages. Eight hours combined rec. and lab. per week. Pr.: Bio. 530 and 600 .
215 870. Advanced Systematic Botany. (4) II in odd years. Classification, nomenclature, and taxonomic theory of vascular plants. Two hours rec. and six hours lab. per week. Pr.: Bio. 551.
215 880. Population Ecology. (3) II. Growth and regulation of populations, cycles, competition theory, seasonal effects, predator-prey and community relationships, biogeography and social regulation. In depth consideration of current theoretical developments, and recent field population studies. Pr.: Bio. 530, a course in Calculus and a course in Statistics.
215 960. Current Literature in Microbial Genetics. (1) I. May be repeated to a maximum of three hours credit. Seminar by students of research described in current issues of Genetics, Journal of Molecular Biology, Virology, Journal of Bacteriology, Proceedings of National Academy of Science and other pertinent journals.
215 980. Graduate Seminar in Botany. (1) I, II. Pr.: Consent of instructor.
215 994. Research in Developmental Biology. Credit arranged. I, II, S.
215 995. Research in Environmental Biology. Credit arranged. I, II, S.
215 996. Research in Molecular Biology and Genetics. Credit arranged. I, II, S.
215 997. Research in Zoology. Credit arranged. I, II, S.
215 998. Research in Botany. Credit arranged. I, II, S.
215 999. Research in Bacteriology. Credit arranged. I, II, S.

## Chemistry

ADRIAN H. DAANE, Head of Department
Professors Daane,* Lambert,* McDonald,* Meloan,* Moser,* Schrenk," and Setser;* Associate Professors Conrow," Copeland,* Hammaker,* Hawley,* Johnson,* Lanning,* Purcell,* and van Swaay;* Assistant Professors Danen,* DesMarteau, Kay, Hoffman, Lenhert, and Paukstelis;* Emeritus: Professors Andrews,* McDowell,* Lash,* and Silker;* Assistant Professor Harriss, Instructor Crawford.
The Department of Chemistry occupies recently remodeled Willard Hall and a new building, the H. H. King Chemical Laboratory. The faculty of the department consists of twenty-one Ph.D. chemists representing a broad range of specialization in the chemistry field. The department offers programs leading to the B.S., B.A., M.S. and Ph.D. degrees, and chemistry majors at the undergraduate and graduate levels both number in the eighties. In addition, instruction is provided in introductory and advanced chemistry to undergraduate and graduate students in numerous other curriculums. Instruction and research in chemistry are conducted in laboratories wellequipped with modern facilities and instruments.

## UNDERGRADUATE STUDY

Chemistry graduates from KSU are sought by chemical industries and graduate schools and by high schools as chemistry teachers. Also, a significant number of graduates use their course of study as an effective preparation for further study in a life science such as medicine. The chemistry curriculum for the B.S. degree is listed below; it has been approved by the American Chemical Society for professional training of chemists.
High school students who plan to major in chemistry should have good preparation in mathematics, chemistry, physics and English composition. Trigonometry and two years of algebra should be taken; more math is good.
Junior college students should take general chemistry, qualitative and quantitative analysis, analytic geometry, calculus, physics and English composition. Our curriculum requires a full year of organic chemistry, so junior college students should normally postpone taking organic chemistry until they enroll at Kansas State University.

Many chemistry students at Kansas State are engaged in independent study and research. Some begin their freshman year, and some begin later, working on their own research projects in a research laboratory under the supervision of a faculty member of their choice. A significant number publish the results of their work in scientific journals.

## GRADUATE STUDY

Programs leading to the M.S. and Ph.D. degrees are offered. Research and graduate level courses are conducted in the areas of analytical, inorganic, organic, and physical chemistry and adequately prepare students for a career in research or college and university teaching.
In order to be admitted to the graduate program leading to the M.S. or Ph.D. degrees, a student must have completed undergraduate courses in chemistry, mathematics, and physics equivalent to those in the undergraduate chemistry curriculum (see below). Prospective graduate students whose undergraduate training does not meet these requirements may be admitted on a provisional basis but are required to take undergraduate courses, which may not be applied for graduate credit, to make up their deficiencies.
The Department of Chemistry requires all graduate students majoring in chemistry to teach as part of their training for an advanced degree.
Information and a brochure describing fields of research, supporting facilities, financial support, and other aspects of graduate study may be obtained on request from the Chairman, Graduate Assistantship Committee, Department of Chemistry, Kansas State University, Manhattan, Kansas 66502.

## CHEMISTRY CURRICULUM FOR THE B.S. DEGREE ${ }^{1}$

120 credit hours required for graduation

1. Chemistry: 42 hours (departmental course numbers are in parentheses)
Freshman: Chem. I (210), 5 hr.; Chem. II (230), 3 hr.; Chem. Analysis (271), 4 hr .

Sophomore: Org. I (431), 3 hr ; Org. I Lab (432), $2 \mathrm{hr} . ;$ Org. II (450), $3 \mathrm{hr} . ;$ Org. II Lab (451), 2 hr .; Chem. Separations (445), 2 hr .
Junior: Phys. Chem. (585), 3 hr.; Phys. Chem. II (595), 3 hr.; Phys. Chem. II Lab (598), 2 hr .

Senior: Inorg. Chem. (597), 3 hr .; Instrumental Anal. (666), 4 hr.; Undergrad. Research (599), 3 hr . (may be taken prior to the senior year).
2. Mathematics; 12 hours

Freshman: Anal. Geom. Calc. I (220), 4 hrs.; Anal. Geom. Calc. II (221), 4 hr .
Sophomore: Anal. Geom. Calc. III (222), 4 hr .
3. Physics: 10 hours

Sophomore: Engg. Phys. I (310), 5 hr.; Engg. Phys. II (311), 5 hr.
4. English: 6 hours

Freshman: Engl. Comp. I (100), 3 hr.; Engl. Comp. II (120), 3 hr .
5. Speech: 1 course
6. Physical Education: 2 courses
7. Social Sciences and Humanities: seven courses from the Departments of Art, Economics, English, History, Modern Languages, Music, Philosophy, Political Science, Psychology, Sociology and Anthropology, Speech, Technical Journalism or Geography. Courses must include:
a. German: German I and II or Tech. German I and II.
b. Philosophy: one course
c. 2 advanced level courses ( 400 level or above or the second year of a foreign language.)
8. Electives: Sufficient additional hours (25-30) to complete a total of 120 .
Modification for preparation for High School Chemistry Teaching ${ }^{2}$

Students who desire to become high school Chemistry teachers may prepare themselves for this vocation while completing the requirements for the B.S. degree in chemistry. Items 5, 7, and 8 above are modified as follows:
5. Speech: Oral Communications (281-105 or 281106).
7. Social Sciences, Humanities, Biological Science and Professional Education:
a. Philosophy: 1 course
b. German: German I and II or Tech. German I and II
c. Biological Science: 1 course
d. Social Science: 12 hours. Must include Gen. Psych. (110), 3 hr .; additional 9 hours selected from economics, geography, political sciences, history, sociology, anthropology. Two courses must be at the 400 level or above.
e. Education: Ed. Psych. I (202), 3 hr. (should be taken the first semester of the junior year); Ed. Psych. II (302), 3 hr .; Professional Semester (second semester of senior year); 16-17 hours of work in Education, including practice teaching.

[^12]8. Electives: Sufficient additional hours to complete a total of 126 .

## Courses in Introductory and General Chemistry

## UNDERGRADUATE CREDIT

221 095. Chemistry Seminar. (0) I, II.
221 110. General Chemistry. (5) I, II. Principles, laws and theories of chemistry; important metallic and nonmetallic substances. Three hours lec., one hour rec. and three hours lab. a week. Not open to students having credit in any college course in chemistry.
221 210. Chemistry I ${ }^{3}$. (5) I, II, S. First course of a twosemester program designed to serve both as a foundation for more advanced chemistry courses and as a terminal, 8-10 hour chemistry study for curriculums which require no further chemistry. Three hours lec., one hour rec., and three hours lab. a week. Not open to students who have credit in Chem. 110. Those without high school chemistry should not enroll in this course until the second semester. 221 230. Chemistry II. (3) I, II, S. Completion of the twosemester Chem. I, II program in introductory chemistry. Three hours lec. a week. Pr.: Chem. 210.
221 250. Chemistry II Laboratory. (2) I, II, S. Elementary qualitative analysis and additional experimental study of chemical principles. Six hours lab a week. Pr.: Chem. 230 or conc. enrollment.
221 399. Honors Seminar in Chemistry. (1) I or II.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

221 499. Problems in Undergraduate Chemistry. Cr. arranged. I, II, S. Problems may include classroom andor lab work. Pr.: Consent of instructor.
221 599. Undergraduate Research. (1,2,3) I, II, S. Analytical, Inorganic, Organic or Physical Chemistry.

## UNDERGRADUATE AND GRADUATE CREDIT

221 618. Air and Water Analysis. (2) II. Current methods in use for the monitoring of air and water pollution; literature survey of new analytical methods and their development. Two hours lec. a week. Pr.: Chem 4 or consent of the instructor.
221 799. Problems in Chemistry. Credit arranged. I, II, S. Problems may include classroom or laboratory work.

Not for thesis research. Pr.: Consent of instructor.

## GRADUATE CREDIT

221 999. Research in Chemistry. Credit arranged. I, II, S. Research in analytical chemistry, inorganic chemistry, organic chemistry, and physical chemistry.

## Courses in Analytical Chemistry

## UNDERGRADUATE CREDIT

221 271. Chemical Analysis. (4) I, II, S. Principles of chemical equilibria and qualitative, gravimetric, and titrimetric analyses. Two hours lec. and six hours lab. a week. Pr.: Chem. 230 or conc. enrollment.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

221 440. Research Techniques. (3) II. Principles and applications of techniques in research; to include chromatography, spectroscopy, electrochemistry, dialysis, electrophoresis, and distillation. Two hours lec. and three hours lab. a week. Pr.: Chem. 250 and 350.
221 442. Chemical Microscopy. (2) On sufficient demand. Use of the microscope in qualitative and quantitative analyses as applied to inorganic substances and to vegetable and animal products. One hour lec. and three hours lab. a week. Pr.: Chem. 271, 350, and 351.
221 445. Chemical Separations. (2) II. Principles of modern separation techniques. One hour lec. and three hours lab. a week. Pr.: Chem. 271 or equiv.

## UNDERGRADUATE AND GRADUATE CREDIT

221 601. Practicum in Teaching Chemistry. (1) I, II. Principles and methods of instruction in laboratories and recitation classes in chemistry, including one semester of supervised experience as an instructor in a chemical laboratory. This is a required course of all teaching assistants in the Department of Chemistry. May be taken only once for credit. Pr.: Senior standing in Chemistry. 221 666. Instrumental Analysis. (4) I, II, S. Theory and application of modern instruments in the field of chemistry. Two hours rec. and six hours lab. a week. Pr.: Chem. ${ }^{4}$
221 667. Instrumentation in Chemistry. (3) I, II. Theory and practice of instrument design for use in chemical research. Study of the flow of energy and information in systems for measurement and control. Two hours rec. and three hours lab. a week. Pr.: Chem. 666 or consent of instructor.

## GRADUATE CREDIT

221 801. Graduate Seminar in Analytical Chemistry. (01) I, II.

221 842. Advanced Analytical Chemistry I. (3) I in odd years. Elemental and functional group analyses, nonaqueous solvent systems, gas analysis, kinetics, and thermal methods of analysis. Pr.: Chem. ${ }^{4}$
221 843. Advanced Analytical Chemistry II. (3) II. Theory of solution equilibria and physical and chemical methods of separation. Three hours lec. a week. Pr.: Chem. ${ }^{4}$
221 844. Advanced Analytical Chemistry III. (3) I in even years. Theory and application of electrochemical methods; chronoamperometry, linear potential sweep chronoamperometry, chronopotentiometry, cyclic chonopotentiometry, controlled-potential and constantcurrent coulometry, electrochemical thin layer techniques, rotating disk, and electrochemical instrumentation. Three lectures a week. Pr.: Chem. ${ }^{4}$

[^13]221 845. Selected Topics in Analytical Chemistry. (1-3) Offered on sufficient demand. A lecture course in analytical chemistry in areas of specialization of the faculty, with emphasis on current developments. Specific topics will be changed from semester to semester, so a student may take the course for credit more than once. Pr.: Chem. ${ }^{4}$

## Courses in Inorganic Chemistry

## UNDERGRADUATE AND GRADUATE CREDIT

221 597. Inorganic Chemistry. (3) I and alt. S. A survey course in modern inorganic chemistry. Three hours lec. a week. Pr.: Chem. 450, 595.
221 610. Chemical Applications of Group Theory. (1) I. Applications of group theory to molecular structure, bonding and spectra. One hour lec. a week. Pr.: Chem ${ }^{4}$ 221 755. Inorganic Techniques. (2-3) S. A graduate level course in the preparation of inorganic compounds which are of unusual interest and which present challenges to the student of advanced inorganic laboratory techniques. Six to nine hours lab. a week. Pr.: Chem. ${ }^{4}$
221 776. Transition Metal Chemistry. (3) II. The chemistry of the high and low valence states of the transition metals and the electronic and magentic properties of their complexes. Three hours lec. a week. Pr.: Chem. 597, 610.

## GRADUATE CREDIT

221 802. Graduate Seminar in Inorganic Chemistry. (01) I, II, S.

221 826. Chemistry of Non-Metals. (3) II in even years. Theory and properties of the non-metallic elements, with emphasis on their individual and group characteristics. Three hours lec. a week. Pr.: Chem. ${ }^{4}$
221 829. Physical Methods in Inorganic Chemistry. (3) II. Theory and application of infrared, Raman, visible, ultraviolet, NMR, ESR, NQR, Mossbauer, and mass spectrometry to inorganic chemistry. Three hours lec. a week. Pr.: Chem. 597, 610.
221 831. Theoretical Inorganic Chemistry. (3) II in odd years. Theory of crystal fields and paramagnetic resonance. Three hours lec. a week. Pr.: Chem. 597, 610, 754,895 or conc. enrollment.
221 835. Selected Topics in Inorganic Chemistry. (1-3) Offered on sufficient demand. A lecture course in inorganic chemistry in areas of specialization of the faculty, with emphasis on current developments. Specific topics will be changed from semester to semester, so a student may take the course for credit more than once. Pr.: Consent of instructor.

## Courses in Organic Chemistry

## UNDERGRADUATE CREDIT

221 190. Elementary Organic Chemistry. (3) I, II, S. A brief introduction to the principles of organic chemistry for students in certain agriculture and home economics curriculums. Conc. enrollment in Chem. 191 is recommended. Three hours lec. a week. Pr.: Chem. 110.
221 191. Elementary Organic Chemistry Laboratory. (2) I, II, S. Six hours lab. a week. Pr.: Chem. 190 or conc. enrollment.

221 350. General Organic Chemistry. (3) I, II, S. A survey of types of organic reactions, particularly in biological science, including pre-veterinary, premedical, and certain agriculture and home economics programs. Conc. enrollment in Chem. 351 is urged. Three hours lec. a week. Pr.: Chem. 230.
221 351. General Organic Chemistry Laboratory. (2) I, II, S. Six hours lab. a week. Pr.: Chem. 350 or conc. enrollment.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

221 431. Organic Chemistry I. (3) I. General principles of organic chemistry; study of the main types of aliphatic compounds, with an introduction to fats, carbohydrates, amino acids, proteins, and aromatic compounds. Required for the chemistry curriculum and for entrance to some medical schools. Recommended for others who desire a more thorough course than the preceding ones. Three hours lec. a week. Pr.: Chem. 250 or 271. Conc. enrollment in Chem. 432 is recommended.
221 432. Organic Chemistry I Laboratory. (2) I. Six hours lab. a week. Pr.: Chem. 431 or conc. enrollment. 221 450. Organic Chemistry II. (3) I, II. Cont. of Chem. 431, including additional aromatic chemistry, condensation reactions and introduction to some advanced topics, such as dyes, polymers and heterocyclic chemistry. Conc. enrollment in Chem. 451 is recommended. Three hours lec. a week. Pr.: Chem. 431 and 432. 221 451. Organic Chemistry II Laboratory. (2) I, II. Six hours lab. a week. Pr.: Chem. 450 or conc. enrollment.

## UNDERGRADUATE AND GRADUATE CREDIT

221 752. Systematic Organic Chemistry. (3) II. Advanced study of organic compounds and fundamental types of reactions. Three hours lec. a week. Pr.: Chem. ${ }^{4}$ 221 760. Advanced Organic Chemistry. (3) I. Conditions, scope, and applications of reactions useful in synthetic organic chemistry. Three hours lec. a week. Pr.: Chem. ${ }^{4}$

## GRADUATE CREDIT

221 803. Graduate Seminar in Organic Chemistry. (0-1) I, II.
221 805. Current Organic Literature. (0-1) I, II, S. Topics of current interest in organic chemistry will be presented and critically discussed by graduate students and faculty. Max. 2 hr. credit in M. S. program, 4 hr . in Ph. D. program. Pr.: Enrollment as graduate student in organic chemistry.
221 865. Theoretical Organic Chemistry I. (3) II. Bond structure, stereo-chemistry, relation of constitution to physical properties, solvents, and other general topics of a theoretical nature. Three hours lec. a week. Pr.: Chem. ${ }^{4}$
221 867. Theoretical Organic Chemistry II. (3) I. The principal mechanisms of organic reactions and various types of evidence for them. Recent developments are followed in the current literature. Three hours lec. a week. Pr.: Chem. 865.

[^14]221 870. Selected Topics in Organic Chemistry. (1-3) Offered on sufficient demand. A lecture course in organic chemistry in areas of specialization of the faculty, with emphasis on current developments. Specific topics will be changed from semester to semester, so a student may take the course for credit more than once. Pr.: Chem. ${ }^{4}$

## Courses in Physical Chemistry

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

221 400. Descriptive Physical Chemistry. (3) Elementary principles of physical chemistry without higher mathematical applinations. Not open to students majoring in chemistry. Three hours lec. a week. Pr.: Chem. 271, Math. 100.
221 535. Radioactive Tracer Techniques. (3) II. Chemistry and physics of radioactive substances and applications to fields of biological and physical science. Two hours lec. and three hours lab. a week. Pr.: Consent of instructor.
221 585. Physical Chemistry I. (3) I, S. Properties of matter in the gaseous state; kinetic and statistical theory; elementary quantum chemistry; elementary thermodynamics, including the statistical interpretation. Three hours lec. a week. Pr.: Chem. 250 or 271, Math. 222, Phys. 311.
221 586. Physical Chemistry I Laboratory. (2) I. Six hours lab. a week. Pr.: Chem. 585 or conc. enrollment. 221 595. Plysical Chemistry II. (3) II, S. Thermodynamics and chemical equilibrium; reaction kinetics and mechanisms elementary quantum theory of molecular structure and chemical bonding; properties of the solid state. Three hours lec. a week. Pr.: Chem. 585. 221 598. Physical Chemistry II Laboratory. (2) II. Six hours lab. a week. Pr.: Chem. 595 or conc. enrollment.

## UNDERGRADUATE AND GRADUATE CREDIT

221 620. Electrochemistry. (3) II in even years. Fundamentals of electrochemistry and their applications. Two hours rec. and three hours lab. a week. Pr.: Chem. ${ }^{4}$ 221 625. Colloid Chemistry. (3) I. Three hours lec. a week. Pr.: Chem. ${ }^{4}$
221 701. Chemical. Thermodynamics. (3) II. The laws, principles, and methods of thermodynamics and their applications to chemical systems, both pure and solutions. Introductory statistical-molecular approach also included. Three hours lec. a week. Pr.: Chem4 ${ }^{4}$
221 702. Chemical Kinetics. (3) II. Survey of experimental and-or theoretical aspects of dynamics of chemical reactions. The topics presented will depend upon the instructor. Three hours lec. a week. Pr.: Chem ${ }^{4}$ 221 754. Molecular Structure. (3) I. Introduction to quantum mechanics and atomic and molecular spectroscopy. Three hours lec. a week. Pr.: Chem ${ }^{4}$

## GRADUATE CREDIT

221 804. Graduate Seminar in Physical Chemistry. (0-1) I, II. Presentation of topics from literature in physical chemistry.
221 850. Chemical Statistical Thermodynamics. (3) I. Application of classical and quantum statistical mechanics to chemical phenomena. Three hours lec. a week. Pr.: Chem. 701, 754.

221 855. Selected Topics in Physical Chemistry. (1-3). Offered on sufficient demand. A lecture course in physical chemistry in areas of specialization of the faculty, with emphasis on current developments. Specific topics will be changed from semester to semester, so a student may take the course for credit more than once. Pr.: Chem ${ }^{4}$
221 895. Theoretical Chemistry I. (3) II. Principles of diatomic and polyatomic molecular spectroscopy and chemical bonding. Three hours lec. a week. Pr.: Chem. 754 or consent of instructor.
221 896. Theoretical Chemistry II. (3) I. Development of the basic principles of quantum mechanics and application to problems of energy states of atoms and molecules. Three hours lec. a week. Pr.: Chem. 754 or consent of instructor.

## Computer Science

HAROLD SACKMAN, Head of Department
Professor Sackman; Associate Professors Ahmed, Conrow, Gallagher and Weinberg; Assistant Professors Brewer, Calhoun, Fisher, ${ }^{*}$ Miller, Sincovec, Trump and Unger.

## UNDERGRADUATE STUDY

The first digital computer, the Harvard Mark I, was demonstrated in 1944. The first electronic digital computer, the ENIAC, was exhibited in 1945. Today there are thousands of digital computers in use in the world. These machines represent what is called the hardware of digital computing.

A computer must be directed to do computations, store information, and produce the final information required in a usable form by means of programs known as software.

The creation and utilization of the best possible hardware and software is, broadly speaking, the field of computer science.

A person seeking an undergraduate degree in computer science must fulfill the general requirements of the College of Arts and Sciences, and one of the following specific curricula:

For the Bachelor of Science degree, complete Math 245220 and 221 and either 224 or 505 ; two additional courses in sciences or engineering; also complete Computer Science $315,400,425,440,505,525$, and 600 ; plus 15 additional hours chosen from the departmental list of technical electives.

For the Bachelor of Arts degree, complete the same specific requirements given above

[^15]for the Bachelor of Science degree; but substitute one of those mathematics courses for the mathematics course in the general requirements of the College of Arts and Sciences for the Bachelor of Arts Degree.

## GRADUATE STUDY

The Department of Computer Science offers graduate studies leading to the Master of Science and Doctor of Philosophy degrees.

Many graduate majors in computer science initially are deficient in formal computer science studies as compared to a person who received the baccalaureate degree in computer science. If so they may need to take one or more courses for undergraduate credit. They also will take two academic years to complete the requirements for the Master of Science degree unless full use is made of Intersessions and Summer Sessions.

The Doctor of Philosophy degree in computer science is offered jointly by the University of Kansas and Kansas State University so that students will have, to some degree, the benefits to be derived from both faculties. The fields of highest concentration in computer science are divided between the two universities in the following manner:

## Identified with Kansas State University

Machine Languages - Language processors, conversational languages, extensible languages
Computer Design and Architecture Computer logic, switching theory
Programming Systems
Biological and Ecological Systems Simulation
Data Organization and Manipulation - File management and data processing, information storage and retrieval, text processing.

## Areas of Current and Essential Interest to Both Campuses

Numerical Analysis
Artificial Intelligence

## Identified with the University of Kansas

Formal Language Theory - Theory of grammars, formal languages, formal semantics

Natural Languages and Symbol Systems Computational linguistics, pattern generation in the humanities and fine arts, sound synthesis and analysis
Automata and Mathematical Logic - Theory of automata, computability, recursive function theory
Machine Systems
Information Systems Theory and Design Analysis of information networks, information acquisition, social implications of information systems.

A student wishing to seek the Doctor of Philosophy degree in computer science should choose his university with the above in mind at least by the time the requirements of the Master of Science Degree are met.

## Courses in Computer Science

## UNDERGRADUATE CREDIT

286 315. Fundamentals of Computer Programming. (3) I, II, S. Introduction to a procedure-oriented language, the description of a digital computing system, the strategy of problem solving using a digital computer, and the concepts and properties of algorithms. Applications to problem solving. Pr.: High School Algebra.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD
286 400. Introduction to Algorithmic Processes. (3) I, II, S . Introduction to algorithms, language and notation for describing algorithms, analysis of computational problems and development of algorithms for their solution. The notation of lists, tables, data sets (files) and records. Pr.: Comp. Sci. 315.
286 410. Cobol. (3) Elements of data processing in cobol language. Applications. Pr.: Comp. Sci. 315.
286 425. Computer Organization and Programming I. (3) I, II, S. Logical organization of computers; number systems and arithmetic control units and instruction sequencing, assemblers, addressing systems, subroutine linkages (transfer vectors), and input-output operations. Pr.: Comp. Sci. 315.
286 440. Introduction to Programming Languages. (3) I, II. Structure of algorithmic languages. Conversational languages. List processing and string manipulation languages. Concepts and facilities of programming languages. Pr.: Comp. Sci. 400.
286 505. Mathematical Machines and Computability. (4) I. Elements of matrix algebra pertinent to digital computations. Computer methods of solving linear equations and inverting matrixes. Error analysis, problem conditioning and post-optimizations. Rectangular and singular systems. A generalized inverse for matrixes. Algorithmic methods of solving eigenvalue problems, progressive algorithms. Applications. Three hours lecture, one hour laboratory on a digital computer. Pr.: Math. 222, Comp. Sci. 385.

286 506. Mathematical Machines and Computability II. (4) Computer algorithms for finding roots of polynomials and the real roots of transcendental equations. Error analysis, effect of uncertainty in the coefficients. Computer algorithms for the approximation of continuous functions. Numerical integration, differentiation and computer algorithms for solving ordinary laboratory differential equations. Three hours lectures and one hour laboratory on a digital computer. Pr.: Comp. Sci. 505.

## UNDERGRADUATE AND GRADUATE CREDIT

286 525. Computer Organization and Programming II. (3) I. Study of information representations and relationships between the form of representation and processing techniques. Transformations between storage media. Referencing of information as related to the structure of its representation and implications for the design of the referencing language. Pr.: Comp. Sci. 425. 286 535. Non-numeric Programming. (3) I, II, S. The use of computers in areas not involving numeric calculations. Surveys of applications into areas such as music, learning theory, games and discrete pattern recognition. Heuristic programs. Pr.: Comp. Sci. 400.
286 600. Discrete Structures (3) II. Study of linear lists, strings, arrays, orthogonal lists, and graphs. Representation of such structures within the computers. Pr.: Comp. Sci. 525, Math. 220.
286 610. List and String Processing Languages (3) II, S alternate years. The languages LISP and SNOBOL will be studied, and problems will be developed illustrating the use of each. Pr.: Comp. Sci. 400, 600.
286 615. Computer Logic (3) II, S. Propositional calculus, axiomatics. Turing machines; unsolvable problems; quantification theory; satisfiability and validity, models, first-order theories; foundational considerations. Pr.: Math. 220, Comp. Sci. 425, 600, or consent of instructor. 286 620. Programming Systems (3) I, S. Languages for writing software, design of assembly systems, macroinstructions, operating systems (monitors), interrupt systems, storage allocation, and multiprogramming. Pr.: Comp. Sci. 400, 525, 600.
286 640. Programming Languages (3) II. The study of the structure and facilities of major algorithmic procedure-oriented languages and their implementation, operation and use. Pr. : Comp. Sci. 440, 600. 286 670. Information Organization and Retrieval (3) I. Models for representing structured information techniques for organizing and searching files. Structure of semiformal languages. Analysis of information by statistical, syntactic and logical methods. Applications to automatic information retrieval systems, question answering systems, and man-machine interaction. Pr.: Comp. Sci. 425, 315.
286 701. Automata Theory I (3) I Alternate years. Finite automata; synchronous sequential circuits; Kleenes' Theorem; semi-groups; monomorphisms; generator systems; algebraic linguistics; potentially infinite machines; theory of computability recursive functions; programming systems. Pr.: Comp. Sci. 615, Math. 512 or consent of instructor.
286 710. Compiler Design I (3) Alternate years. Formulation of syntax-directed and tabledriven techniques
used in compiler design. Various alternative techniques. Environment of a compiler, conversational compilers. Pr.: Comp. Sci. 620, 640.
286 711. Compiler Design II. (3) II, S. Conversational compilers. Syntax-directed compilers. Extensible compilers. Compiler writing systems. Pr.: Comp. Sci. 710.

286 712. Seminar in Computer Science (1) I, II, S.
286 720. Business Data Processing (4) II, S. Manual, semi-automatic, automatic systems of data processing. Accounting concepts, data processing implications. Organization of sequential and direct-access files. Checking and control techniques. Student groups will study business applications and recommend dataprocessing systems. Three hours lecture, two hours lab each week. Pr.: Comp. Sci. 410, 600.
286 798. Topics in Computer Science. Credit Arranged. I, II, S.

## GRADUATE CREDIT

286 800. Computational Semantics. (3) I, S. Theoretical prerequisites and computational techniques for mechanical interpretation of language sentences. Semantics of formal computer languages, including query languages for information retrieval. Structural representation of meaning. Pr.: Comp. Sci. 315, 615.
286 801. Automata Theory II (3) II, S. Theory of computability, recursive functions, programming systems, representation of languages by automata. Pr.: Comp. Sci. 701.
286 810. Computer Simulation (3) A variety of examples will be studied to illustrate the power and flexibility of automata theoretic representation, statistical techniques, and information theory in simulation studies. Pr.: Comp. Sci. 600 or 620.
286 811. Computer Simulation Experiments (3) A computer simulation will be programmed for the digital computer and used to predict data and test hypotheses. Pr.: Comp. Sci. 810 or consent of instructor.
286 815. Special Topics in Computer Science (2-4) I, II, S. Study in selected areas of artificial intelligence, computational linguistics, linear and nonlinear programming, theorem providing by computer, models of intelligent processes, and the like. Pr.: Consent of instructor.
286 865. Computer Simulation of Eco-systems. (3) II, S Alternate Years. A selection of various eco-systems will be used to show how a computer can be used to formally define an eco-system. Then computer-simulated ecosystems will be used to discover ways to optimize the benefits to be derived from actual eco-systems. Pr.: Comp. Sci. 810 or consent of instructor.
286 998. Research in Computer Science and Mass Communication. (credit arranged) I, II, S.

## Economics*

PAUL L. KELLEY,* Head of Department
EDGAR S. BAGLEY, Assistant Head, Teaching and Graduate Studies
NORMAN V. WHITEHAIR, Assistant Head, State Leader, Extension Marketing, Management and Resource Development

Professors Bagley*, Chalmers*, Emerson*, and Nordin'; Associate Professors DeCou*, Delehanty, Greenwood* ; Assistant Professors Gormely*, Nafziger*, Olson, Rao', and Thomas; Instructors Bradley and Hazlett.

Economics is concerned with the principles governing the production and distribution of goods and services, the principles guiding the best use of resources-land, labor, and capital-and factors causing business prosperity and depression, economic growth, inflation and deflation. Students may pursue specialized study in the fields of economic theory, history of economic thought, money and banking, public finance, labor relations, international trade, economic development, business fluctuations, transportation, econometrics, mathematical economics, and economic systems.

A major in economics will help prepare a student for a career in business, in government, or in education. The study of economics will also be useful to a student in acquiring the background needed as a citizen for understanding problems of our society and appraising policies of governments.

A student majoring in economics may be enrolled for either the Bachelor of Arts or the Bachelor of Science degree.

## UNDERGRADUATE STUDY

Requirements for an economics major for either the B.A. or B.S. degree (see page 81) are (1) Econ. 110, 120, 410, 420. (2) Five additional courses numbered 400 or above in the Department of Economics in at least four branches of Economics. Economics 405 and 406 cannot be counted in fulfillment of this requirement. (3) Math. 100, Stat. 320 or 520. (4) One of the following: Math 220 or 340 ; Bus. Admin. 275; Stat. 321 or 521.

Secondary Education Certification. A student majoring in economics may also prepare for teacher certification at the secondary level (see page 183). This program leads to the Bachelor of Science degree (see page 81). The sequence of courses should be planned in cooperation with the student's advisers in both economics and education so that the
requirements of secondary education are met (see page 183).

Industrial Relations and Manpower Studies Options. Students planning to work in the industrial relations or manpower development utilization field (holding a government, industrial, or trade union position) will become acquainted with the economic, political, and social aspects of labormanagement relations and manpower studies by taking the following courses as part of either a terminal university program or a foundation for graduate study: Econ 620, 627; Soc. 541, 643; Pol. Sc. 681; B. A. 530, 630, 632.

## GRADUATE STUDY

Graduate study leading to the degrees Master of Arts and Doctor of Philosophy is offered in economics. Fields of study are economic theory, history of economic thought, econometrics, regional economics, labor economics, monetary and fiscal policy, economic development, international trade, welfare economics, economic fluctuation, public finance, and transportation.

Graduate degrees are essential for careers as professional economists in higher education, business, or government. Graduate study also is valuable training for certain executive and research positions in business and government and for teaching social science in secondary schools.

Prerequisite to major graduate study in economics is completion of an undergraduate curriculum equivalent to that required of undergraduate majors in economics at Kansas State University. Ph.D. students must demonstrate reasonable proficiency in mathematics.

Research facilities available to graduate students include modern electronic computers.

Opportunities for advanced study are enhanced by close contacts with the Agricultural Economics section of the department, with the College of Business Administration, with the Agricultural and Engineering Experiment Stations, and with the various state agencies.

[^16]
## Courses in Economics

## UNDERGRADUATE CREDIT

225 110. Economics I. (3) I, II, S. Basic facts, principles, and problems of economics; introductory principles of resource allocation; determination of the level of employment, output, price level; the monetary and banking system; institutions of the American economy; problems of labor, economic instability, depressions, inflation, economic growth; principles of economic development; other economic systems.
225 111. Economics I Honors. (3) I, II. Course description same as Econ. 110. (3) I, II, S. Basic facts, principles of resource allocation; determination of the level of employment; output, price level; the monetary and banking system; institutions of the American economy; problems of labor, economic instability, depressions, inflation, economic growth; international economic relations. Pr.: Open to students in Honors Program.
225 120. Economics II. (3) I, II, S. Continuation of Economics I. Basic facts, principles and problems of economics including study of the determination of prices by supply and demand the determination of wages, rent, interest and profit; theory of the firm; problems of monopoly, agriculture, taxation; international economic relations.
225 399. Honors Seminar Economics. (1) I, II. Readings and discussions. Open to students in the Honors Program not majoring in economics.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

225 405. Introduction to the Civilization of South Asia I. (3) I. Interdisciplinary survey of the development of civilization in South Asia, geographical and demographic context, philosophical and social concepts, economic, social and political institutions, literature and historical movements. (Same as Geog. 405, P. Sci. 405, Soc. 405, Anthro. 405.)
225 406. Introduction to the Civilization of South Asia II. (3) II. Interdisciplinary survey of recent and contemporary civilization in India, Pakistan, Ceylon, Nepal, and Afghanistan, including recent history, current economy, religion, culture, languages and literature, geography, social and political structures and ideas. (Same as Geog. 406, P. Sci. 406, Soc. 406, Anthro. 406.)
225 410. Intermediate Macroeconomics. (3) I, II, S. An examination of the behavior of the economy as a whole, including an analysis of the national income account, consumption, investment, money, interest, the price level, the level of employment, monetary and fiscal policy, and economic growth. Pr.: Econ. 110.
225 420. Intermediate Microeconomics. (3) I, II, S. An examination of the theories of consumer behavior and demand, and the theories of production, cost and supply. The determination of product prices and output in various market structures, and an analysis of factor pricing. Introduction to welfare economics. Pr.: Econ. 120.

225 430. Money and Banking. (3) I, II, S. Nature, principles and functions of money; development and operation of financial institutions in the American monetary system, with emphasis on processes,
problems, and policies of commercial banks in the United States. Pr.: Econ. 110.
225432. Public Finance. (3) I, II, S. Stabilization of the economy through fiscal policy, instruments and analysis of taxation, allocation of goods by the public sector (government spending). Pr.: Econ. 110.
225 455. Urban and Regional Economics. (3) II. An examination of the determinants of the economic performance of urban and regional economies, including theory, problems, and policy. Pr.: Econ. 120.

## UNDERGRADUATE AND GRADUATE CREDIT

225 620. Labor Economics. (3) I, S. History and philosophy underlying trade union organization and collective bargaining; analysis of selected major issues in the field of industrial relations, including wages, unemployment and inflation, and the concentration of economic and political power in unions and management. Pr.: Econ. 110.
225 627. Contemporary Manpower Problems. (3) II. Impact of automation and technological change of the labor force; employment, unemployment, and manpower trends; labor-management relations and policies; training, retraining and education; case studies of labormanagement adjustment to technological change. Pr.: Econ. 620 or consent of instructor.
225 631. Principles of Transportation. (3) II, some S. The historical development and economic importance of rail, motor, air, water, and pipeline transportation in the United States-routes, services, rates, public regulation. Pr.: Econ. 110.
225 632. Economics of State and Local Government. (3) II. Analysis of the fiscal operation of state and local government; Determinants of growth in public expenditures, provision of optimum amount of public goods, forms of state and local taxation, non-tax source of government finance. Pr.: Econ 420 or 432 or consent of instructor.
225 636. Economic Systems. (3) I, some S. A survey of economic systems. Marxian socialism and modern socialism, giving attention to the English socialism, communism, and to the essential characteristics of the free enterprise capitalistic system. Pr.: Econ. 110.
225 640. Industrial Organization and Public Policy. (3) I. An examination of measures and determinants of industrial concentration, and an analysis of market structure, conduct, and performance, and policies related to performance. Pr.: Econ. 120.
225 681. International Trade. (3) I, some S. Economic principles underlying international trade and finance; governmental policies toward international trade; procedures in exporting and importing. Pr.: Econ. 110. 225 682. Development Economics. (3) I, some S. Factors influencing the economic modernization of the less-developed countries. Emphasis on capital formation, investment allocation, structural transformation, population growth, development planning, and the international economics of development. Pr.: Econ. 120.
225 686. Business Fluctuations and Forecasting. (3) I, some S. Types of business fluctuations; measurement of business cycles; theories of the causes of business cycles; proposals for stabilizing business activity, techniques of forecasting business activity. Econ. 120.

225 690. Monetary, Credit, and Fiscal Policies. (3) II. Monetary, central bank, tax, public expenditure, and public debt policies; their influences on business activity and the price level. Utilization of such policies to maintain economic stability and progress. Pr.: Econ. 430.

225 699. Seminar in Economics. (1-3) Offered on sufficient demand. Seminars of special interest will be offered on demand. Pr.: Econ. 120.
225 730. Introduction to Econometrics. (3) II, some S. Analytical and quantitative methods used in economics. Applications to specific problems. Pr.: Math. 220 or 340 or equiv.
225 735. Mathematical Economics. (3) I. Application of mathematical tools of concrete problems in micro and macroeconomics; mathematical treatment of models of consumption, production, market equilibrium, and aggregate growth. Pr.: Econ. 420, Math. 221 or 340, or consent of instructor.
225 740. Managerial Economics. (3) Offered on sufficient demand. A study of maximizing an individual business firm's profits under conditions of (a) fixed supply and (b) variable supply for (1) a fixed time period and (2) multiple time periods. A critical appraisal will be made of efforts of business firms to increase profits by affecting the position and slope of the demand schedule for their products by different patterns of expenditure or advertising and selling. Pr.: Econ. 420.
225 795. Problems in Economics. Credit arranged. I, II, S. Advanced study on an individual basis is offered in money and banking, public finance, general economics, international trade, labor relations, transportation. Pr.: Background of courses needed for problem undertaken.

## GRADUATE CREDIT

225 801. Topics in Monetary Theory. (3) II. Deals with four fundamental questions of monetary theory-What is money? Does money matter? What is its role in economic stabilization? What is its role in economic growth? Pr.: Econ. 410 and Econ. 430.
225 805. Income and Employment Theory I. (3) II, S in even years. Determination of national income, employment, and the price level. The theories of J. M. Keynes are emphasized along with selected postKeynesian developments in theories of consumption, investment, money, the interest rate, and the price level. Pr.: Econ. 120 and 410 or consent of instructor.
225 806. Income and Employment Theory II. (3) II. Aggregative econometric models; dynamic analysisgrowth models, the stability of macroeconomic systems. Other current developments in macroeconomic theory. Pr.: Econ. 805 or consent of instructor.
225 810. History of Economic Thought. (3) I, some S. Development of economic ideas and doctrines and the relation of these to conditions existing when they were formulated. Pr.: Econ. 110.
225 815. Value and Distribution Theory. (3) I, S in odd years. Neoclassical value and distribution theory; theories of imperfect competition; introduction to general equilibrium theory and dynamic analysis. Pr.: Econ. 420 or consent of instructor.
225 820. Labor Economics Seminar. (3) I. A critical analysis of wage theories, collective bargaining and
unemployment problems. Pr.: Econ. 620 or consent of instructor.
225 823. Advanced International Economics. (3) II. Theoretical and policy issues related to the international monetary system, capital movements, exchange rate systems, the U.S. balance of payments, and trade of underdeveloped countries. Pr.: Econ. 681.
225 825. Location of Economic Activities. (3) II. Integration of effects of factors affecting location of economic activities; selection of strategies the people of an economic area can use to optimize their responses to expected technological and political changes, and changes in consumer demand. Pr.: Econ. 815.
225 835. Econometric Methods. (3) I. Quantitative methods of research used in economics. Pr.: Econ. 730 or consent of instructor.
225 840. Economic Welfare and Public Policy. (3) I. Theory of welfare economics, with application to current economic problems and policy. Pr.: Econ. 815 or consent of instructor.
225 845. Advanced Economic Theory. (3) II. A study of traditional theories of a firm and competitive market in the light of contemporary thought. General equilibrium theory. Modern microeconomic theories, with attention given to risk and uncertainty. Pr.: Econ. 815.
225 855. Theory and Methods of Regional Economic Analysis. (3) I. A consideration of differences in regional and urban growth; comparison of alternative growth theories; methods of analyzing regional economics such as input-output analysis, linear programming, industrial complex, and spatial interaction models. Pr.: Econ. 825 or consent of instructor.
225 860. Growth and Development Theories. (3) II. Advanced theories of economic growth; growth and development models. Topics include optimum savings, allocations of investment, investment criteria, technical change, programming models, and alternative designs for development policies. Pr.: Econ. 420, 682, 805, Math. 340, or consent of instructor.
225 880. Seminar in Economics. (3) I, II. Special topics in economic theory. Pr.: Graduate standing.
225 995. Research in Economics. Credit arranged. I, II, S. Research for thesis or master's report.

## English

## FRED H. HIGGINSON, Head of Department

Professors Davis," Higginson," Hummel,* Moses,* Noonan," and Rogerson; ${ }^{*}$ Associate Professors Adams, ${ }^{*}$ Ansdell, Eitner, " Jones," McCarthy, " McGhee, ${ }^{*}$ Nichols, ${ }^{*}$ Pennel, ${ }^{*}$ and White; Assistant Professors Brondell,* Conrow, Evans, Gillespie, Glenn,* Houser, Johnston,* Koch," Laman,* Lewis, Nyberg,* Psilos, Rees,* H. Schneider, M. Schneider,* Stewart,* and Weber; Instructors Cohen, Conover, Geissler, and Pelischek; Emeritus: Professors Aberle and Faulkner.

## UNDERGRADUATE STUDY

Students may elect to earn a B.A. in the department with a specialization in either English or American literature. The general requirement for both degrees is 30 semester
hours subsequent to English 120, 125 or 126. All majors (including Secondary Education majors in English) must take the comprehensive examination (Engl. 599) in the second semester of their junior year. For the B.A. in English literature, the following courses are required: English Survey I and II, American Survey I or II, one Shakespeare course, from six to twelve hours of English literature electives, from six to nine hours of American literature electives and up to six hours of other departmental electives. For the B.A. in American literature, the following courses are required: American Survey I and II, English Survey I or II, one Shakespeare course, from six to twelve hours of American literature electives, from six to twelve hours of English literature electives and up to six hours of other departmental electives. At least nine hours in either option must be in courses numbered 600 or above.

Students preparing to teach English in high school may adopt either of two programs: (1) the regular major as above, leading to the B.A. degree, or (2) the major in Secondary Education, leading to the B. S. degree. Either degree may allow teaching certification. Regular majors desiring certification should consult their advisers in the English Department; under the second option, the following courses are required: three of the Survey courses (Engl. 380, 381, 385 and 386.); one Shakespeare course; Advanced Composition (Engl. 406); Modern English Grammar (Engl. 451); Literature for Adolescents (Engl. 475) ; and nine hours of electives, six of which must be in courses numbered 600 or above. The English Comprehensive (Engl. 599) also is required.

The department offers many general education courses for the non-major student. All are intended to introduce such students to the appreciation of literature. Examples are: Engl. 143, 144, 146 and 147; 230; 240; 251, 256, 270 and $275 ; 340 ; 345 ; 350 ; 360 ; 370$ and 375 . In general it is proper to substitute in any program of study an advanced course for an elementary one, if the student so elects and the teacher consents. Only one course among Engl. 230, 240, 340 and 345 may be taken for major credit.

## GRADUATE STUDY

Both the M.A. and the Ph.D. are awarded by the department. For the Ph.D., the em-
phasis may be on either English or American literature; for the M.A., the emphasis may be on creative writing or linguistics, in addition to the two literatures.

Candidates for graduate work should have completed an undergraduate major with at least 24 hours in English above freshman composition; otherwise, they will be asked to do additional undergraduate work to make up deficiencies. The Graduate Record Examination is required for entrance, and additional requirements of the Graduate School may be found in the appropriate section of this catalogue.

Requirements for the M.A. include a minimum of 30 semester hours of course work and research. Candidates must demonstrate competence in one foreign language, usually French or German. A written and an oral examination are required. A report, thesis, or satisfactory presentation of acceptable papers is required, as are Engl. 790 (unless waived) and 801.

Requirements for the Ph.D. include some 60 semester hours of course work and 30 of research on the dissertation. Candidates must demonstrate competence in two foreign languages or in one foreign language plus a specified substitute for the second. They must pass a written and oral preliminary examination in both English and American literature, write an acceptable dissertation and defend it in a final oral examination.

For more detailed and current information about either the M.A. or the Ph.D., consult the Director of Graduate Studies, Department of English.

## Courses in English

## UNDERGRADUATE CREDIT

229 030. Writing Laboratory. (0) I, II, S. Laboratory practice in writing for all students who need review in fundamentals of composition. Especially designed for students who have difficulty in meeting standards in English Composition I and II.
229 075. English for Foreign Students. (3) I, II, S. Review of English usage for students whose first language is not English; designed to improve understanding and usage. While hours will count in the grade-point average, hours are not applicable toward degree requirements. Required of all students not making a satisfactory TOEFL or ETS score. Students may also be admitted on recommendation of their advisor.
229 100. English Composition I. (3) I, II, S.
229 110. English Composition IH. (3) I, II, S.

229 111. English Composition IS. (3) I. Reading and composition for freshmen. Composition IH is for freshmen who score high on their entrance examination in English and who are interested in pursuing a more sophisticated and challenging program than that of I. Composition IS is open only to students in the Arts and Sciences Honors Program.
229 120. English Composition II. (3) I, II, S. Continues Engl. 100.
229 125. English Composition IIH. (3) II. Continues Engl. 110.
229 126. English Composition IIS. (3) II. Continues Engl. 111. Engl. 120 concentrates on critical reading and evaluation. Engl. 125 and 126 place an emphasis on literary forms and themes. Students who have taken Engl. 100 may, on the recommendation of their instructor, be admitted to Engl. 125. Otherwise, admission is on a similar basis to that for Engl. 100, 110 and 111.
229 143. Humanities: Classical Cultures. (3) I, S.
229 144. Humanities: Medieval and Renaissance. (3) II, S.

229 146. Humanities: Baroque and Enlightenment. (3) I, S.
229 147. Humanities: Modern. (3) II, S. The four courses above seek to develop a greater understanding, appreciation, and enjoyment of the humanistic resources of Western culture. The student is introduced to the great works of literature, philosophy, art, music and religion in each major period. The courses may be taken individually and in any order.
229 200. English Composition III. (3) I, II, S. Advanced exposition and argumentation. Pr.: Engl. 120, 125 or 126.
229 230. Introduction to Fiction. (3) I, II. Selected short stories, novellas and novels from world literature, with emphasis on the present. Concern for the forms of fiction and critical analysis. Pr.: for freshmen, consent of the instructor.
229 240. Introduction to the Short Story. (3) I, II, S. American, British and Continental stories are studies. Pr.: Engl. 120, 125 or 126.
229 251. English Literature I. (3) I, II, S. Major works to about 1700 , selected for the general student; emphasizing Chaucer, Shakespeare and Milton. Not for English majors. Pr.: Engl. 120, 125 or 126.
229 256. English Literature II. (3) I, II, S. Major works since about 1700, selected for the general student. Not for English majors. Pr.: Engl. 120, 125 or 126.

229 270. American Literature I. (3) I, II, S. Major works selected for the general student. Not for English majors. Pr.: Engl. 120, 125 or 126.
229 275. American Literature II. (3) I, II, S. Major works, including the modern, selected for the general student. Not for English majors. Pr.: Engl. 120, 125 or 126.

229 340. Introduction to Poetry. (3) I, II; S. in alt. years. Close reading of poems and analysis of poetic genres, with emphasis on modern poetry. Pr.: Engl. 120, 125 or 126.

229 345. Intorduction to Drama. (3) I, II. Study of drama from classical times to the present. Pr.: Engl. 120, 125 or 126.

229 350. Introduction to Shakespeare. (3) I, II, S. Study of representative comedies, histories and tragedies. Pr.: Engl. 120, 125 or 126.
229 360. Modern American Novel. (3) I, II, S. An introductory study of selected novels. Pr.: Engl. 120, 125 or 126.

229 370. Books and Men I. (3) I, II, S. Introduction to great world classics from present to past. Not for English majors. Pr.: Engl. 120, 125 or 126.
229 375. Books and Men II. (3) I, II, S. Continues Engl. 370. Not for English majors. Pr.: Engl. 120, 125 or 126.

229 380. English Survey I. (3) I, II, S. English literature from Anglo-Saxon times to the close of the Elizabethan period. Required of majors in English literature. Pr.: Engl. 120, 125 or 126.
229 381. English Survey II. (3) I, II, S. English literature from Milton to the end of the nineteenth century. Required of majors in English literature. Pr.: Engl. 120, 125 or 126.
229 385. American Survey I. (3) I, II, S. An introductory review of our literary history from the early accounts of colonization through the American Renaissance. Required of majors in American literature. Pr.: Engl. 120,125 or 126.
229 386. American Survey II. (3) I, II, S. An introductory review of our literary history from Whitman to the present. Required of majors in American literature. Pr.: Engl. 120, 125 or 126.
229 390. Humanities Abroad. (0-6) Interterm and-or S. A concentrated study tour of selected European cultural centers; credit is arranged at the rate of about 1 credit hour per week abroad. Preliminary attendence for one class study session a week in the preceding semester is required of on-campus undergraduates enrolled in the course. If credit is to be applied toward the degree, at least three hours of appropriate courses in the department are required.
229 397. Honors Seminar in Humanities. (1) I, II. Colloquium on the interrelationships of the humanities, including art, literature, music and philosophy. Pr.: Honors students only.
229 398. Junior Honors Colloquium. (Variable credit) I, II. Open only to juniors in the Arts and Sciences Honors Program.
229 399. Honors Seminar in English. (1) I, II. Readings and colloquia in selected masterpieces. For non-English majors in the Honors Program. May not be used to satisfy the three-course requirement in Humanities. Pr.: Honors students only.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

229 406. Advanced Composition. (3) I, II, S. Expository writing, primarily for candidates for the teaching certificate in Secondary Education. Pr.: Engl. 120, 125 or 126.

229 430. Narrative Writing I. (3) I. Subjects selected from the student's particular field of work; exposition of mechanisms, processes, and general expository writing. Pr.: Consent of instructor only.
229 436. Narrative Writing II. (3) I. Narrative writing, both in its relation to the other forms of composition and as an independent form. Direction and criticism of thesis
work are offered to graduate students. Pr.: Consent of instructor only.
229 451. Modern English Grammar. (3) I, II, S. A systematic study of the structure of the English language and a consideration of current theories of analysis, such as traditional, structural and transformationalgenerative. Primarily for candidates for the teaching certificate in Secondary Education-English or for elementary language Arts majors. Pr.: Engl. 120, 125 or 126.

229 470. Literature for Children. (3) I, II, S. A survey of the field of literature for children, providing an opportunity for reading and evaluating books for children. For teachers of elementary grades and students of child guidance. Pr.: Engl. 120, 125 or 126.
229 475. Literature for Adolescents. (3) I, II, S. Selecting, reading and evaluating books for adolescents. For teachers in the junior and senior high school and students of guidance for adolescents. Pr.: Engl. 120, 125 or 126, and junior standing.
229 520. English Bible. (3) I, II, S. The Bible as literature and history; cultural and historical backgrounds of the Old Testament. Pr.: Engl. 120, 125 or 126.

229 560. American Folklore and Folk Literature. (3) I, II, S. Fold tales, heroes and beliefs; ballads; the literature developed from folk beginnings. Pr.: Engl. 120, 125 or 126.
229 599. English Comprehensive. (0) I, II, S. Required of all majors; based both on a departmental reading list and on the scope of literature covered in the English and American Survey courses. To be taken in the second semester of the junior year.

## UNDERGRADUATE AND GRADUATE CREDIT

229 620. The Epic Tradition. (3) II. Greek and Roman masterpieces in translation as background for the study of literature. Pr.: Junior standing.
229 625. Medieval Narrative. (3) II. A survey of nonChaucerian literature, with stress on the Arthurian romances. Pr.: Engl. 120, 125 or 126.
229 630. Chaucer. (3) I, II, S. Pr.: Engl. 120, 125 or 126. 229 641. Elizabethan Non-dramatic Literature. (3) I in alternate years. An introduction to the literature of the English Renaissance. Pr.: Engl. 120, 125 or 126.
229 645. English Drama to 1642. (3) I, S in alt. years. A survey of the dramatic literature of Elizabethan and Jacobean times, exclusive of Shakespeare. Pr.: Junior standing.
229 646. Restoration and Eighteenth Century Drama. (3) I, S in alt. years. A survey of English dramatic literature from 1660 to 1800 . Pr.: Junior standing.
229 653. Shakespearean Drama I. (3) I; S in alt. years. A study of Shakespearean drama from the first plays through about 1600 , with an emphasis on the histories and comedies; special attention to the criticism and bibliography. Pr.: junior standing.
229 654. Shakespearean Drama II. (3) II; S in alt. years. A study of Shakespearean drama from about 1601 through the last plays, with an emphasis on the mature tragedies and the romances; special attention to the criticism and bibliography. Pr.: junior standing.

229 655. The Folk Tale. (3) II. Study of oral tradition in the folklore of various cultures, with literary analogues. Pr.: Engl. 560 and consent of instructor.
229 665. Seventeenth Century Literature. (3) II, S. A survey of the principal non-dramatic writers, apart from Milton. 1600-1660. Pr.: Junior standing.
229 671. Milton. (3) II, S. Pr.: Engl. 120, 125 or 126.
229 681. Eighteenth Century I. (3) I, S. English literature from the Restoration to the death of Swift, with emphasis on Dryden, Swift and Pope. Pr.: Engl. 120, 125 or 126.
229 686. Eighteenth Century II. (3) II, S. The age of Dr. Johnson and the beginnings of Romanticism. Pr.: Engl. 120,125 or 126.
229 688. Early American Literature. (3) I. Literary beginnings in seventeenth-century Virginia and New England; eighteenth century prose and poetry, including the first plays and novels. Special attention to Edward Taylor, John Woolman, Jonathan Edwards, Benjamin Franklin and Philip Freneau. Pr.: Junior standing and at least one other literature course.
229 691. English Novel I. (3) I, S. A survey of British fiction from Defoe to the Brontes. Pr.: Engl. 120, 125 or 126.

229 696. English Novel II. (3) II, S. A survey of British fiction from Dickens and Thackeray to Galsworthy and Bennett. Pr.: Engl. 120, 125 or 126.
229 699. English Seminar. (3) I, II, S. Intensive study of the writings of a single major author, British or American. Pr. : Senior or graduate standing and consent of instructor.
229 705. The Romantic Movement. (3) I, S. The poetry and prose of Blake, Wordsworth, Coleridge, Byron, Shelley and Keats. Pr.: Engl. 120, 125 or 126.
229 709. The New England Transcendentalists. (3) II in alt. years, S. A study of the Transcendental Movement, with emphasis on Emerson and Thoreau. Pr.: Engl. 120, 125 or 126.
229 711. Nineteenth Century American Poetry. (3) II in alt. years, S. A survey beginning with Bryant, and with special attention to Poe, the Brahmins, Emerson, Whitman, Melville and Dickinson. Pr.: Engl. 385 or consent of instructor.
229 715. Nineteenth Century American Fiction I. (3) I, S. Emphasis on Brown, Irving, Cooper, Poe, Hawthorne and Melville. Pr.: Engl. 385.
229 718. Nineteenth Century American Fiction II. (3) II, S. Emphasis on Twain, James, Howells, Crane and Norris. Pr.: Junior standing or consent of instructor.
229 720. The Victorian Era. (3) II, S. The poetry of Arnold, Browning and Tennyson; the criticism of Arnold; additional related prose. Pr.: Junior standing.
229 725. Nineteenth Century British Prose. Significant prose writing of the period from Edmund Burke to Samuel Butler and Walter Pater, with an emphasis on Thomas Carlyle. Pr.: Junior standing.
229 730. American Humor and Satire. (3) II, S. Emphasis on works produced in the nineteenth and twentieth centuries. Pr.: Junior standing.
229 740. Twentieth Century English Novel. (3) II. British fiction from Conrad and Joyce to Greene and Waugh. Pr.: Engl. 120, 125 or 126.

229 744. Twentieth Century American Novel. (3) I, S. American fiction form Dreiser to contemporary figures. Pr.: Engl. 120, 125 or 126.
229 745. Twentieth Century American Short Story. (3) II, S. The development of the form since 1900. Pr.: Engl. 120, 125 or 126.
229 750. Twentieth Century English Poetry. (3) I. Development of English poetry from Hardy and Yeats to the present. Pr.: Engl. 381 or consent of instructor.
229 755. Twentieth Century American Poetry. (3) II, S. Development of American poetry from Robinson and Frost to Eliot and the present. Pr.: Engl. 386 or consent of instructor.
229 760. Twentieth Century English Drama. (3) I, S. Pr.: Junior standing.
229 765. Twentieth Century American Drama. (3) II, S. American drama from O'Neill and Anderson to Miller and Williams. Pr.: Junior standing.
229 775. Creative Writing. (3) I, II. Imaginative writing, with particular emphasis on the short story. May not be taken more than twice. Pr.: Engl. 430 or consent of instructor.
229 780. Literary Criticism. (3) I, S. Major points of view in modern American and British criticism, with practice in the analysis and judgment of individual literary works. Pr.: Senior standing.
229 790. History of the English Language. (3) II, S. The development of British English, with digressions. Pr.: Senior standing or consent of instructor.
229 799. Problems in English. (Variable credit) I, II, S. Studies in major authors, genres and periods of English and American literature and language. Pr.: Background of courses needed for problem undertaken.

## GRADUATE CREDIT

229 801. Introduction to Secondary Sources. (0) I, S. An introduction to author and period bibliography, required in the first year of study toward the M. A. in English.
229 802. Bibliography and Methods of Research. (3) I, S. An introduction to textual, bibliographic and professional problems, required of $\mathrm{Ph} . \mathrm{D}$. candidates.
229 810. Old English. (3) I, S. The elements of Old English grammar, with readings in prose and poetry. Pr.: Consent of instructor.
229 811. Old English Poetry. (3) II, S. Pr.: Engl. 810 or consent of instructor.
229 812. Middle English Poetry. (3) I. Pr.: Engl. 790 or consent of instructor.
229 820. Selected Topics in the Study of Language. (3) On demand. Pr.: Engl. 790 or consent of instructor.
229 830. Chaucer Seminar. (3) On demand. Pr.: Engl. 630.

229 845. Studies in Sixteenth Century Literature. (3) On demand. Pr.: Consent of instructor.
229 850. Shakespeare Seminar. (3) On demand. Pr.: Engl. 651.
229 855. Studies in Seventeenth Century Literature. (3) On demand. Pr.: Consent of instructor.
229 870. Milton Seminar. (3) On demand. Pr.: Engl. 671 or consent of instructor.
229 875. Studies in Eighteenth Century Literature: British. (3) On demand. Pr.: Consent of instructor.

229 876. Studies in Eighteenth Century Literature: American. (3) On demand. Pr.: Consent of instructor. 229 885. Studies in Nineteenth Century Literature: British. (3) On demand. Pr.: Consent of instructor.
229 886. Studies in Nineteenth Century Literature: American. (3) On demand. Pr.: Consent of instructor. 229 895. Studies in Twentieth Century Literature: British. (3) On demand. Pr.: Consent of instructor.
229 896. Studies in Twentieth Century Literature: American. (3) On demand. Pr.: Consent of instructor. 229 899. Master's Report. (2) I, II, S.
229 920. Topics in Poetry. (3) On demand. Intensive study of a poet or group of poets, either British or American. Pr.: Consent of instructor.
229 930. Topics in Drama. (3) On demand. Intensive study of a dramatist or group of dramatists, either British or American. Pr.: Consent of instructor.
229 940. Topics in Fiction. (3) On demand. Intensive study of a novelist or group of novelists, either British or American. Pr.: Consent of instructor.
229 999. Research in English. (Variable credit) I, II, S. Pr.: Sufficient training to carry on the research undertaken.

## Courses in Linguistics Offered Jointly With the Department of Speech

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

229 455. General Phonetics. (3) Same as Speech 455.

## UNDERGRADUATE AND GRADUATE CREDIT

229 652. Introduction to Linguistics. (3) I, II, S. Same as Speech 652.
229 664. Topics in Applied Linguistics. (3) II. Same as Speech 664 .
229 669. Language Typology. (3) Same as Speech 669. 229 672. Transformational Grammar. (3) Same as Speech 672.
229 673. Introduction to Historical Linguistics. (3). Same as Speech 673.
229 674. Methods and Techniques of Learning a Second Language. (3). Same as Speech 674.
229 676. Phonetics and Phonemics of English. (3). Same as Speech 676.
229 677. Morphology and Syntax of English. (3). Same as Speech 677.

## Geography

## W. R. SIDDALL,* Head of Department

Professor Stacey;* Associate Professors Kromm,* Siddall,* and Stover; * Assistant Professors Bussing, Self,* and Seyler; Emerita: Instructor Larson

Geographers, in studying the differences in human activities from one place to another, deal with vital questions about current national and international situations. Why are the people of some areas wealthy and those of other regions poor, some well-fed and others
starving, some industrialized and some agricultural, some free and others enslaved?

In their attempts to answer such questions geographers draw upon other disciplines, especially in the social sciences, in order to discern the various interrelated factors which combine to bring about particular conditions in specific areas. Geography is, therefore, a very broad inquiry into the state of the world today, advanced by bringing together the ideas and concepts of many disciplines to obtain some measure of understanding about specific areas.

Professional opportunities for students trained in geography exist especially in government service, teaching, planning, and business; and for the non-professionally oriented student it is a study characterized by a broad and liberalizing approach to worldwide political, social, and economic conditions.

## UNDERGRADUATE STUDY

Requirements for a major in geography under the curriculum leading to the Bachelor of Arts degree (see page 81) consist of a minimum of 28 hours in geography. Included in this total must be Geog. 150, 151, 250, 260, 350 , and 550 , plus a minimum of 8 additional hours of geography courses numbered 500 or above.

The student also has the option of majoring in geography under a curriculum leading to a Bachelor of Science degree. The geography requirements are the same, although the University requirements differ as described elsewhere (see page 81).

A third curriculum is available leading to the Bachelor of Science degree in Secondary Education. For information concerning this program see the College of Education section of this catalog.

## GRADUATE STUDY

Graduate work in geography is offered in the human and regional aspects of the discipline. Closely related courses in the fields of history, economics, regional planning, and agriculture, and courses offered under the auspices of the South Asia Center, may be made an integral part of the student's program. All candidates for the Master of Arts degree are required to take Geography 800 and 900 .

The student may choose, in consultation
with his adviser, either of two programs leading to the M. A. degree. Option A requires 30 hours of graduate credit including 6 hours of credit for a thesis. Of the 24 hours of credit required in course work, not less than 15 hours must be in geography. Some students, especially those interested in a career in public school teaching, may find Option B, which is a non-thesis program, more suitable. Option B requires 30 hours of graduate credit including 2 credits of Geography 970 in which a written report is offered. At least 18 credit hours must be in geography. Option B is not an appropriate choice for any student who may ultimately decide to pursue additional graduate work beyond the master's level.

The Geography Department is equipped with a small reference library, a good collection of research maps, a cartography laboratory, and a seminar room, and the University Library contains a large collection of geographical journals.

## COURSES IN GEOGRAPHY

UNDERGRADUATE CREDIT
229 110. World Regional Geography. (3) I, II, S. Introduction to geography structured on a framework of major world regions and countries. With the regional approach is an explicit discussion of the essential concepts of certain systematic specialties, such as political, social, economic and urban geography.
235 130. Geography of Kansas. (2) I, II, S. A regional geographical analysis of Kansas including discussion of climate, landforms, soil, water, and minerals as well as patterns of settlement, population, agriculture, industry, transportation and urban development.
235 150. Physical Geography I. (4) I, II, S. A geographic study of the natural environment. Climatic elements and types, natural vegetation, and soils; their major characteristics, areal distribution, and relevance to man. Three hours lec. and two hours lab. a week.
235 151. Physical Geography II. (4) I, II. Cont. of Physical Geography I. Mapping, surface forms of the land, occurrence of minerals, and oceanography, together with an analysis of the interrelationships of the various elements of landscape, including the human impact. Three hours lec. and two hours lab. a week. Pr.: Physical Geography I.
235 250. Geography of the Extractive Industries. (3) I, II. A study of the spatial variations and world distribution of agriculture, forestry, mining, and fishing together with discussion of the various economic, social, and political principles giving rise to these distributions.
235 260. Geography of Manufacturing and Commerce. (3) I, II. An inquiry into the location of the more important manufacturing industries and the patterns of commercial interchange together with an examination of these distributions in terms of current concepts of industrial location and spatial interaction.

235 350. Cartography. (3) II. Theory, interpretation, and design and drafting of maps, with emphasis on presenting quantitative data.
235 390. Experimental Studies in Geography. (1-6). Experimental and interdisciplinary studies in geography. Topics selected in consultation with instructor. Pr.: Permission of instructor.
235 399. Honors Seminar in Geography. (1) Selected topics. Open to non-majors in the Honors Program.

## UNDERGRADUATE AND GRADUATE CREDIT

235 405. Introduction to the Civilization of South Asia I. (3) I. An interdisciplinary survey of the development of civilization in South Asia, geographical and demographic context, philosophical and social concepts, social and political institutions, literature, and historical movements. (Same as Hist. 405, P. Sci. 405, Soc. 405, Anthro. 405.)
235 406. Introduction to the Civilizations of South Asia II. (3) II. Interdisciplinary survey of recent and contemporary civilization in India, Pakistan, Ceylon, Nepal, and Afghanistan, including recent history, current economy, religions, culture, languages, literature, geography, social and political structure, ideas. (Same as Hist. 406, P. Sci. 406, Soc. 406, Anthro. 406.
235 550. Pro-Seminar in Geography. (2-3) II. A survey of geography as a profession-its philosophy and its methodology. Graduation requirement for all undergraduate majors in geography. Not open to graduate students. Pr.: Four courses in geography or consent of instructor.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

235 600. Geography of Anglo-America. (3) A regional analysis of the United States and Canada, giving special attention to the historical, political, and economic factors which contribute to a real differentiation within the area. Pr.: Three hours of geography or junior standing.
235 610. Historical Geography of the United States and Canada. (3) The geography, during selected past periods, of the area now occupied by these countries; description, explanation, and evaluation of changing distributional patterns, with emphasis on settlement and land use. Pr.: Junior standing or consent of instructor.
235 620. Geography of Latin America. (3) A broad survey of the physical and human patterns of the Latin American culture area, past and present, with emphasis on the changing landscape features in the successive patterns of human occupancy. Pr.: Six hours of geography or junior standing.
235 640. Geography of Western Europe. (3) The nations and regions of Europe west of the U.S.S.R.; the people and their economics; trends of development as affected by changing political and economic factors. Pr.: Six hours of geography or junior standing.
235 650. Geography of the Soviet Union. (3) Geographic regions of the U.S.S.R.; the agriculture, minerals, manufacturing, and settlement in each, particularly as affected by climatic and locational factors. Pr.: Six hours of geography or junior standing.
235 660. Geography of Eastern Asia. (3) Relationships between oriental land resources, agriculture, industry, and population; trends in economic and political
development in Eastern and Southern Asia, with concentration in India, China, and Japan. Pr.: Six hours of geography or junior standing.
235 670. Geography of Australia and New Zealand. (2) Present conditions and prospects, with special attention to regional structure, economic development, and roles of these countries in world trade. Pr.: Six hours of geography or junior standing.
235 690. Seminar in Regional Geography. (1-3) Pr.: Consent of instructor.
235 700. Political Geography. (3) The interrelationship between large political units and geography; location, size, boundaries, and resources as they affect the strength of nations. Pr.: Three hours of geography or junior standing.
235 710. Geography of World Agriculture. (3) Distribution, variations, and significance of the major types of agriculture. Pr.: Junior standing or consent of instructor.
235 720. Urban Geography. (3) A study of geographic principles relating to the distribution, function, and structure of cities; a geographic analysis and classification of urban settlements. Pr.: Six hours of geography or consent of instructor.
235 740. Geography of Transportation. (3) A consideration of the nature of spatial interaction, the various kinds of transport media, and the relationship between transportation and economic and social patterns. Pr.: Six hours of geography and-or economics, or consent of instructor.
235 760. Resource Utilization and Economic Development. (3) An examination of the role of resource utilization in developing the structural arrangement of economic activity, considered in different political and cultural contexts. Pr.: Six hours of geography or junior standing.
235 770. Quantitative Analysis in Geography. (3) II. Quantitative methods employed in modern geographical research. Applications of both statistical and mathematical approcahes will be treated. Emphasis will be placed on interpretation and evaluation of techniques employed in spatial analysis. Pr.: Statistics 520, or consent of instructor.
235 780. Seminar in Cultural-Economic Geography. (13) Pr.: Consent of instructor.

235 790. Problems in Geography. Credit arranged. I, II, S. Pr.: Nine hours of geography and consent of instructor.

## GRADUATE CREDIT

235 800. Graduate Colloquium. (1) I. The nature, aims, methods, and evaluation of geographical research. Required of all graduate students majoring in geography.
235 820. Advanced Economic Geography. (3) Economic and place factors in the shifting locations of major production: agricultural, mineral, manufacturing and other world industries. Lecture and seminar.
235 860. Cultural Geography. (3) A study of the forms of human occupancy of landscapes, with consideration of innovations in the use of the landscape, the origins and dispersals of these innovations, and human attitudes toward the natural environment.

235 900. History and Philosophy of Geography. (2) A critical examination of the aims and methods of geography, especially in terms of its historical development and its logical structure. Pr.: Open to all graduate students in social sciences.
235 970. Master's Report. (2) I, II, S. For students enrolled in Geography Option B. Pr.: Registration in Graduate School, with sufficient training to carry on the line of research undertaken.
235 980. Research in Geography. Credit arranged. I, II, S. Pr.: Registration in Graduate School, with sufficient training to carry on the line of research undertaken.

## Geology

PAGE C. TWISS,* Head of Department
Professors Beck, ${ }^{*}$ Chelikowsky, ${ }^{*}$ Shenkel, ${ }^{*}$ and Twiss;* Associate Professors Brookins.* Chaudhuri,* and Walters;* Assistant Professors Riseman* and West;* Instructor Clark; Emeritus: Professor Sperry.*
Traditionally defined as the study of the Earth's composition, behavior, and history, geology now includes the study of the members of the solar system. As a science, it is both practical and highly theoretical. "What type of foundation is necessary to support a 14 -story building in Atlantic City?," "Where can Kansas City find unpolluted water for an increasing population?," "What are the world's reserves in oil and natural gas and where can more be found?," "How are mountains formed?," "Is the ocean floor spreading?," and "Can Mars support life?" are some of the questions geologists try to answer.

The Earth and other members of the solar system are dynamic physical systems composed of atoms interacting under extreme conditions of temperature and pressure. Consequently, geology relies heavily on other sciences-mathematics, physics, chemistry, biology, and astronomy. In the solar system, the Earth seemingly has been the only known habitat of life for at least the last billion years.

Geologists operate in two laboratories: the Earth itself (field laboratory) and the standard chemical, physical, or biologic laboratory. However, geologists cannot control the variables affecting the natural process operating in the field, as a chemist can control the variables experimentally in a laboratory. Geologists are the observers of processes in operation or already concluded and often must deduce conclusions from incomplete data or by analogy with events that may be reproduced in part in a laboratory.

## UNDERGRADUATE STUDY

Geology offers optional programs of study in Geology, Geochemistry, Geophysics, cooperates with the College of Education in an Earth Science program for high school teachers, and cooperates with the Department of Civil Engineering in a dual degree in Civil Engineering and Geology. For detailed plans of study, consult the head of the department.

## Geology Option

In addition to the requirements for a geology major in the B.A. or B.S. degree program (p. 81), the following must be completed: Geol. 100, 420, 430, 460, 461, 470, 480, 481, 530, 603, and 640; Math. 220 and 221 Phys. 211 and 212; Chem. 210, 230, and 250; Biol. 205 and 210.

## Geochemistry Option

In addition to the requirements on p .81 , the following must be completed: Geol. $100,430,460,461,470,480,530,600,603,605,612$, 614, and 640; Math. 220, 221, 222, and 240 ; Phys. 211 and 212; Chem. 210, 230, 250, 271, 585, and 586; Biol. 205.

## Geophysics Option

In addition to the requirements on p .81 , the following must be completed: Geol. $100,430,460,461,470,530,603$, and 640; Math. 220, 221, 222 and 240; Phys. 211, 212, 400, 407, 408, 421, and 473; Chem. 210, 230, and 250; Biol. 205.

## Earth Science Options for High School Teachers

In addition to the requirements for a geology major in the B. A. or B. S. degree program (p. 81), the Teacher Certification requirements ( $p$ 184) and the following must be completed: Geol. 100, 420, 430 , and 460; Geog. 150; Math. 100 and 150 ; Chem. 210, 230, and 250; Biol. 205 and 210; Phys. 131, 135, 211, and 212.

## Dual Degrees in Civil Engineering and Geology

Students interested in a career in foundation engineering and construction must complete the B. S. degree requirements in Civil Engineering and complete the requirements for a B. A. or B. S. degree program (p. 81) and the following: Geol. $420,430,460,461,530,603$, and 640.

## GRADUATE STUDY

The prerequisite to graduate work for the M. S. degree in Geology and Geochemistry and the Ph. D. degree in Geochemistry is the completion of a four-year undergraduate program including suitable preparatory work in geology, chemistry, physics, mathematics, and the biological sciences.

Research facilities include a 6-inch, 60degree solid source mass spectrometer, emission spectrograph, X-ray diffractometer and spectrograph, a fully equipped geochemistry laboratory for isotopic work, complete petrographic, paleobiological and general geology laboratories. Geophysical facilities include a seismological observatory, seismic and magnetic exploration equipment.

The University area contains excellent outcrops and is unusually well situated for field work involving studies in sedimentary petrology, geochemistry, stratigraphy, groundwater geology, soil mineralogy, petroleum geology, plains-type structures, invertebrate paleobiology, and paleoecology.

## Courses in Geology

## UNDERGRADUATE CREDIT

234 100. Physical Geology. (4) I, II, S. The Earth's structural and dynamic features; the most common minerals and rocks; processes affecting the Earth; field trips. Three hours rec. and two hours lab. a week.
234 310. Topics in Geology. (1) I, II. Seminar discussions of subjects of current interest in geology. Pr.: Geol. 100.
234 399. Honors Seminar in Geology. (1-3) I or II. Selected topics. Open to nonmajors in the Honors Program.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

234 406. Earth Science Institute. (8) S. A study of the integrated physical sciences encompassing the Earth's crust; patterns on the Earth's surface and in the Earth's atmosphere; includes the description and interaction of the atmosphere, weather, climate, composition, and processes of the Earth. Five hours lec., five hours rec. and 6 hours lab. a week and a five-day field trip into the Rocky Mountains. Pr.: Geol. 100 or Geog. 150.
234 412. Earth Science. (4) S. A critical study of the atmosphere, weather, climate, composition and processes of the Earth; also, the interaction of these in producing the pattern of landforms and human activity. Three hours rec. and three hours lab. a week. Pr.: Geol. 100 or Geog. 150 or junior standing.
234 420. Geomorphology. (4) I, II, S. Various landforms and their evolution; geologic interpretation of landscapes, especially of features in the United States; interpretation of topographic maps. Three hours rec. and three hours lab. a week. Pr.: Geol. 100.

234 430. Historical Geography. (4) I, II, S. Physical and biological events through which the earth has gone. Three hours rec. and three hours lab. a week. Pr.: Geol. 100.

234 440. Petroleum Geology. (3) I or II. Origin, migration, and accumulation of petroleum. Stratigraphy and structure of important fields. Three hours rec. a week. Pr.: Geol. 430.
234 460. Mineralogy I. (4) I. Fundamentals of crystallography and crystal chemistry; physical properties of crystals; descriptive mineralogy of nonsilicates. Three hours lec. and three hours lab. a week. Pr.: Geol. 100 and Chem. 230.
234 461. Mineralogy II. (4) II. Descriptive mineralogy of the silicates; fundamental geochemistry; microscopic identification of minerals and rccks. Three hours lec. and three hours lab. a week. Pr.: Geol. 460.
234 470. Field Methods in Geology. (2) I or II. Construction of geologic maps; application of field methods to the problems of geology. One hour rec. and three hours lab. a week. Pr.: Geol. 430.
234 480. Paleobiology l. (3) I. Concepts and problems of paleobiology; systematic approach to lower invertebrate phyla and marine calcareous algae with emphasis on fossil forms. Two hours rec, and three hours lab. a week. Pr.: Geol. 430 or Biol. 198 or 201 or 205 or consent of instructor
234 481. Paleobiology II. (3) II. Continuation of Paleobiology I dealing with higher invertebrate phyla with fossil records. Two hours rec. and three hours lab. a week. Pr.: Geol. 480.
234 530. Structural Geology. (4) I or II. Mechanics of the Earth's crust; interrelation of structures in the earth. Three hours rec. and three hours lab. a week. Pr.: Geol. 470.

## UNDERGRADUATE AND GRADUATE CREDIT

234 600. Optical Mineralogy and Petrography I. (3) I. The polarizing microscope; optical properties of crystals; optical properties and identification of common rock-forming minerals as crushed fragments and in thin sections; mineral paragenesis. Two hours lec. and three hours lab. a week. Pr.: Geol. 461.
234 601. Geologic Reports and Illustrations. (2) I or II. Preparation and representation of geologic reports and illustrations. Two hours rec. a week. Pr.: Geology majors with senior or graduate standing.
234 602. Economic Geology. (3) I or II. Origin and mode of occurrence of nonmetallic minerals, including coal and petroleum, and of metallic mineral deposits. Two hours rec. and three hours lab. a week. Pr.: Geol. 430, 461.

234 603. Stratigraphic Geology. (4) I or II. Description, classification, and correlation of stratigraphic units, with emphasis on those of Kansas. Three hours rec. and three hours lab. a week. Pr.: Geol. 480.
234 604. Paleoecology. (3) I or II. Application of biological, physical, and chemical factors in modern marine environments to the quantitative study of the structure and dynamics of fossil populations and communities. Two hours rec. and three hours lab. a week. Pr.: Geol. 480 or consent of instructor.
234 605. Optical Mineralogy and Petrography II. (3) II. Continuation of study of common rock-forming minerals;
introduction to study of rocks in thin section. Two hours lec. and three hours lab. a week. Pr.: Geol. 600.
234 610. Applied Geology. (3) I or II. Geology applied to the science of engineering in urban and regional planning. Two hours rec. and three hours lab. a week. Pr.: Consent of instructor.
234 612. Geochemistry I. (3) I or II. Application of chemical principles to geologic systems; emphasis on low-temperature aqueous equilibrium, oxidationreduction, crystal chemistry, thermodynamics, high temperature phase equilibria. Three hours rec. a week. Pr.: Chem. 585 or equiv., Geol. 605 or consent of instructor.
234 614. Geochemistry II. (3) I or II. Thermodynamics of high temperature and pressure phase equilibrium applied to igneous and metamorphic rocks and ore deposits. Three hours rec. a week. Pr.: Geol. 612 or equiv.
234 620. Geology of Subsurface Water. (3) I or II, alternate years. Introduction to origin, geologic occurrence, and migration of subsurface water; basic laws governing ground-water flow and yield of aquifers with practical applications. Three hours rec. a week. Pr.: Geol. 420, 530, or 603 , or consent of instructor for nongeology majors.
234 640. Field Geology. Credit arranged. S. Opportunity is offered students to do field work in the Rocky Mountains. Students interested should consult the head of the department.
234 660. Micropaleontology. (3) I or II. Preparation, identification, and use of microscopic fossils. One hour rec. and six hours lab. a week. Pr.: Geol. 481 and junior standing.
234 670. Subsurface Methods. (3) I, II. Study of well cutting, electric logs, and radioactive logs as applied to subsurface mapping of rocks and their fluid content. One hour rec. and six hours lab. a week. Pr.: Geol. 440, 461 or consent of instructor.
234 680. Vertebrate Paleontology. (3) I or II. Evolution, geologic history, and classification of the vertebrate. Pr.: Geol. 430 or 8 hours of biology.
234 720. Pleistocene Geology. (2) I or II. Pleistocene stratigraphy and its development in North America; correlation of European and North American Pleistocene rocks. Two hours rec. a week and one field trip a semester. Pr.: Geol. 420.
234 740. Regional Geology. (3) I or II. Structure and stratigraphy of the major tectonic units of North America. Pr.: Geol. 530, 603.
234 750. Aerial Photogeology. (3) I or II. Interpretation and use of aerial photographs; characteristics of photographs; adjustment of geologic, cultural, and topographic detail. One hour rec. and six hours lab. a week. Pr.: Geol. 470.
234 790. Problems in Geology. Credit arranged. I, II, S. Work is offered in mineralogy, paleobiology, paleoecology, stratigraphy, structural geology, sedimentary petrology, and geochemistry. Pr.: Background of courses needed for problem undertaken.

## GRADUATE CREDIT

234 800. Graduate Seminar in Geology. Variable credit. I, II. Topics in geology, geochemistry and geophysics.

234 801. Advanced Paleobiology. (1-4) I or II. Detailed study of the functional morphology, ecology, biogeography, evolution, and classification of selected groups. Pr.: Geol. 480, Biol. 630 or consent of instructor. 234 804. Igneous Petrology. (3) I. Petrography and petrogenesis of igneous rocks. Two hours lec. and three hours lab. a week. Pr.: Geol. 605.
234 805. Metamorphic Petrology. (3) II. Petrography and petrogenesis of metamorphic rocks. Two hours lec. and three hours lab. a week. Pr.: Geol. 804.
234 806. Sedimentary Petrology I. (3) I. Petrography, classification, and origin of mudrocks, sandstones, and conglomerates. Two hours rec. and three hours lab. a week. Pr.: Geol. 605.
234 807. Sedimentary Petrology II. (3) II. Petrography, classification, and origin of limestones, dolostones, and other chemical sedimentary rocks. Two hours rec. and three hours lab. a week. Pr.: Geol. 605.
234 810. Isotope Geology I. (3) I or II. Radioactive decay in geologically important systems, rigorous treatment of $\mathrm{Pb}, \mathrm{Sr}$, and Ar isotope variations, radiation damage and diffusion in minerals, instrumentation. Three hours rec. a week. Pr.: Geol. 605 or consent of instructor.
234 820. Isotope Geology II. (3) I or II. Stable isotope variation, rigorous treatment of $\mathrm{S}, \mathrm{O}, \mathrm{C}$, and H isotope systems, cosmogenic nuclides, application of isotope variations to problems of petrogenesis and continental growth. Three hours rec. a week. Pr.: Geol. 810 or equiv. 234 830. Advanced Igneous Petrology. (3) I. Current research in the origin of igneous rocks. Three hours lec. a week. Pr.: Geol. 614, 804, Chem. 595 and consent of instructor.
234 831. Advanced Metamorphic Petrology. (3) II. Current research in the origin of metamorphic rocks. Three hours lec. a week. Pr.: Geol. 805, 830 and consent of instructor.
234 840. Planetology. (3) II. Geologic principles applied to a study of the solar system. Pr.: Geol. 530, 614 or consent of instructor.
234 860. Goniometry and Crystal Drawing. (2) I or II. Measurements, calculations, projections, and drawings of crystals. Measurements will be made with contact and optical goniometers and the universal stage microscope. Six hours lab. a week. Pr.: Geol. 605.
234 870. Structural Mineralogy. (3) I. Principles governing the formation and stability of different crystals; investigation of structures of various mineral groups; calculation of lattice energy of different minerals; stability relations of polymorphic substances and their petrologic significances. Three hours rec. a week. Pr.: Consent of instructor.
234 920. Clay Mineraology. (3) II. Geologic occurrences, physical properties, atomic structures and the identification of clay minerals, including thermal analytical methods and the study of X-ray diffraction patterns. Two hours rec. and three hours lab. a week. Pr.: Consent of instructor.
234 990. Research in Geology. Credit arranged. I, II, S. Work is offered in mineralogy, paleobiology, paleoecology, stratigraphy, structural geology, igneous, metamorphic and sedimentary petrology, geochemistry and isotope geology. Pr.: Registration in the Graduate School, with sufficient training to undertake research in specific area.

## History

JOSEPH J. MALONE, Chairman
Professors Brooks, ${ }^{*}$ Carey,* Higham,* Malone, Sageser,* Socolofsky,* and Wilcoxon;* Associate Professors Crawford, "Eastwood, ${ }^{*}$ Kren, ${ }^{*}$ Linder, ${ }^{*}$ Jones, ${ }^{*}$ Mulhollan, Page;* Assistant Professors Bailes, Donovan,* Ferguson," Golin,* Gray, Hagan,* and McMahon; Emeritus: Professors Parish* and Sweedlun,* Associate Professors Alsop* and Riggs.*

## UNDERGRADUATE STUDY

Requirements for a major in history consist of a minimum of 27 hours in history, including Hist. 101 and 102 (or Hist. 103 and 104, or Hist. 105 and 106), a minimum of 15 hours in courses numbered 400 and above, Hist. 597, in the junior year, and Hist. 599 (comprehensive examination). Students must distribute their upper division courses over at least three of the following fields:
I. Ancient, medieval and early modern Europe.
II. Modern Europe (including Britain)
III. Non-Western history
IV. The Americas (including Latin America)
V. History of Science, History of Technology, Military history.

## GRADUATE STUDY

Graduate study leading to the Master of Arts and Doctor of Philosophy degrees is offered in most fields, including the history of science and technology, intellectual history, military history, and economic and agricultural history. General requirements for these degrees are set forth in the Graduate School section of the Catalog.

Candidates for the Master of Arts degree must take a course in historiography and demonstrate reading proficiency in an approved foreign language. If they write a thesis or report they must offer two seminars and pass a final oral examination. If they take the non-thesis, non-report degree, they must offer three seminars and pass a written final examination. A language is not required for a terminal M.A. degree.

For the Doctor of Philosophy degree, candidates must present a general field in European or American history, two special fields in history, and an outside minor field. The preliminary examinations are both written and oral. Reading proficiency in two acceptable foreign languages is required.

A detailed description of the graduate programs and information regarding financial support may be obtained by writing the Head of the Department.
The Department co-operates with a number of other Departments in the South Asia Program, which is described in detail on page 160.

It also publishes The British Studies Intelligencer and Military Affairs, the journal of military, naval and air history, theory, and technology.

## FACILITIES FOR GRADUATE STUDY

The University's Farrell Library has a number of large specialized collections. In addition, nearby are several excellent research facilities: the Eisenhower Presidential Library, with outstanding holdings relating to the Eisenhower Administration and recent military history; the Truman Presidential Library, with valuable collections on the Truman Administration, the history of the American Presidency, and foreign policy; the Linda Hall Library, emphasizing materials pertaining to the history of science; the library of the United States Army Command and General Staff College at Fort Leavenworth; and the regional Federal Records Center at Kansas City, presently rich in military and civil records and eventually to have a microfilm duplication of the main holdings of the National Archives in Washington.

## Courses in History

## UNDERGRADUATE CREDIT

241 101. History of Western Civilization I. (3) I, II, S. Major trends in Western Civilization to the end of the seventeenth century. Required of all majors in history. Pr.: Not open to juniors and seniors except with consent of instructor.
241 102. History of Western Civilization II. (3) I, II, S. Principal developments in Western Civilization from the eighteenth century to the present. Required of all majors in history. Pr.: Not open to juniors and seniors except with consent of instructor.
241 103. History of Western Civilization I, Honors. (4) I, II. Major trends in Western Civilization to the end of the seventeenth century. Pr.: For freshmen and sophomores in the Honors Program.
241 104. History of Western Civilization II, Honors. (4) I, II. Principal developments in Western Civilization from the eighteenth century to the present. Pr.: For freshmen and sophomores in the Honors Program.
241 105. Freshman Interdisciplinary Honors I. (4) I. A freshman honors course focusing on selected historical problems, conducted by faculty from several departments. Pr.: Conc. enrollment in P. Sci. 111.

241 106. Freshman Interdisciplinary Honors II. (4) II. A freshman honors course focusing on selected historical problems, conducted by faculty from several departments. Pr.: Conc. enrollment in Soc. 104.
241 121. Science and Civilization in the Western World I. (3) I, II, S. The impact of science on the course of Western Civilization. From early times to the 17 th century.
241 122. Science and Civilization in the Western World II. (3) I, II, S. From the 17th century to modern times.

241 201. Ancient Mediterranean Civilizations. (3) I and alt. S. Civilizations of the ancient Near East, Greece, and Rome to the fall of the Roman Empire.
241 202. Civilization of the Middle Ages. (3) II and alt. S. European and Near Eastern civilizations from the fall of the Roman Empire to the end of the thirteenth century. 241 211. Asian Civilization I. (3) I and alt. S. A survey of Asian Civilization to 1650, emphasizing cultural and political developments.
241 212. Asian Civilization II. ) (3) II and alt. S. A survey of Asian Civilization from 1650 to the present. Emphasis is placed on cultural and political developments including European imperialism and the new nationalism. 241 221. History of England to 1603. (3) I. A survey of English history from Teutonic Britain to the death of Elizabeth I. Pr.: Not open to juniors and seniors except with consent of instructor.
241 222. History of England from 1603. (3) II. Political, constitutional, economic, and cultural history of modern England. Pr.: Not open to juniors and seniors except with consent of instructor.
241 251. History of the United States to 1877. (3) I, II, S. Colonial and Revolutionary America, the federal union, Civil War, and Reconstruction. Pr.: Not open to juniors and seniors except with consent of instructor.
241 252. History of the United States since 1877. (3) I, II, S. The American nation from Reconstruction to the present. Pr.: Not open to juniors and seniors except with consent of instructor.
241 253. History of the United States to 1877, Honors. (4) I, II, S. Colonial and Revolutionary America, the Federal Union, Civil War, and Reconstruction. Pr.: Open only to freshmen and sophomores in the Honors Program.
241 254. History of the United States since 1877, Honors. (4) I, II, S. The American nation from Reconstruction to the present. Pr.: Open only to freshmen and sophomores in the Honors Program.
241 257. American Social History. (3) I or II. Social customs and institutions from colonial times to the late nineteenth century. Pr.: Sophomore standing.
241 258. History of Kansas. (2) II, S. Land, people, problems, and cultural development of Kansas. Pr.: Sophomore standing.
241 309. Latin American Nations. (3) II and alt. S. Economic, social, and political progress of the Latin American nations from independence to the present. Emphasis is placed on Argentina, Brazil, Chile, and Mexico.
241 399. Honors Seminar in History. Variable credit. I, II.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

241 405. Introduction to the Civilization of South Asia I. (3) I. Interdisciplinary survey of the development of civilization in South Asia, geographical and demographic context, philosophical and social concepts, social and political institutions, literature and historical movements. (Same as Geog. 405, P. Sci. 405, Soc. 405, Anthro. 405.)
241 406. Introduction to the Civilization of South Asia II. (3) II. Interdisciplinary survey of recent and contemporary civilization in India, Pakistan, Ceylon, Nepal, and Afghanistan, including recent history, current economy, religion, culture, language and literature, geography, social and political structure and ideas. (Same as Geog. 406, P. Sci. 406, Soc. 406, Anthro. 406).
241 597. Pro-Seminar in Historiography. (3) Proseminar in historical method and historiography. Required for graduation of all majors in history. To be taken in the junior year, preferably in the first semester. 241 598. Senior Honors Seminar. (3) Advanced proseminar in history. Pr.: Senior standing, recommendation of departmental committee.
241 599. History Comprehensive. (0) An examination required of all seniors majoring in history.

## UNDERGRADUATE AND GRADUATE CREDIT

241 603. History and Culture of Greece. (3) I and alt. S. The political evolution of ancient Greece, its social and economic structure, the development of Hellenic culture and its diffusion throughout the Mediterranean world and Near East. Pr. : Hist. 201 or consent of instructor.
241 606. History and Culture of Rome. (3) II and alt. S. Constitutional development of Rome, agrarian and social problems, fall of the republic and growth of the empire. Rome's contribution to classical culture and its influence on the modern world. Pr.: Hist. 201 or consent of instructur.
241 609. Medieval Religion and Politics. (3) I, II. A study of European religion and politics during the Middle Ages and their interrelationship, with special emphasis on men and ideas. Not open to freshmen.
241 610. Medieval Intellectual History. (3) I, II. The main trends of medieval thought from St. Augustine to William of Ockham in their historical setting. Pr.: Junior or senior standing.
241 615. The Renaissance. (3) II and alt. S. The Italian Renaissance as a major phase in the history of Western Civilization and its spread to Northern Europe. Pr.: Junior or senior standing, or consent of instructor.
241 618. Renaissance Intellectual History. (3) The history of ideas in Western Europe during the Renaissance, 1300-1600. Pr.: Junior or senior standing. 241 621. The Continental Reformation. (3) I. Lutheranism, Calvinism, the wars of religion and their impact on the political, economic, social and intellectual history of the Western World. Pr.: Junior or senior standing.
241 622. The Radical and Catholic Reformations. (3) II. A study of the Radical and Catholic Reformations with special attention to their impact on Western political, economic and social thought. Pr.: Junior or senior standing.

241 624. Europe in the Seventeenth Century. (3) I in alt. years. The intellectual history of Europe from the Wars of Religion through the Age of Louis XIV. Pr.: Junior or senior standing, or consent of instructor.
241 625. Europe in the Eighteenth Century. (3) II in alt. years and S. Intellectual history of Europe from the death of Louis XIV through the Congress of Vienna. Pr.: Junior or senior standing, or consent of instructor.
241 626. Revolutionary Europe, 1760-1815. (3) I in alt. years and S. Ideological and social revolution of Europe from the Enlightenment to the downfall of Napoleon. Pr.: Junior or senior standing, or consent of instructor.
241 630. Europe, 1815-1914. (3) I, II. The history of Europe from 1815-1870; major emphasis on intellectual history and the relationship between ideas and their political, economic and social context. Pr.: Junior or senior standing, or consent of instructor.
241 631. Nineteenth Century European Thought. (3) I, II. Intellectual history of nineteenth centruy Europe and the relationship between ideas and their political, economic and social context. Pr.: Junior or senior standing, or consent of instructor.
241 632. Europe, 1914-1945. (3) I, S. History of Europe from World War I through World War II; emphasis will be placed on the crisis of democracy and the significance of totalitarian movements. Pr.: Junior or senior standing, or consent of instructor.
241 640. Twentieth Century European Thought. (3) I, II. Pr.: Junior or senior standing, or consent of instructor. 241 642. European and American Political and Social Movement. (3) I, II. Selected revolutionary, reform, or conservative movements since the 1600 's. The course transcends geographic and chronological boundaries in search of unifying themes. Pr.: Hist. 101-102, Hist. 251252, or consent of instructor.
241 643. Topics in European History. (3) I, II, S. Intensive study of a particular phase of European history. Topics will vary. May be repeated for credit.
241 646. English Medieval Culture. (3) I. A detailed study of some representative institutions English Medieval life. Pr.: Junior or senior standing.
241 647. Tudor England. (3) I in alt. years. Pr.: Junior or senior standing, or consent of instructor.
241 648. Stuart England. (3) II in alt. years. Pr.: Junior or senior standing, or consent of instructor.
241 650. England in the Eighteenth Century. (3) I in alt. years. Pr.: Junior or senior standing, or consent of instructor.
241 651. Victorian Britain. (3) I. Pr.: Junior or senior standing, or consent of instructor.
241 652. Modern Britain. (3) II. The course treats topically the political, diplomatic and military, economic, social, ideological and imperial currents of the period since 1900 and examines the causes for the decline of British greatness.
241 653. Modern British Culture. (3) II. Cultural History of Modern Britain. Pr.: Junior or senior standing.
241 655. Modern France. (3) II in alt. years and S. Pr.: Junior or senior standing, or consent of instructor.
241 659. Germany 1648-1789. (3) I. Development of Central Europe from the Peace of Westphalia to the outbreak of the French Revolution. Pr.: Junior or senior standing or consent of instructor.

241 660. Modern Germany to 1914. (3) I, II. Major developments in Central European history in the nineteenth century. Pr.: Junior or senior standing, or consent of instructor.
241 661. Modern Germany, 1914-1945. (3) I, II. Central European history in the twentieth century; major emphasis on the failure of German democracy and on an analysis of the national socialism. Pr.: Junior or senior standing, or consent of instructor.
241 667. History of Russia from the Beginnings to 1689. (3) I, II, and alt. S. Rise and fall of Kievan Russia, the Mongol occupation, the ascendancy of Moscow. Pr.: Junior or senior standing, or consent of instructor.
241 668. Eighteenth and Nineteenth Century Russia. (3) I, II, and alt. S. Development of the Russian Empire. Political, social, economic, and intellectual developments in Russian and the conduct of foreign policy from Peter the Great to the 1905 revolution. Pr.: Junior or senior standing, or consent of instructor.
241 671. The Russian Revolutions and the Soviet System. (3) I, II, and alt. S. The revolutions of 1905 and 1917 and the subsequent development of the Soviet system. Pr.: Junior or senior standing, or consent of instructor.
241 674. Topics in Modern Russian History. (3) II. Selected topics in the political, social, or intellectual development of Russia since the Eighteenth century. Pr.: Junior or senior standing or consent of instructor. 241 677. Far Eastern History I. (3) I, II. The traditional civilization and cultures of the Far East. Focus on China and Japan prior to the advent of European power. Pr.: Junior or senior standing.
241 678. Far Eastern History II. (3) I, II. From the rise of European and American power in the Far East to the present. Focus on the crises within traditional Chinese and Japanese cultures, the rise of nationalism, World War II, and the post-war period or resurgence of Chinese power. Pr.: Junior or senior standing.
241 680. South Asia 1. (3) I, II. The traditions and civilizations of South Asia-Pakistan, India, and Ceylon-prior to the intrusion of Europeans. Examination of social, intellectual, religious and political history. Pr.: Junior or senior standing.
241 681. South Asia II. (3) I, II. The rise of European powers in South Asia, creation of the British Empire in India, growth of nationalism and the creation of India, Pakistan and Ceylon to the present. Pr.: Junior or senior standing.
241685 . Nationalist Leaders of South Asia. (3) I, II, S. Using a biographical approach, this course will examine the social and religious movements of the nineteenth century and the nationalist movements of the twentieth century that led to the creation of the modern states of India and Pakistan. Pr.: Junior or senior standing.
241 688. The History of Christianity. (3) I, II, alt. S. A history of the Christian religion from the time of Christ to the present. Pr.: Junior or senior standing, or consent of instructor.
241 690. Topics in Non-Western History. (3) I, II, S. Intensive study of a particular phase of non-Western history. Topics will vary. May be repeated for credit.
241 701. History of Science I. (3) The growth of scientific thought from ancient times to about 1700. Pr.: Junior or senior standing, or consent of instructor.

241 702. History of Science II. (3) The development of scientific thought from about 1700 to the recent past. Pr.: Junior or senior standing, or consent of instructor.
241 707. The Scientific Revolution. (3) I, II, S. Rise of a new world view in the 16th and 17th centuries. Pr.: Junior or senior standing.
241 708. Science and Thought in the Eighteenth Century. (3) Scientific development in the eighteenth century from Newton to Laplace. Pr.: Junior or senior standing. 241 709. Science and Thought in the Nineteenth Century. (3). Scientific development in the nineteenth century. Pr.: Junior or senior standing.
241 715. History of Biological Thought. (3) I, II, S. Major trends in the development of biological thought. Emphasis on such topics as theories of generation, evolution theory, and genetics. Pr.: Junior or senior standing.
241 719. Science in America. (3) I, II, and alt. S. Survey of American science from the old colonial era to the present, with special attention given to the historical context and the role of institutions and government. Pr.: Junior or senior standing, or consent of instructor.
241 722. History of American Technology, 1607-1960.
(3) I, II, and alt. S. The interaction of technology with agriculture, transportation, communications, and transmission of European techniques and the concept of American ingenuity. Pr.: Junior or senior standing, or consent of instructor.
241 725. Science and Government in America. (3) I, II, S. History of the recent rise of federally supported and sponsored science, the political institutions which emerged as a result, and the politics of science.

241 733. European Economic History. (3) I, S. Major economic developments, institutions, and ideas since the seventeenth century. Pr.: Junior or senior standing, or consent of instructor.
241 737. American Economic History I. (3) I, II, and alt. S. Development of the American economy to 1825. An examination of colonial agriculture and mercantilism to the emergence of the factory system and a national economy. Pr.: Junior or senior standing or consent of instructor.
241 738. American Economic History II. (3) I, II, and alt. S. From 1825 to the present; industrial capitalism, laissez-faire, and large-scale business and agricultural enterprises will be studied, along with government and private reactions to these developments. Pr.: Junior or senior standing, or consent of instructor.
241 743. American Ethnic History. (3) I and alt. S. Cultural factors based on race and nationality in American history, emphasizing the white minorities. Pr.: Hist. 252 or consent of instructor.
241 744. Black American History. (3) The role of slavery, Jim Crow, twentieth century reform movements and the relationship of the Negro to the totality of American culture. Pr.: Junior or senior standing or consent of instructor.
241 749. American Urban History. (3) II and alt. S. The history of urbanism in America, its beginnings, its position in American life and its complexity. Pr.: Hist. 252 or consent of instructor.
241 752. History of American Diplomacy, 1763-1900. (3) I. The evolution of American foreign policy with em-
phasis on colonial origins and economic factors, prior to 1898. Pr.: Junior or senior standing or consent of instructor.
241 753. History of American Diplomacy since 1900. (3) I. A reluctant United States becomes the arbiter of the world's destinies. Emphasis is placed on the revolution from the isolationist instincts of the early 1900's to the internationalist policies of the post-World War II period. Pr.: Junior or senior standing, or consent of instructor.
241 756. War in the Twentieth Century. (3) I. World War I, World War II, the Korean War, and the Indochina War, with special emphasis on the American involvement.
241 761. Technology and War to 1900. (3) I. The approach is chronological with the emphasis upon the interrelationship of technology, military affairs, and the general pattern of societal and national developments. 241 762. Technology and War 1900 to the present. The approach is topical, a variety of problems are examined in order to provide a background for understanding present and future developments through the application of historical knowledge where weapons technology is concerned.
241 763. The History of Peacekeeping Forces. (3) I, II. A historical survey of the problems of military work in peacetime, with particular emphasis upon colonial wars, guerrilla activities and civic action. Pr.: Junior or senior standing.
241 764. The History of Military Thought. (3) I, II. An examination of the evolution of military thinking from Vauban to Liddell Hart and the atomic age. Pr.: Junior or senior standing.
241 766. History of American Military Affairs. (3) I. From the colonial period to the present. Emphasis on the evolution of military institutions, doctrines, and policies in peace and war, and their relationships with political, economic, and social factors. Pr.: Junior or senior standing or consent of instructor.
241 771. American Thought to 1860. (3) I, II, and alt. S. American thought from the Puritans through New England domination. Pr.: Junior or senior standing, or consent of instructor.
241 772. American Thought since 1860. (3) I, II, and alt. S. Emphasis upon the impact of industrialism, populism, science, technology, and politics. Pr.: Junior or senior standing or consent of instructor.
241 775. Colonial America. (3) I, II, and alt. S. Discovery, foundation and development of the North American colonies; the European rivalry for the American empire. Pr.: Junior or senior standing, or consent of instructor.
241 776. The American Revolution. (3) I, II, and alt. S. The foundations of the American republic, 1763-1789. Pr.: Junior or senior standing, or consent of instructor.
241 777. The Early National Period. (3) I, II, and alt. S. Contest between Federalists and Jeffersonian Republicans for national leadership; the War of 1812 and the growth of American nationality. Pr.: Junior or senior standing or consent of instructor.
241 778. The Age of Jackson. (3) I, II, and alt. S. Growth of democracy. Westward expansion and divisive sectionalism; the flowering of the American mind; the perfectable society. Pr.: Junior or senior standing or consent of instructor.

241 779. Civil War and Reconstruction. (3) II and alt. S. The sectional conflict in the United States from 1850-1880. Pr.: Junior or senior standing, or consent of instructor. 241 780. Populism and the Progressive Movement. (3) II, S. Growth of the industrial economy, role of the entrepreneur, and the new forces in American life from the Civil War to World War I. Pr.: Junior or senior standing or consent of instructor.
241 781. Frontier America. (3) I, S. Environmental factors, peoples, settlements, and institutions of the frontier. Pr.: Junior or senior standing, or consent of instructor.
241 782. The Great Plains. (3) II and alt. S. The historical development of the region comprising the Great Plains, and its impact on American history. Pr.: Junior or senior standing, or consent of instructor.
241 789. The United States in the Twentieth Century. (3) I, S. Major developments in recent American history. Pr.: Junior or senior standing, or consent of instructor. 241 791. Colonial Hispanic America. (3) I and alt S. Exploration, settlement, and development of Central and South America and the Caribbean in the colonial period. Pr.: Junior or senior standing, or consent of instructor. 241 794. Modern Mexico. (3) I, II. The last decade of Porfiria Diaz, 1900-1910. The principal developments of the political and social revolution, 1910-1938. Recent changes in Mexico. Pr.: Junior or senior standing.
241 797. Topics in the History of the Americas. (3) I, II, S. Intensive study of a particular phase of the history of the Americas. Topics will vary. May be repeated for credit.
241 798. Readings in History. (1 to 3) I, II, S. Students will read on a central theme, attend weekly discussions, and write a final report. Open to majors and graduate students with the consent of instructor.
241 799. Problems in History. Credit arranged. I, II, S. Invensive study of a particular phase of history. Students will attend weekly discussions and write a major research paper on their findings.

## GRADUATE CREDIT

241 801. Historiography I. (2) I and alt. S. Main currents in historical research, the writing of history, and the influence of the great historians from Herodotus to the present. Required of all graduate students in history.
241 802. Historiography II. (2) II and alt. S. Cont. of Hist. 801. Required of all graduate students in history.
241 808. Quantification in History and Political Science. (3) I, II. A course for graduate students in the methodology of research using computer techniques. Stress is placed on acquiring bibliographical expertise as well as familiarity with computer technology.
241 820. Seminar in American Social History. (3) I, II, S. Usually emphasizing problems of immigration and urbanization. Pr.: Consent of instructor.
241 821. Seminar in Latin American History. (3) I, II, S. Pr.: Consent of instructor.
241 822. Seminar in American Diplomatic History. (3) I, II, S. Pr.: Consent of instructor.
241 823. Seminar in the History of the American West. (3) I, II, S. Pr.: Consent of instructor.

241 824. Seminar in Colonial America. (3) I, II, S. Pr.: Consent of instructor.

241 825. Seminar in American Intellectual History. (3) I, II, S. Pr.: Consent of instructor.
241 826. Seminar in American Economic History. (3) I, II, S. Pr.: Consent of instructor.
241 827. Seminar in American Science and Technology. (3) I, II, S. Pr.: Consent of instructor.

241 830. Seminar in Modern European History. (3) I, II, S. Pr.: Consent of instructor.

241 831. Seminar in German History. (3) I, II, S. Pr.: Consent of instructor.
241 832. Seminar in French History. (3) I, II, S. Pr.: Consent of instructor.
241 835. Seminar in Modern Russian History. (3) I, II, S. Pr.: Consent of instructor.
241 836. Seminar in Renaissance and Reformation. (3) I, II, S. Pr.: Consent of instructor.
241 837. Seminar in English History. (3) I, II, S. Pr.: Consent of instructor.
241 840. Seminar in Military History. (3) I, II, S. Pr.: Consent of instructor.
241 850. Seminar in South Asian History. (3) I, II, S. Pr.: Consent of instructor.
241 879. Seminar in the History of Science. (3) I or II. Pr.: Consent of instructor.
241 887. European Intellectual History. (3) I or II. An examination of the methodology of intellectual history and its relationship to other methodologies and disciplines; the application of this methodology to intellectual developments and to the non-intellectual factors which explain them. Pr.: Consent of instructor. 241 995. Research in History. Credit arranged. I, II, S. Work offered in European, American, Latin American, English, Russian, and Asiatic History, and in the history of science and technology, the history of ideas, intellectual history, military history and economic and agricultural history. Pr.: Consent of instructor.

## Journalism and Mass Communications

Professor Howe;* Associate Professors Bontrager* and Macy; Assistant Professors Applegate, Brown, Dennis, Eaton, Morris, Mrozinski, Oukrop* and Rush.*

The Department of Journalism and Mass Communications is one of 56 schools and departments accredited by the Association for Education in Journalism and is a member of the American Association of Schools and Departments of Journalism.

## UNDERGRADUATE STUDY

Students interested in journalism can major in one of four sequences leading to either the Bachelor of Science degree or the Bachelor of Arts degree. The sequences include news-editorial, radio and television production, home economics and agricultural journalism.

The sequences can be applied toward the Bachelor of Science degree and the Bachelor of Arts degree.

Students interested in Agricultural Journalism should note requirements on page 33, those interested in Home Economics and Journalism should note requirements on page 237.

## GRADUATE STUDY

Advanced students in public communication at Kansas State University may work toward a master of science in journalism or a master of arts in radio and television.

The programs of study are planned to provide specialized professional work and a mastery of theoretical concepts in the fields of journalism, radio, television, film and general communications. Programs are structured upon a series of professional media-oriented courses along with studies in research methods and in communication theory and process.

Individualized programs are designed to meet the student's needs and goals. The programs are focused more on the strategic application of communication knowledge and technology than on technical competence in media operation per se. Each student is assigned a graduate faculty academic adviser, appropriate to the student's area of emphasis.
Prerequisite to advanced work in public communication is the completion of a fouryear college curriculum. Students not having an undergraduate degree from a department accredited by the Association for Education in Journalism or from a department which is a member of the Association for Professional Broadcasters in Education may be held for as many as 12 semester hours of course work at the undergraduate level. Decisions regarding the number of hours for which a student will be held are made on an individual basis, with professional experience and other relevant circumstances considered.
There are two options in completing work for a master's degree in public communication, 30 semester hours including a thesis or 32 semester hours including a report. The thesis option requires 24 hours of course work (at least half of which should be in public communication) and a six-hour thesis, and is the recommended option for students
who think they may do further graduate work beyond the M.S. or M.A. degree. The report option requires 30 hours of course work (again, at least half should be in public communication) and a two-hour report. The report option is recommended for those students who consider the master's their terminal degree, and who plan to go directly into professional media careers.

In addition to course work in public communication, the student will take about 15 hours outside the department, in the related area or areas of his choice. The department does not recommend specific outside courses or particular outside areas, because in today's complex world all areas are relevant to the student of public communication.

The student may opt to take most or all of his electives in one particular area, or, if he plans a media career as a knowledgeable generalist, he may elect to take a course or two in each of several different areas. Each student will work closely with his adviser in planning the program which best fits the student's needs and goals.
Recommended courses for M.S. candidates include History of Journalism (3 semester hours), Communication Theory (3) and Research Methods (3). Journalist in a Free Society (3) is required for students whose undergraduate degree is not from an ACEJaccredited Journalism department. It is also recommended that the M. S. candidate take one course in the area of public opinion and public relations and at least one advanced writing course, such as Interpretation of Contemporary Affairs (3).

The M.A. degree in radio-television-film has three major areas of emphasis, programming, production and-or management. Recommended courses for M.A. candidates in programming include Research Methods (3), Radio-TV Writing (3), Radio-TV Programming (3), and Radio-TV Advertising (3). For students taking production and-or management the required courses are Research Methods (3), TV Production (3), Advanced TV Production (3), Broadcasting Law (3), and Radio-Television Station Management (3).

## Courses in Journalism UNDERGRADUATE CREDIT

289 235. Survey of the Mass Media. (3) I, II. Historical, social, legal and economic aspects of mass communications; current practices and responsibilities; role of newspapers, magazines, radio, television, motion pictures and other mass media in society, and their impact on world affairs.
289 300. Editing I. (3) I, II, S. Survey of graphic arts principles; fundamentals of the editing process; relationship of the graphic arts principles to the elements of newspaper design and the total editing function. Pr.: consent of instructor or Journ. 306.
289 306. Reporting I. (3) I, II. Instruction in news gathering and reporting techniques. Pr.: Sophomore standing; ability to type 30 words a minute.
289 316. Reporting II. (3) I, II. Three hours rec. and six hours reporting for the Kansas State Collegian each week. Pr.: Journ. 306.
289 320. Principles of Advertising. (3) I, II. An examination of the advertising field and its relationship to marketing and journalism.
289 331. Editing II. (3) I, II. Advanced study of the editing processes with emphasis on handling the story, writing headlines, use of all elements for packaging the news, and creative use of the editing tools. Two hours of recitation and six hours editing for the Kansas State Collegian each week. Pr.: Consent of instructor.
289 335. Photojournalism I. (3) I, II, S. Basic camera and laboratory techniques of news photography.
289 350. Agricultural Journalism. (3) I, II, S. Survey of agricultural information techniques, with emphasis on principles of news and feature writing.
289 355. Advertising Salesmanship. (2) I, II. Study and actual application of the principles of selling advertising, emphasis on the print media. Pr.: Consent of instructor. 289 358. Publications Management. (1-4) I, II, S. Practical work in writing, editing, advertising, business practices, and photography on student publications under supervision of an instructor. Three hours lab. a week for each hour of credit.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

289 400. Radio and Television News. (2) II. Processing and broadcasting of radio news. Pr.: Journ. 306.
289 406. Yearbook Editing and Management. (2) I. Planning, editing, layout, financing, and management of a yearbook, with special emphasis on the problems of The Royal Purple. One hour lec. and three hours lab. a week. Pr.: Journ. 316 and junior standing.
289 435. Photojournalism II. (2) I, II. Advanced work in taking, processing and editing photographs for newspapers and magazines, including picture page layout and legal implications. Pr.: Journ. 335.
289 455. Advertising Copy and Layout. (3) I, II. The creating, designing and writing of advertising copy for the print media stressing the production of a workable advertising campaign. Pr.: Journ. 320.

## UNDERGRADUATE AND GRADUATE CREDIT

289 600. Public Affairs Reporting. (2) II. Investigative reporting of local, state and national affairs. Pr.: Journ. 316 or consent of instructor.

289 605. The Black Press in America. (3) I. Consideration of the growth, development and current status of the black press in the United States. Junior standing or consent of instructor.
289 606. History of Journalism. (3) II. Pr.: Junior standing and Hist. 165, 170 or consent of instructor.
289 610. The Family Page. (3) I, II. Study of contemporary trends in community and family life reporting, emphasizing feature writing and creative editing. Pr.: Journ. 330 or consent of instructor.
289 615. Magazine Article Writing. (3) II. Preparation of feature stories and articles; techniques of marketing, market analysis and publishing articles written in course. Pr.: Journ. 610 or 620 or consent of instructor.
289 617. Magazine Production. (3) I. The practical application of theory on the fields of writing, editing, graphic reproduction, layout, and management of magazines. Pr.: Journ. 105, 300, and 330.
289 620. Interpretation of Contemporary Affairs. (3) I. Critical questions of the day; interpretive articles and editorials which document and analyze the news; introduction to research methods in depth reporting.
289 626. Formation of Public Opinion. (3) I. Role of interpersonal and mass communication information of public opinion. Practical survey experience. Pr.: Junior standing and consent of instructor.
289 630. Public Information Methods. (2) I. Pr.: Journ. 316.

289 635. Public Relations. (3) I. Media, methods, principles, and practices of public relations. Pr.: Junior standing or consent of instructor.
289 640. Law of the Press. (3) II. Study of laws which guarantee and protect privileges and define duties and responsibilities of mass media; law, libel, privacy, and governmental regulations pertinent to the press. Pr.: Senior standing or consent of instructor.
289 645. Readings in Journalism. (1-3) I, II, S. Investigation of the literature of journalism.
289 650. International Communication. (3) Comparative study of world press systems and the role of communication in national development.
289 652. Supervision of School Publications. (1-3) S. Supervision of high school yearbooks and newspapers. Three hours maximum credit. Pr.: Graduate standing or consent of instructor.
289 660. The Journalist in a Free Society. (3) I. A consideration of influences and controls that define the role of the journalist in American society. Open to nonmajors. Pr.: Senior standing or consent of instructor.
289 665. Newspaper Management. (2) II in alt. years. Relations of departments of a newspaper to one another; costs, statistics, advertising, news, and business methods in publishing. Pr.: Journ. 320.
289 670. Communication Theory. (3) An examination of major communication theories as they relate to individual, interpersonal, group and mass communication.
289 671. Mental Health Information Seminar I. (3) I. Survey of public attitudes toward mental illness and mass media's role in reporting.
289 672. Mental Health Information Seminar II. (3) Examines specific issues in the mental health field (alcoholism, drug abuse, mental retardation, etc.) as
they relate to the journalist in mental health communication.
289 675. Professional Journalism Practicum. (2-4) I, II, S. For advanced students. Supervised practical work in the area of professional journalism. Includes laboratory investigation, field work and internships.
289 676. Behavioral Science Reporting. (3) I. Reporting and writing on problems of human behavior. For Fellows in Mental Health Mass Communications Program or consent of instructor.
289 720. Research Methods in Journalism. (3) I, II, S. Survey of research methods used in the study of the mass media.
289 765. Seminar in the New Journalism. (3) I. An examination of contemporary developments in reportage with emphasis on new journalism practitioners and media outlets. Restricted to seniors and graduate students.
289 775. Seminar in the Future of the Media. (3) II. A study of philosophical and technological advances in mass communication with emphasis on projected patterns of future growth and development. Restricted to seniors and graduate students.
289 798. Colloquium in Mass Communication. (1-3) I, II. Discussion of selected topics in mass communication research and practice. Restricted to seniors and graduate students.
289 799. Problems in Technical Journalism. Credit arranged. I, II, S. Pr.: Background of courses needed for problem undertaken.

## GRADUATE CREDIT

289 999. Research in Technical Journalism. Credit arranged. I, II, S. Pr.: Sufficient training to carry on the line of research undertaken.

## Courses in Radio and Television

 UNDERGRADUATE CREDIT290 132. KSDB-FM Participation. (1) Supervised performance in the operation of all regulation broadcast department of the University's student FM radio station. Pr.: Journ. 152 for majors.
290 152. Radio-Television Speech Procedures. (3) Basic training in design, delivery and operational procedures of broadcasting. Three hours lec. and two hours lab. a week. For and required of all radio-television majors only.
290 160. Survey of Broadcasting. (2) History of the radio industry; its effects on American life; the economic, political and social significance of broadcasting. Required of students with radio-television concentration.
290 225. Radio-Television Continuity. (3) Study of the forms and the preparation of non-dramatic scripts for all types of broadcast programs. Required of majors. Pr.: Journ. 160 for students with radio-television emphasis. 290 326. Introduction to Television. (2) Study of the development of TV; its codes and control; its relation to other media; economic and social implication. Required of majors. Pr.: Journ. 160 for students with radiotelevision concentration.
290 330. Advanced Radio Production. (2) Advanced theory and techniques of modern radio production in-
cluding tape editing, production commercials, documentaries, dramatic narratives, use of modern equipment and other production concepts. Pr.: Journ. 152 and 225.
290 392. Television Film. (2) Study of the principles and techniques of motion picture film production for television; theory of television film production and practical use of film equipment. Pr.: Journ. 160, 225, 326 for students with radio-television concentration; consent of instructor for non-majors.

## UNDERGRADUATE AND GRADUATE CREDIT

290 661. Television Production. (3) Emphasis placed on basic television production. Pr.: Journ. 225 and 326 for students with radio-television concentration; consent of instructor for non-majors.
290 662. Instructional Television. (3) The principles of instructional television: its development, programming, techniques, and application. See Educ. 662. Pr.: Junior standing and consent of instructor.
290 670. Radio-Television Programming. (3) Study of the principles of planning and the development of radio and television programs and schedules. Pr.: Journ. 225 and 326 for students with radio-television concentration. 290 672. Advanced Television Production. (3) Study of visual and dramatic principles in television from the point of directors, producers and performers. Pr.: Journ. 661 for students with radio-television concentration.
290 677. Radio-Television Advertising. (3) Study of the principles and practices in broadcast advertising. Pr.: Journ. 320 for students in Technical Journalism. Journ. 225 for students with radio-television concentration.
290 685. Radio-Television Writing I. (3) Study of the principles and preparation of dramatized broadcast programs. Pr.: Journ. 225 for students with radiotelevision concentration.
290 690. Broadcasting Criticism. (3) Study of the principles and criteria of mass media criticism, with emphasis on those considerations unique to broadcasting. Pr.: Consent of instructor.
290 692. Broadcasting Law. (3) A study of the major laws and legal decisions which affect broadcasting. Primary attention given to the Communications Act and the Federal Communications Commission's Rules and Regulations: other laws relating to broadcasting and broadcast management considered. Pr.: Junior standing and consent of instructor.
290 695. Radio-Television Series Writing. (3) Cont. of Journ. 685. Development of complete scripts for series of documentary and dramatized broadcast programs. Pr.: Journ. 685 or consent of instructor.
290 726. Radio-Television Station Management. (3) Study of the practices and the problems of broadcast station management. Pr.: Junior standing.
290 745. Broadcasting of Women's Programs. (3) Principles of writing, production, and criticism of radio and television programs presented by women, and those prepared for an audience of women and-or children. Required of women majors. Pr.: Journ. 225 for students with radio-television concentration.
290 750. Broadcast Research. (3) Study of research in broadcasting; its literature and methodology. Pr.: Junior standing.

## Mathematics

JOHN E. MAXFIELD,* Head of Department


#### Abstract

Professors Chawla," Dixon," Fuller," Hsu," Kirmser," Marr," Maxfield," T. Parker," Stamey," Stromberg, ${ }^{*}$ and Young;" Associate Professors Greechie," P. Grillet,* Lee," Sloat, and Yee;* Assistant Professors Curtis,* Dressler," M. Grillet," Herman, Marsden," Miller,* W. Parker, Pigno, Russell, J. Spears,* W. Spears,* and Williams;" Instructor Ratcliffe; Emeritus: Professors Babcock" and White;" Associate Professors James and Mossman;" Instructor Woldt.


## UNDERGRADUATE STUDY

For credit by examination in College Algebra, Trigonometry and Calculus, See page 7.

## The Mathematics Honors Program

This degree will prepare students of extraordinary ability to enter graduate school to prepare themselves to become research mathematicians. It is an invitational program. In order to be considered for this program the student should contact the department.
(1) Math. 230, 231, 330, 331, 399.
(2) Major requirement of 21 hours in mathematics numbered 400 and above. The recommended courses to be included in these 21 hours are:

| Math. 477, 478 | Intro. to Set Theory and Metric <br> Spaces I, II |
| :---: | :---: |
| Math. 512, 513 | Intro. to Modern Algebra I, II ................... 6 |
| Math. 530, 531 | Intro. to Real Analysis I, II ...................... ${ }^{6}$ |
| Math. 603 | Intro. to Linear Algebra . . . . . . . . . . . . . . . . . . . . 3 |

(3) In addition to the above at least 12 more hours numbering 600 and above are strongly recommended: Math. 604 Introduction to the Theory of Groups, and Math. 721, 722 Real and Complex Analysis, I, II or Math. 771, 772 General Topology I, II, should be included.
(4) The student should study at least one foreign language as a tool for mathematical research. These languages should be chosen from French, German and Russian.
(5) The student should include Chemistry I and II, and the General or Engineering Physics I and II if he is interested in applied mathematics.

This curriculum is designed for the preparation of research mathematicians. The first two years include the standard basic material. The inclusion of Set Theory and Metric Topology in the second year serves two purposes. One is to provide a background of material used in almost all advanced
courses. A special year course giving this material avoids duplication and scanty coverage. The second is to give, early in the student's career, an exposure to abstract thinking and the development of an appreciation of the nature and the role of definitions and proofs.

By the third year, students in the honors curriculum will have been exposed to a great deal more material and rigorous thinking than the students in the regular curricula in mathematics. They will be able to handle a more comprehensive course in Real Analysis. Following the recommendations of the Committee on the Undergraduate Program in Mathematics of the Mathematical Association of America, we include a thorough development of differential forms.

All other Mathematics majors are expected to take a course in Symbolic Logic in the Philosophy Department: Stat. 410 in the Statistics Department and Math. 220, 221, 222, and 240 .

## The Pre-Graduate Program

This degree will prepare students who intend to enter graduate school to work toward an advanced degree either in pure or applied mathematics.
(1) Major requirement of 21 hours in mathematics numbered 400 and above. The recommended courses to be included in these 21 hours are:

(2) In addition to the above at least 12 more hours numbered 600 and above are strongly recommended: Math. 608, 609, Set Theory I, II; and Math 604, Introduction to the Theory of Groups, should be included if at all possible.
(3) The student should include Chemistry I and II and General or Engineering Physics I and II if he is interested in applied mathematics. He should study at least one foreign language as a research tool for graduate work. These languages should be chosen from French, German, and Russian.

## The Mathematics Education Program

This degree program is designed for students who want to become secondary school teachers and includes the
requirements for the teaching certificate.
(1) Major requirement of 21 hours of courses in mathematics numbered 400 and above. The recommended courses to be included in these 21 hours are:


In addition, six hours of electives should be selected from:

| Math. 513 | Modern Algebra 11 |
| :---: | :---: |
| Math. 573 | Foundations of Geometry |
| Math. 470 | History of Mathematics |

For a student who expects to enter a graduate school the following courses are appropriate to his program:

| Math. 577, 578 | Elementary Topology 1, II |
| :--- | :--- |
| Math. 603 | Intro. to Linear Algebra |
| Math. 604 | Intro. to Theory of Groups |
| Math. 621, 622 | Analysis 1, II |

(2) Each student should elect at least one course in physics as a part of the general education science requirement.
(3) The Professional Educational requirements to be certified to teach in the State of Kansas are to be completed as a part of this degree program. These are:
(a) Make application to and be accepted as part of the Teacher Training Curriculum. (See College of Education for requirements.)
(b)

| Psych. 110 | General Psychology |
| :--- | :--- |
| Educ. 202, 302 | Educational Psychology I, II |
| Educ. 451 | Principles of Secondary Education |
| Educ. 476 | Methods of Teaching in Secondary |
|  | Schools |
| Educ. 477 | Teaching Participation in Secondary |
| Educ. 616 | Schools |

## Bachelor's Degree Program for Industry

Students who wish to enter industry upon earning a bachelor's degree in mathematics should take this program.
(1) Math. 240, 301 and 350
(2) Major requirement of 21 hours of courses in mathematics numbered 400 and above. The recommended courses to be included in these 21 hours are:

| Math. 550, 551, 552 | Applied Mathematics I, II, III |
| :---: | :---: |
| Math. 761, 762 | Numerical Analysis 1, II .... |
| Math. 512 or | Intro. to Modern Algebra I |
| Math. 621 | Analysis 1 |

(3) It is strongly recommended that the student take at least nine hours of work beyond the basic courses of Chemistry I and II and General or Engineering Physics I and

II in Computer Science, Statistics, Physics, Chemistry or Business Administration.

## GRADUATE STUDY

The Department of Mathematics offers work in mathematics which may lead to a master's or a doctor's degree. Admission as a graduate student does not imply admission to candidacy for an advanced degree. For admission to graduate work in mathematics, a person should have completed work in mathematics equivalent to what is required for a B.S. or B.A. degree here with a better than $B$ average. The general requirements for advanced degrees are given on p. 260. Information on special requirements for an advanced degree may be obtained by writing to the Department of Mathematics.

Any course will be offered any term on the request of a sufficient number of students. Information concerning courses offered during the summer term may be had on writing to the department.

## Courses in Mathematics

UNDERGRADUATE CREDIT
245 010. Intermediate Algebra. (3) I, II, S. Review of elementary algebra; topics preparatory to Math. 100. Three hours rec, a week. Pr.: One unit of high school algebra.
245 100. College Algebra. (3) I, II, S. Pr.: Plane geometry and satisfactory placement test score in algebra. Students with $11 / 2$ entrance units of algebra should normally be eligible for this course.
245 110. Mathematics, Its Form and Impact. (3) I, II, S. This course requires no mathematical background. It includes the development and analysis of mathematical structures; applications of these structures are used to exemplify the linguistic use of mathematics and its impact on society.
245 150. Plane Trigonometry. (3) I, II, S. Pr.: Plane geometry and $1^{1 / 2}$ units of high school algebra.
245 220. Analytic Geometry and Calculus I. (4) I, II, S. Analytic geometry, differential and integral calculus of polynomials. Pr.: Math. 100, 150, or two years of high school algebra and one semester of trigonometry.
245 221. Analytic Geometry and Calculus II. (4) I, II, S. Cont. of Math. 220 to include transcendental functions. Pr.: Math. 220.
245 222. Analytic Geometry and Calculus III. (4) I, II, S. Cont. of Math. 221 to include functions of more than one variable. Pr.: Math. 221.
245 224. Elements of Applied Linear Analysis. (3) I, II, S. A survey of mathematical techniques useful in the solution of problems arising in engineering and scientific analysis. Pr.: Math. 221 , co-requisite, Math. 222.
245 225. Analytic Geometry and Calculus I-S. (4) I, II. Analytic geometry, differential and integral calculus. Distinguished from Math 230 in concrete orientation of content. Pr.: Consent of Department.

245 226. Analytic Geometry and Calculus II-S. (4) I, II. Continuation of Math 225 to include transendental functions. Distinguished from Math 231 in concrete orientation of content. Pr.: Math 225.
245 230. Honors Calculus I. (4) I. Analytic geometry, differentiation and integration of functions of one variable, infinite sequences and infinite series, elements of differential equations. Pr.: Consent of Department. 245 231. Honors Calculus II. (4) II. Continuation of Math. 230. Pr.: Math. 230 and consent of Department.
245 240. Series and Differential Equations. (4) I, II, S. Convergence of series, expansions in series, solutions of elementary differential equations, with applications. Pr.: Math. 222.
245 301. Concepts of Mathematics. (3) Intuitive logic to include negation of statements, introduction to connectives, quantifiers, implication and truth tables, set algebra, mappings, definitions, axioms, theorems and methods of proof. Pr.: Math. 220.
245 330. Algebra and Calculus in Euclidean Spaces I. (4) I. Differentiation and the Chain Rule on $\mathrm{E}^{n}$, Gradient Potential Functions, Line Integrals, Taylor's Formula, Multiple Integrals, Linear Spaces, Applications to Functions on $\mathrm{E}^{\mathrm{n}}$, Determinants. Pr.: Math. 231 and consent of Department.
245 331. Algebra and Calculus in Euclidean Spaces II. (4) II. Continuation of Math. 330. Pr.: Math. 330 and consent of Department.
245 340. Introduction to Analytic Processes. (3) II. Some topics in differentiation, integration, linear algebra, matrices and linear programming, with applications. Pr.: Two years high school or college algebra, elements of statistics. Not open to students having credit in Math. 220.
245 350. Elementary Digital Computing Techniques. (2) I. Introduction to punched card equipment, digital computers, fixed and floating-point arithmetic, programming for high-speed computers. Pr.: Math. 100. 245 399. Seminar in Mathematics. Credit arranged. On sufficient demand. Primarily for Honors Students. Pr.: Consent of instructor.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

245 408. Topics in Mathematics for Elementary School Teachers. (4) I, S. Systems of numeration, sets and numbers, properties of the number system, relations, real numbers, elementary logic, concept of proof, elements of algebra and statistics. Pr.: Consent of instructor.
245 409. Intuitive Geometry. (2) S. Measurement, triangles, quadri-laterals, nonmetric geometry, similarity, volumes, elementary coordinate geometry. Pr.: Consent of instructor.
245 420. Introduction to Analysis. (3) Theory of limits, continuity, emphasis on proofs. Pr.: Math. 222, 301.
245 470. History of Mathematics. (3) II in alt. years. Cannot be used as part of the advanced mathematics needed by mathematics majors. Pr.: Math. 220.
245 475. Modern Geometry. (3) Concepts of Euclidean geometry including distance and congruence, separation, geometric inequalities, congruence with distance, similarity, area, consistency of Euclidean
geometry; brief treatment of Lobachevskian and Riemannian geometries. Pr.: Math. 221.
245 477. Introduction to Set Theory and Metric Spaces I. (3) I. Set Theory, Zorn's Lemma, Ordinal and Cardinal Numbers, Transfinite Induction, Topological Spaces, Separators, Tietze Theorem, Connectedness, Compactness, Tychonoff's Theorem, Metric Spaces. Pr.: Math. 231 and consent of Department.
245 478. Introduction to Set Theory and Metric Spaces II. (3) II. Continuation of Math. 477. Pr.: Math. 477 and consent of Department.
245 505. Determinants and Matrices. (3) I, II. Applications of determinants and matrices to genetics, economics, electronics, and other fields. Pr.: Math. 100 and junior standing.
245 511. Introduction to Algebraic Systems (3) I. Properties of groups, rings, domains and fields. Examples selected from subsystems of the complex numbers. Elementary number theory and solving equations. Pr.: Math. 222.
245 512. Introduction to Modern Algebra I. (3) I, II. Basic concepts in the theory of numbers, groups, rings, integral domains, and fields. Pr.: Math. 220 and 301 or graduate standing.
245 513. Introduction to Modern Algebra II. (3) II. Cont. of Math. 512. Pr.: Math. 512.
245 530. Introduction to Real Analysis I. (3) I. Topics in Calculus of One Variable, Stone-Weierstrass Theorem, Differentiation on $R^{n}$, Implicit Function Theorem, Vector Fields, Differential Forms, Integration on Manifolds and Stoke's Theorem, Green's Identities. Pr.: Math. 331 and Math. 478 and consent of Department.
245 531. Introduction to Real Analysis II. (3) II. Continuation of Math. 530. Pr.: Math. 530, and consent of Department.
245 550. Introduction to Applied Mathematics I. (3) I, II. Complex analytic functions and power series, complex integrals. Taylor and Laurent expansions, residues, Laplace transformation and the inversion integral. Pr.: Math. 240.
245 551. Introduction to Applied Mathematics II. (3) I, II. Vector calculus; line and surface integrals; formulas of Gauss, Green and Stokes; matrix algebra; systems of linear equations; matrix eigenvalue problems. Pr.: Math. 240. No credit to those with credit in Math. 505.
245 552. Introduction to Applied Mathematics III. (3) II in alt. years. Bessel and Legendre functions, basic concepts and techniques in Fourier Series, boundary value problems in partial differential equations. Pr.: Math. 550.
245 573. Foundations of Geometry. (3) Euclid's parallel postulate, non-Euclidean geometrics, incidence, affine geometries, order congruence, continuity. Pr.: Math. 475.

245 575. Advanced Analytic Geometry. (3) On sufficient demand. Properties of conic sections; poles and polars; selected topics in Solid Analytic Geometry. Pr.: Math. 240.

245 577. Elementary Topology I. (3) I. Introduction to general topological spaces and invariants under continuous mappings and under homeomorphisms. Pr.: Math. 240, 301.
245 578. Elementary Topology II. (3) II. Cont. of Math. 577. Pr.: Math. 577.

## UNDERGRADUATE AND GRADUATE CREDIT

245 601. Set Theory and Logic. (2-3). Basic set theory, cardinal and ordinal numbers, axiom of choice, transfinite induction symbolic logic, tautologies, universal and existential quantifiers, propositional and predicate calculus, arguments, deductive systems. Pr.: Math. 301. 245 603. Introduction to Linear Algebra. (2-3) I. Finite dimensional vector spaces; linear transformations and their matrix representations; dual spaces, invariant subspaces; Euclidean and unitary spaces; solution spaces for systems of linear equation. Pr.: Math. 513.
245 604. Introduction to the Theory of Groups. (3) II. Introduction to abstract group theory; to include permutation groups, homeomorphosis, direct products, Abelian groups. Jordan-Holder and Sylow theorem. Pr:: Math. 513.
245 606. Theory of Numbers (2-3) II in alt. years. Divisibility properties of integers, prime numbers, congruences, multiplicative functions. Pr.: Math. 221. 245 608. Set Theory I. (3) I. Set theory; functions, relations and orderings; ordinal and cardinal numbers; transfinite induction; axiom of choice. Pr.: Math. 301 or equiv.
245 609. Set Theory II. (3) II. Cont. of Set Theory I. Pr.: Math. 608.
245 617. The Real Number System (3) An extensive development of number systems, with emphasis upon structure. Includes systems of natural numbers, integers, rational numbers and real numbers. Pr.: Math. 221.

245 619. Foundations of Analysis. (3) A study of sets and sequences, neighborhood, limit point, convergence, and open and closed set in the real line and in the plane, the concept of continuous function. Pr.: Math. 222.
245 620. Intermediate Analysis. (3) A brief review of some of the properties of the real number system, limits of functions of a single real variable, theorems on continuity, Rolle's Theorem, mean value theorem with some of its consequences, and theorems on integration. Pr.: Math. 222, 301.
245 621. Analysis I. (3) I, II, S. The topology of metric spaces, limits, continuity, mean value theorems. The Riemann-Stieljes integral. Introduction to Lebesgue measure. Elementary theory of surfaces and manifolds. Differentiation, multiple integrals, differential forms. The implicit function theorem and the Theorem of Stokes. Pr.: Math. 240, 301 or graduate standing.
245 622. Analysis II. (3) I, II, S. Continuation of Analysis I. Pr.: Math. 621.

245 651. Partial Differential Equations. (3) II in alt. years. Solutions of partial differential equations. Pr.: Math. 475.
245 670. Axiomatic Geometry. (3) Axiom systems and their use in finite geometries, an axiomatic development of three and four dimensional Euclidean geometries, including the notions of coordinates, order relation, space separation, convexity and measurement.
245 671. Projective Geometry. (3) I. Affine spaces, Euclidean spaces, projective spaces, coordinizations, duality principle, geometric lattices, classifications, subgeometries of projective geometry (especially nonEuclidean geometries). Pr.: Math. 513.

245 672. Differential Geometry I. (3) I. Curve theory via moving frames, ruled surfaces, special curves on a surface, integration theory, mappings and deformations, intrinsic properties of surfaces, geodesics, surfaces of constant curvature. Pr.: Math. 240 and consent of instructor.
245 673. Differential Geometry II. (3) in alt. years. Differentiable manifolds; differential geometry in Euclidean n-space; global properties of curves, ovals and ovaloids; Gauss-Bonnet theorem and rigidity; CliffordKlein's space form problems; minimal surfaces (varieties). Pr.: Math. 672.
245 691. Topics in Mathematics for High School Teachers. (3) Topics of importance in the preparation of high school teachers to teach modern mathematics. May be repeated for credit.
245 701. Theory of Matrices I. (3) I. The algebra of vectors and matrices, function of vectors and matrices, similarity and the eigen value problem, numerical methods associated with matrices and tensor algebra. Pr.: Math. 511 or 512 or graduate standing.
245 702. Theory of Matrices II. (3) II. Cont. of Math. 701. Pr.: Math. 701.
245 706. Algebraic Theory of Numbers I. (3) I in alt. years. Algebraic number fields. Dedekind ideal theory, divisors, structure of the multiplicative group, finiteness of the class group, density of ideals in classes. Pr.: Math. 603 and 604.
245 707. Algebraic Theory of Numbers II. (3) II in alt. years. Development of the following topics; primes in residue classes, ramifications of Galoisian extensions, Diophantine equations, Gausian sums and class number formulas, Abelian extensions and class fields. Pr.: Math. 706.

245 710. Higher Algebra I. (3) I. Theory of groups, theory of rings and ideals, polynomial domains, theory of fields and their extensions. Pr.: Math. 513.
245 711. Higher Algebra II. (3) II. Cont. of Math. 710. Pr.: Math. 710.
245 721. Real and Complex Analysis I. (3) I. Measurability, integration theory, regular Borel measures, the Riesz representation theorem, and Lebesque measure in Euclidean spaces. Pr.: Math. 622. 245 722. Real and Complex Analysis II. (3) II. The $L^{p_{-}}$ spaces, Banach spaces and Hilbert spaces, complex measures and the Radon-Nikodym theorem, the Fubini theorem on double integration, and differentiation. Pr.: Math. 721.
245 725. Real and Complex Analysis III. (3) I. Holomorphic functions, harmonic functions, the Cauchy integral theorem, normal families and the Riemann mapping theorem, and the Mittag-Leffler theorem. Pr.: Math. 722 or consent of department.
245 726. Real and Complex Analysis IV. (3) II. Analytic continuation, the Picard theorem, $\mathrm{H}^{\mathrm{p}}$-spaces, elementary theory of Banach algebra, the theory of Fourier transforms, and the Paley-Wiener theorems. Pr.: Math. 725.

245 740. Calculus of Variations. (3) On sufficient demand. Necessary and sufficient conditions for an extreme value; applications to geometry and mechanics. Pr.: Math. 622.

245 747. Advanced Differential Equations. (3) II in alt. years on sufficient demand. Selected topics in differential equations. Pr.: Math. 601, 622.
245 750. Fourier Series. (3) On sufficient demand. Trigonometric Fourier Series, general orthogonal expansions, convergence and summability, multiple Fourier series, Fourier integrals and transforms. Pr.: Math. 621, 622.
245 752. Tensor Analysis. (3) I every third year. Multilinear algebra, differentiable manifolds, differential forms and tensor fields, exterior differentiation, integration of forms and Stokes' theorem, Frobenius theorem, convariant differentiation, Riemannian connections. Pr.: Math. 513, 622.
245 753. Applied Real and Complex Analysis I. (3) I. Elementary set theory; limits and continuity; series; sequences of functions; uniform convergence of sequences of functions; Riemann integration, mean value theorems; Weierstrass approximation theorem. Pr.: Math. 505, 551, 552.
245 754. Applied Real and Complex Analysis II. (3) II. Introduction to matric spaces, normed spaces and Hilbert spaces, with applications; naive Lebesque integration; contour integrals; branch cut integration, conformal mapping; asymptotic expansion; unified treatment of special functions. Pr.: Math. 753.
245 761. Numerical Analysis I. (3) I. Solution of algebraic and transcendental equations, with emphasis on linear algebraic systems; applications of finite differences to interpolation, numerical differentiation and integration. Pr.: Math. '753.
245 762. Numerical Analysis II. (3) II. Numerical methods for solving ordinary and partial differential equations; matrix inversion, with applications; method of least squares; use of orthogonal polynomials. Pr.: Math. '761.
245 763. Numerical Analysis III. (3) I. Advanced numerical analysis. Topics covered may include elementary functional analysis relevant to numerical analysis; large-scale linear systems; numerical solution of partial differential equations; analysis of stability and convergence of various finite difference methods (von Neumann, Courant-Friedricks-Lewy, etc.) ; various approximation theories. Pr.: Math. 762.
245 764. Numerical Analysis IV. (3) II. Continuation of Math. 763. Pr.: Pr.: Math. 763.
245 771. General Topology I. (3) I. Topological spaces and topological invariants; continuous mappings and their invariants; perfect mappings; topological constructs (product, quotient, direct and inverse limit spaces). Pr.: Math. 578.
245 772. General Topology II. (3) II. Compact spaces and compactification uniform and proximity spaces, metric spaces and metrization, topology of $\mathrm{E}^{\mathrm{n}}$, function spaces, complete spaces, introduction to homotopy theory. Pr.: $\bullet$ Math. 771.
245 790. Hilbert Space. (3) I in alt. years. Geometry of Hilbert space, bounded and unbounded operations, Riesz representation theorem, spectral theorem, the lattice of closed subspaces of Hilbert space and generalizations to projection lattices. Pr.: Math. 726.
245 799. Topics in Mathematics. Credit arranged. I, II, S. Background of courses needed for topic undertaken and consent of instructor.

## GRADUATE CREDIT

245 800. Journal Seminar. (1) I, II. Students will present research papers from the current literature. All graduate students are required to enroll for four semesters. May be repeated for credit. Pr.: Graduate standing.
245 802. Homological Algebra I. (3) I in alt. years. Categories and functors, Abelian categories, extension and torsion functors, homological dimensions, and spectral sequences and some of their applications. Pr.: Math. 711.
245 803. Homological Algebra II. (3) II in alt. years. Cont. of Math. 802. Pr.: Math. 802.
245 806. Analytic Theory of Numbers I. (3) I in alt. years. The distribution of primes, geometric number theory, additive theory of numbers, Diophantine approximation, arithmetic of quadratic forms. Pr.: Math. 722.

245 807. Analytic Theory of Numbers II. (3) II in alt. years. Cont. of Math. 806. Pr.: Math. 806.
245 810. Commutative Algebra I. (3) I in alt. years. Prime ideals and localization, primary decompositions, Noetherian rings and modules, integral dependence, and local rings. Pr.: Math. 711.
245 811. Commutative Algebra II. (3) II. in alt. years. Valuations and absolute values, valuation rings, places, divisors, Dedekind rings and factorial rings. Pr.: Math. 810.

245 812. Group Theory I. (3) I in alt. years. Abelian groups, p-groups and supersolvable groups, free groups and free products. Pr.: Math. 711.
245 813. Group Theory II. (3) II in alt. years. Group extensions, cohomology of groups, representations of groups, and finite groups. Pr.: Math. 812.
245 814. Lattice Theory I. (3) I in alt. years. Posets, quantum logics, orthocomplemented, orthomodular, and Booleon lattices; the concepts of atomicity, completeness, reductibility, modularity, M-symmetry, Osymmetry, distributivity, algebraic coordination, and specific realizations. Pr.: Consent of instructor.
245 815. Lattice Theory II. (3) II in alt. years. Cont. of Math. 814. Pr.: Math. 814.
245 852. Functional Analysis I. (3) I in alt. years. Topics to be selected from linear topological spaces, seminormed linear spaces, Banach spaces, Banach algebras, harmonic analysis, and others. May be repeated for credit. Pr.: Math. 722.
245 853. Functional Analysis II. (3) II in alt. years. Cont. of Functional Analysis I. May be repeated for credit. Pr.: Math. 852.
245 871. Algebraic Topology I. (3) I. Homotopy groups, covering spaces, fibrations, homology, general cohomology theory and duality, homotopy theory. Pr.: Math. 711, 772.
245 872. Algebraic Topology II. (3) II. Cont. of Algebraic Topology I. Pr.: Math. 871.
245 890. Combinatorial Analysis. (3) II in alt. years. Permutations, combinations, inversion formulae, generating functions, partitions, finite geometries, difference sets, and other topics. Pr.: Consent of instructor.
245 900. Practicum in Mathematics. (3) I, II. Techniques of presentation of mathematical material at the university level. May be repeated for credit. Pr.: Consent of Department.

245 901. Topics in Algebra. (3) On sufficient demand. Selected topics in modern algebra. May be taken more than once for credit. Pr.: Consent of instructor.
245 910. Ring Theory I. (3) I in alt. years. Structure of rings and algebras including density theorems, chain conditions, reducibility, Kronecker products. Pr.: Math. 711 and one of Math. 701 and 603.
245 911. Ring Theory II. (3) II in alt. years. Cont. of Ring Theory I, with emphasis on special rings. Pr.: Math. 910.
245 912. Theory of Sheaves I. (3) I every third year. Inductive systems and limits, complexes and double complexes, differential filtered graded modules, presheaves and sheaves, the Grothendieck cohomology theory for sheaves. Pr.: Consent of instructor.
245 913. Theory of Sheaves II. (3) II every third year. The Cech-Serre cohomology theory for presheaves; applications such as the duality theorems for topological manifolds, the theorem of de Rham for differentiable manifolds and the theorem of Dolbeault for complex manifolds. Pr.: Math. 911.
245 915. Semigroup Theory I. (3) I every third year. Main properties of regular semigroups, inverse semigroups; completely 0 -simple semigroups. ReesSushkevitsch theorem; semisimple semigroups; ideal extension. Pr.: Math. ' 711.
245 916. Semigroup Theory II. (3) II every third year. Cont. of Semigroup Theory I. Pr.: Math. 915.
245 921. Topics in Analysis. (3) On sufficient demand. Selected topics in modern analysis. May be taken more than once for credit. Pr.: Consent of instructor.
245 922. Topics in Harmonic Analysis. (3) On sufficient demand. Selected topics in harmonic analysis. May be taken more than once for credit. Pr: Consent of instructor.
245 951. Differential Topology I. (3) I in alt. years. Differential calculus, imbedding and immersion of manifolds; vector space bundles; Thom's cobordism theory. Pr.: Math. 672 and 872.
245 952. Differential Topology II. (3) II in alt. years. Cont. of Differential Topology I. Pr.: Math. 951.
245 953. Topological Groups I. (3) I in alt. years. General theory of topological groups, linear representations of compact topological groups, locally compact Abelian groups, introduction to Lie groups and Lie algebra. Pr.: Math. 711, 772.
245 954. Topological Groups II. (3) II in alt. years. Cont. of Topological Groups I. Pr.: Math. 953.
245 955. Fibre Bundles I. (3) I every third year. General theory of bundles, homotopy theory of bundles, cohomology of bundles. Pr.: Math. 871.
245 956. Fibre Bundles II. (3) II every third year. Cont. of Fibre Bundles I. Pr.: Math. 955.
245 957. Lie Groups. (3) II in alt. years. Analytic manifolds, differential forms, topological and Lie groups, the Lie algebra of Lie groups, Lie's fundamental theorems, exponential mapping, subgroups and subalgebras. Pr.: Math. 954.
245 961. Topics in Applied Mathematics. (3) On sufficient demand. Selected topics in applied mathematics. May be taken more than once for credit. Pr.: Consent of instructor.

245 971. Topics in Geometry. (3) On sufficient demand. Selected topics in geometry, such as convex sets or distance geometry. May be taken more than once for credit. Pr.: Consent of instructor.
245 973. Theory of Linear Connections and Riemannian Manifolds. (3) II in alt. years. Differentiable manifolds, connections in fibre bundles, linear connections, Riemannian manifolds and submanifolds, completeness, sectional curvature, curvature and homology, conjugate and cut loci. Pr.: Math. 672, 772.
245 981. Topics in Topology. (3) On sufficient demand. Selected topics in topology, such as homotopy, topological groups, topological dynamics, or algebraic topology. May be taken more than once for credit. Pr.: Consent of instructor.
245 999. Research in Mathematics. Credit arranged. I, II, S. Pr.: Sufficient training to carry on the line of research undertaken and consent of instructor.

## Military Science

COLONEL ARCHIE R. HYLE, Head of Department

Professor Hyle; Assistant Professors Bass, Ringgenberg, Riley, Fielden, Lightfoot; Instructors Byrne, Arnold.

Kansas State University offers the General Military Science curriculum to all male students. This curriculum is designed to give all students who complete the program the basic knowledge of skills necessary to all officers in the U.S. Army as well as the historical background requisite for a proper understanding of the Army and its relation to the nation. Specialization in a particular branch will come after graduation and commissioning.

The first two years constitute the Basic Course. All students enrolled in the Basic Course are furnished free of charge complete uniforms, texts, and other necessary equipment. In the Basic Course, students receive one credit hour per semester, and attend recitation one hour per week.
The third and fourth years constitute the Advanced Course, in which enrollment is selective and voluntary. In the Advanced Course, students receive a total of twelve semester hours credit, three per semester. They attend class three hours per week, and receive $\$ 50$ per month.
As part of the Advanced ROTC Course, in any semester the student chooses, enrollment in History 761, 762, 763, 764 or 766 is required. However, if the student's curriculum does not
allow sufficient elective time for one of the above courses, the requirement is waived.

A student can earn an Army Reserve Commission by completing the Advanced ROTC program (junior and senior years). He can become eligible to enter the Advanced program in either of two ways: (1) complete the Basic Course (freshman and sophomore years); or (2) complete a Basic Course Summer Camp prior to enrolling as a junior. The latter is called "The Two-Year Program." This program is especially suited to junior college transferees and graduate students beginning post graduate work at KSU. Application is made during the spring prior to attendance at the Summer Camp. Students in the Advanced Course must complete an Advanced Course Summer Camp between their junior and senior years.

Cadets who have demonstrated outstanding achievement in academic and military subjects are eligible for designation as Distinguished Military Students (DMS) during their senior year. This can lead to the designation of Distinguished Military Graduate (DMG) upon receipt of the baccalaureate degree. Those cadets chosen DMG can be commissioned in the Regular Army, should they so desire.

Under present regulations, freshmen in the first-year Basic ROTC are eligible for a draft deferment after conclusion of one semester. Students enrolled in the Advanced Course must sign a deferment agreement. The deferment agreement exempts the student from selective service induction in return for agreement to accept a commission, if tendered, upon completion of the course of instruction and to serve on active duty for a period of either two years or six months, as determined by the Secretary of the Army.

Senior Advanced Course cadets are eligible to participate in the Army ROTC Flight Training Program on a voluntary and selective basis. This training consists of 35 hours of ground school and $361 / 2$ hours of dual and solo flight instruction. Successful completion of this training can qualify students for Federal Aviation Administration Private Pilot's Certificate. Students completing ROTC flight training must agree to serve at least three years on active duty with the Army following graduation from Army flight school.

The ROTC program offers to selected
students one, two, three, and four-year scholarships. These scholarships pay tuition and fees, up to $\$ 110$ per year for books and special fees, and pay the student a subsistence of $\$ 50$ per month. A student must apply for and be approved for a four-year scholarship prior to coming to the University. The other scholarships are available only to students who are enrolled in ROTC. Application for these scholarships is made in the second semester of the year, prior to the fall semester in which the scholarship would become effective.

## Basic Course

UNDERGRADUATE CREDIT
249 113. Military IA. (1) I. Introduction to National Defense Establishment, an introduction to the history of warfare and organization of the Army, a discussion of organization and importance of the ROTC program. Leadership Lab (drill and command). One hour recitation and one hour Leadership Lab a week. No prerequisites.
249 114. Military IB. (1) II. Introduction to National Defense Establishment (con't)-organization of Departiment of Defense and national power and policies. Leadership Lab (drill and command). One hour recitation and one hour Leadership Lab a week. No prerequisites.
249 125. Military 2A. (1) I. American Military History in 20th Century. Leadership Lab (drill and command). One hour recitation and one hour leadership lab a week. Pr.: Completion of MS I.
lab a week. Pr.: Completion of MS I.
249 126. Military 2B. (1) II. Map and Aerial Photograph Reading. Leadership Lab (drill and command). One hour recitation and one hour leadership lab a week. Pr.: Completion of MS I.

## Advanced Course

## UNDERGRADUATE CREDIT

249 233. Military 3A. (3) I. Principles of Leadership, Methods of Instruction, Internal Defense-Development and Management. Leadership Lab (drill and command). Three hours recitation and one hour leadership lab a week. Pr.: Completion of MS I and MS II or attendance at ROTC Basic Course Summer Camp.
249 234. Military 3B. (3) II. Small Unit Tactics, Communications, Branches of the Army. Leadership Lab (drill and command). Three hours recitation and one hour leadership lab a week. Pr.: Completion of MS I and MS II or attendance at ROTC Basic Course Summer Camp.
249 243. Military 4A. (3) I. Theory and dynamics of the military team. Leadership Lab (drill and command). Three hours recitation and one hour leadership lab a week. Pr.: Completion of MS I, MS II, and MS III.
249 244. Military 4B (3) II. Seminar in Leadership and Management. Leadership Lab (drill and command). Three hours recitation and one hour leadership lab a week. Pr.: Completion of MS I, MS II, and MS III.

## Modern Languages

ROBERT L. COON,* Head of Department
Professor Coon; Associate Professors Beeson* and Coates;* Assistant Professors Alexander, Brann, McGraw, C. Miller, ${ }^{*}$ Ron, Slishman,* Terrill,* and Vazquez;* Instructors Baysden, Driss, McCain, M. Miller, Shopmaker, and Swietlicki; Emeritus: Professors Limper* and Moore;* Associate Professors Munro* and Pettis.*

## UNDERGRADUATE STUDY

Students majoring in languages should enroll for the Bachelor of Arts degree (see page 81).
For a minor, 18 hours in a single language at college level should be completed.
For a language major, 30 hours at college level in a single language should be completed, which includes the 12 -hour curricular requirement. The attention of the student preparing for graduate school (as well as for high school teaching) is directed to the corollary courses: 455, 652 and 664 . Six hours of history in the country and period related to the student's major language interest are desirable.
Students who have had two or more years of foreign language study in high school usually may not duplicate that work for college credit. Students who have studied a foreign language for less than two years in high school may enroll in an elementary college course in that language. If there is any doubt as to proper placement, the head of the Department of Modern Languages should be consulted.

## GRADUATE STUDY

Prerequisite to graduate work in German, French, and Spanish is completion of a fouryear undergraduate curriculum substantially equivalent to that required of general arts and science students, but including sufficient work in the languages to prepare the student for advanced work in the language he has chosen. Major work leading to the Master of Arts degree is offered in French, German and Spanish.

## Courses in Modern Languages

## UNDERGRADUATE CREDIT

253 399. Honors Seminar in Modern Languages. Credit arranged. I, II. Selected topics. Open to non-majors in the Honors Program.

## Linguistics

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

253 455. General Phonetics. (3). Same as Speech 455. UNDERGRADUATE AND GRADUATE CREDIT
253 652. Introduction to Linguistics. (3) I, II, S. Same as Speech 652.
253 664. Topics in Applied Linguistics. (3) II. Same as Speech 664.
253 669. Language Typology. (3). Same as Speech 669. 253 672. Transformational Grammar. (3). Same as Speech 672.
253 673. Introduction to Historical Linguistics. (3). Same as Speech 673.
253 674. Methods and Techniques of Learning a Second Language. (3). Same as Speech 674.
253 676. Phonetics and Phonemics of English. (3). Same as Speech 676.
253 677. Morphology and Syntax of English. (3). Same as Speech 677.

## French

## UNDERGRADUATE CREDIT

253 131. French I. (4). Introduction to the grammar of modern French, with the use of the language laboratory's facilities
253 135. French II. (4). Completion of the grammar of modern French with the use of the language laboratory's facilities. Pr.: Mod. L. 131 or equiv.
253 230. French III. (4). Reading of selections from modern prose and review of the structure of the language as needed. Pr.: Mod. L. 135 or equiv.
253 235. French IV. (3). Selections from nineteenth and twentieth century French prose. Pr.: Mod. L. 230 or equiv.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

253 422. Contemporary French Civilization. (3). To present to students the broad sweep of French culture from the medieval period to the present and to give a basis upon which students may continue study of French culture in France. The presentation of factual information, as well as the classroom discussions, to be in French. Pr.: Fifteen hours of college French or consent of instructor.
253 430. French V. (3). An introduction to French literature. Pr.: Mod. L. 235 or equiv.
253 431. French Composition and Conversation I. (3). Review in depth of the structure of modern French on the basis of themes and conversations in French. Pr.: Mod. L. 235 or equiv.

253 432. French Composition and Conversation II. (3) Continuation of the study of the grammar and syntax of modern French and its phonetic basis. Pr.: Mod. L. 431 or equiv.
253 434. French Conversation III. (2). A course devoted to the spoken language and its proper use. Pr.: Mod. L. 432 or equiv.

## UNDERGRADUATE AND GRADUATE CREDIT

253 623. Survey of French Literature 1. (3). The reading and discussion of French literature from the Middle Ages to the end of the eighteenth century. Pr.: Eighteen hours of college French or equiv.
253 624. Survey of French Literature II. (3). The reading and discussion of French literature from the early nineteenth century to the mid-twentieth century. Pr.: Eighteen hours of college French or equiv.
253 626. French Poetry. (3). Reading and discussion of a representative anthology of French poems from Villon to Baudelaire. Pr.: Eighteen hours of college French or equiv.
253 630. French Novel I. (3). Reading, explication and discussion of several novels of the seventeenth and eighteenth centuries. Pr.: Eighteen hours of college French or equiv.
253 631. French Novel II. (3). Reading, explication and discussion of several novels of the nineteenth century.
Pr.: Eighteen hours of college French or equiv.
253 632. French Drama I. (3). Reading and discussion of a selection of French plays of the nineteenth century. Pr.: Eighteen hours of college French or equiv.
253 633. French Drama II. (3). Reading and discussion of a selection of modern twentieth century French plays. Pr.: Eighteen hours of college French of equiv.
253 634. Moliere.(3). A study of the plays. Pr.: Eighteen hours of college French or equiv.
253 635. Contemporary French Literature. (3). Reading and explication of a selection of twentieth century poetry and prose. Pr.: Eighteen hours of college French or equiv.
253 636. Nineteenth Century French Literature I. (3). A study of Pre-romanticism and Romanticism. Pr.: Eighteen hours of college French or equiv.
253 637. Nineteenth Century French Literature II. (3). A study of Naturalism and Symbolism. Pr.: Eighteen hours of college French or equiv.
253 700. History of the French Language. (3). A brief survey of the evolution of the French language from a genetic, sociological, descriptive, and literary point of view. Pr.: Eighteen hours of French.

## German

## UNDERGRADUATE CREDIT

253 105. Technical German I. (3). The grammar and syntax of German and the reading of basic material selected from modern German scientific writing.
253 111. Technical German II. (3). Continued reading of material from modern German scientific writing. Pr.: Mod. L. 105 or equiv.
253 121. German I. (4). Introduction to the structure of modern German, reading of selected prose texts, and practice of the spoken language in the language laboratory.
253 126. German II. (4). Continuation and conclusion of the introduction to the syntax and grammar of modern German, reading of selected prose texts. Pr.: Mod. L. 121 or equiv.
253 221. German III. (4). Reading and discussion of a selection of modern German prose and review of the structure of German. Pr.: Mod. L. 126 or equiv.

253 225. German IV. (3). Reading and discussion of modern German prose and review of the more difficult points of German grammar. Pr.: Mod. L. 221 or equiv.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

253 423. German Culture. (3). To acquaint students (particularly those contemplating study in Germany) with contemporary German culture. Lectures and discussions in German. Pr.: Eighteen hours of college German or equiv
253 426. German Composition and Conversation. (3). Study of the basic structure of spoken German, with practice in the writing and speaking of German. Pr.: Mod. L. 225 or equiv.
253 427. Advanced German Composition and Conversation. (3). Continued study in depth of spoken and written German using audio-visual and audiolingual aids. Pr.: Mod. L. 426 or equiv.
253 428. Introduction to German Literature I. (3). Literary movements of the 19th century are introduced through the reading and discussion of texts in various forms and by representative authors. Pr.: Mod. L. 225 or equiv.
253 429. Introduction to German Literature II. (3). Discussion of significant works of 20th century prose, poetry, and drama. Special emphasis is placed on the literature of recent decades. Pr.: Mod. L. 225 or equiv.

## UNDERGRADUATE AND GRADUATE CREDIT

253 720. German Drama I. (3). Reading and discussion of selected plays from the late eighteenth and nineteenth centuries. Pr.: Eighteen hours of college German or equiv.
253 721. German Drama II. (3). Reading and discussion of selected plays from the twentieth century. Pr.: Eighteen hours of college German or equiv.
253 722. Schiller. (3). Reading and discussion of selected plays and poems from the work of Schiller. Pr.: Eighteen hours of college German or equiv.
253 723. Goethe. (3). Reading and discussion of selected dramas, poetry, and prose from the work of Goethe. Pr.: Eighteen hours of college German or equiv.
253 724. German Lyric Poetry. (3). Reading and explication of selected poems from the Middle Ages to the twentieth century. Pr.: Eighteen hours of college German or equiv.
253 725. Survey of German Literature I. (3). Introduction to German literature from Ulfilas to German Classicism. Pr.: Eighteen hours of college German or equiv.
253 726. Survey of German Literature II. (3). German literature in survey from German Classicism to the twentieth century. Pr.: Eighteen hours of college German or equiv.
253 727. The Germam Novelle. (3). A selection of the outstanding German Novellen of the nineteenth and twentieth centuries. Pr.: Eighteen hours of college German or equiv.
253 728. Modern German Literature. (3). Introduction to twentieth century literature. Pr.: Eighteen hours of college German or equiv.

## Greek

## UNDERGRADUATE CREDIT

253 171. Greek I. (4). Introduction to the grammar of classical Greek and reading of elementary prose.
253 172. Greek II. (4). Completion of the grammar of classical Greek and continuation of the reading of elementary prose. Pr.: Mod. L. 171 or equiv.

## Italian

## UNDERGRADUATE CREDIT

253 151. Italian I. (4). Introduction to the structure of modern Italian.
253 155. Italian II. (4). Continuation and completion of the study of modern Italian grammar, using the facilities of the language laboratory for audiolingual practice. Pr.: Mod. L. 151 or equiv.
253 251. Italian III. (4). Grammar review and reading selections from Italian literature. Pr.: Mod. L. 155 or equiv.
253 253. Italian IV. (3). Selective review of grammar and reading of examples of modern Italian literature. Pr.: Mod. L. 251 or equiv.

## Latin

## UNDERGRADUATE CREDIT

253 115. Latin I. (4). An introductory study of the structure of Latin.
253 116. Latin II. (4). Continuation and completion of the study of the structure of Latin. Pr.: Mod. L. 115 or equiv.
253 270. Latin III. (4). Review of Latin grammar and reading of an anthology of Roman prose and poetry. Pr.: Mod. L. 116 or equiv.
253 271. Latin IV. (3). Continuation of the study of Latin syntax and grammar, based upon the reading of Roman prose and poetry. Pr.: Mod. L. 270 or equiv.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

253 450. Cicero. (3). A study of the versatility of Cicero as evidenced in various works. Pr.: Mod. L. 271 or equiv. 253 451. Vergil. (3). A study of the Latin epic as exemplified by Vergil's. Pr.: Mod. L. 450 or equiv.
253 501. Horace. (3). A critical study of the major works of Horace. Pr.: Mod. L. 451 or quiv.
253 502. Roman Comedy. (3). A study of the techniques of Roman comedy. Pr.: Mod. L. 501 or equiv.

## Russian

## UNDERGRADUATE CREDIT

253 161. Russian I. (4) I. Introduction to the structure of modern Russian and reading of elementary prose.
253 165. Russian II. (4) II. Continuation of the study of the grammar and syntax of modern Russian. Pr.: Mod. L. 161 or equiv.

253 261. Russian III. (4) I. Reading of selected prose on the intermediate level. Pr.: Mod.L. 165 or equiv.
253 265. Russian IV. (3) II. Reading and discussion of selected nineteenth and twentieth century poetry and prose. Pr.: Mod. L. 261 or equiv.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD
253 448. Russian V. (3). Reading of selected Russian literature of the nineteenth and twentieth centuries. Pr.: Mod. L. 265 or equiv.
253 460. Russian Conversation and Composition. (3). Discussion, writing of compositions, study of current events. Pr.: Mod. L. 265 or equiv.
253 500. Russian Literature in Translation. (3). Development of Soviet literature since the revolution, stressing the prose works.
253 530. Introduction to Russian Literature. (3). Russian literary and intellectual trends to the Revolution of 1917. Pr.: Mod. L. 265 or equiv.
253 531. Russian Drama. (3). Development of the Russian theater, with special emphasis on dramatists of the period from 1850 to 1920 . Reading of plays by Griboedov, Gogol, Turgenev, Ostrovsky, and Gorky. Pr.: Mod. L. 530 or equiv.
253 532. Russian Novelists of the Nineteenth Century. (3). Major masters of the fiction of the nineteenth century, excluding Pushkin, Dostoevsky, and Tolstoy; emphasis on Lermontov, Gogol, Turgenev, Leskov, and Saltykov-Shchedrin. Pr.: Mod. L. 530 or equiv.

## Spanish

## UNDERGRADUATE CREDIT

253 141. Spanish I. (4). Basic introduction to the structure of the Spanish language, emphasizing oral and written drills, as well as practice in the language laboratory.
253 145. Spanish II. (4). Continuation of Spanish I, completion of basic presentation of structural and linguistic principles of the Spanish language, and practice in the language laboratory. Pr.: Mod. L. 141 or equiv.
253 241. Spanish III. (4). An intensive review of syntax and a comprehensive structural review of Spanish, with emphasis on composition and conversation. Pr.: Mod. L. 145 or equiv.
253 243. Elementary Spanish Conversation. (2). Practice in the beginning conversational Spanish. Emphasis on oral communication within the classroom. Course not open to fluent speakers. Pr.: Twelve hours of college Spanish or equivalent.
253 245. Spanish IV. (3). Reading and discussion of selections from contemporary prose, and review of grammatical structures as needed. Pr.: Mod. L. 241 or equiv.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

253 440. Spanish V. (3). An introduction to the prose of Spain, with a review of difficult grammatical points as they arise. Pr.: Mod. L. 245 or equiv.
253 445. Spanish Composition and Conversation. (3). Review in depth of the structure of modern Spanish on the basis of classroom discussion and assigned topics. Pr.: Mod. L. 245 or equiv.
253 446. Advanced Spanish Composition and Conversation. (3). Continuation of the study of the grammar and syntax of modern Spanish and its phonetic basis. Pr.: Mod. L. 445 or equiv.

UNDERGRADUATE AND GRADUATE CREDIT
253 600. Spanish Civilization. (3) Survey of Spanish culture and civilization from its beginnings to the present; emphasis on Spanish contributions over the centuries in the humanistic fields. Pr.: Fifteen hours of Spanish or equiv.
253 601. Hispanic-American Civilization. (3) Cultural development of Latin American countries. Pr.: Fifteen hours of Spanish or equiv.
253 678. Survey of Spanish Literature I. (3). Introduction to the verse, prose, and drama of Spain from the Middle Ages to Calderon. Pr.: Eighteen hours of college Spanish or equiv.
253 679. Survey of Spanish Literature II. (3). Verse, prose, and drama of Spain from 1700 to the present. Pr.: Eighteen hours of college Spanish or equiv.
253 680. Spanish Novel I. (3). Reading and discussion of Golden Age novels including the picaresque novel and the novel of customs. Pr.: Eighteen hours of college Spanish or equiv.
253 681. Spanish Novel II. (3). Reading and discussion of several nineteenth century novels, their form and content. Pr.: Eighteen hours of college Spanish or equiv. 253 682. Spanish Drama I. (3). Reading of a selection of dramas from the Golden Age. Pr.: Eighteen hours of college Spanish or equiv.
253 683. Spanish Drama II. (3). The reading of selected plays from the nineteenth century Spanish stage. Pr.: Eighteen hours of college Spanish or equiv.
253 684. Spanish-American Literature. (3). Reading and discussion of a broad selection of the prose and verse of Spanish America. Pr.: Eighteen hours of college Spanish or equiv.
253 685. Cervantes. (3). Reading of the works of Cervantes and discussion of the literary and cultural background of the period. Pr.: Twenty-one hours of college Spanish or equiv.
253 686. Contemporary Spanish Literature. (3). Reading and discussion of prose and poetry from Spanish literature of the twentieth century. Pr.: Eighteen hours of college Spanish or equiv.
253 687. Spanish-American Novel. (3). The reading of representative novels from Latin America. Pr.: Eighteen hours of college Spanish or equiv.
253 688. The Works of Federico Garcia Lorca. (3). Study of his drama and poetry. Pr.: Eighteen hours of Spanish or equiv.
253 690. Spanish-American Short Story. (3). Introduction to modern and contemporary SpanishAmerican short story. Pr.: Eighteen hours of college Spanish or equiv.
253 691. Spanish-American Drama. (3). Introduction to modern and contemporary Spanish-American plays. Pr.: Eighteen hours of college Spanish or equiv.
253 799. Problems in Modern Languages. Credit arranged. Pr.: Consent of department head and instructor involved.

## GRADUATE CREDIT

253 999. Research in Modern Languages. Credit arranged. Pr.: Thirty hours in one modern language or equiv.

## South Asian Languages

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

253 471. Languages in South Asia. (3). Survey of South Asian languages from genetic, sociological, descriptive, and comparative points of view. Pr.: Introduction to linguistics desirable, not necessary.

## Music

ROBERT A. STEINBAUER,* Head of Department
Professors Leavengood,* Steinbauer,* Steunenberg* and Walker;* Associate Professors Jussila,* Langenkamp,* Pelton* and Shull;* Assistant Professors Caine,* Gutana, Hewett, Jackson,* Polich, Roby,* Sidorfsky,* Sloop,* and Walker;* Instructor Barton.

## UNDERGRADUATE STUDY

The Department of Music is a member, with institutional accrediting, of the National Association of Schools of Music.
Curricula in Applied Music and Music Education with majors in theory and composition, voice, piano, organ, stringed, woodwind and brass instruments are offered. For specific requirements of each curriculum, see pages 134 and 135 .
A major program of music leading to the degree of Bachelor of Arts may be elected in one of these three fields: Music Literature, Music Theory, or Applied Music. The general requirement is 30 semester hours of selected music courses subsequent to the completion of Music 201, 202, 304, 305 (see courses under Theory of Music). Of these, Music 421, 422, 651, 652 (Music History and Music Literature), and 506, 507 (Theory of Music), are required in each field. Recital Attendance (Music 050) is required for eight semesters. If the field is Music Literature, the program also calls for Music 401, 402 (Theory of Music), and 6 semester hours selected from Music 609, 661, 662, 663, 664 (Music History and Literature). In addition, 8 semester hours in a single applied area are required. If the field is Music Theory, the program calls for Music 401, 402, 503 (Theory of Music); 2 semester hours chosen from Music 609, 661, 662, 663, 664 (Music History and Literature) and 8 semester hours of Applied Piano. If the field is Applied Music, other than the basic requirements, the program calls for 2 semester hours selected from any other courses above which are in the 600 series, and 16 hours of Applied Music in either Piano or Voice. The major in music in the Curriculum
in Humanities is not intended to prepare students to teach in the public schools in Kansas.

For a minor in Music in the Bachelor of Arts degree, the following courses are required: Music 201, 202 (Theory of Music), and 4 semester hours of Applied Music in a single area. Recital Attendance (Music 050) is required for 2 semesters.

Courses in music are available to any student enrolled in the University, subject to prerequisites listed in the course descriptions. Courses in Applied Music do not require prerequisites for those not majoring in music. This elective credit cannot be used later toward a music degree unless it meets the requirements of that course as they apply to those majoring in music. No more than 2 credits a semester will be granted for Applied Music as an elective.

## PROGRAM IN APPLIED MUSIC

A four-year program is offered in Applied Music with majors in voice, keyboard, strings, wind and percussion instruments. This program leads to the Bachelor of Music degree.

The basic requirements for the program in Applied Music are these: Music 201, 202, 304, 305, 401, 402, 506, 507 (Theory of Music), 421, 422, 651, 652 (Music History and Literature) and Physics for Musicians (Physics 126). Instrumental majors are required to take Music 503 (Theory of Music). Vocal majors must elect 8 additional hours in music; instrumental majors, 5 hours.

Requirements in General Education are stated on page 82.

In the vocal program, 32 semester hours of voice (Music 286), 4 semester hours of piano (Music 270) and 4 semester hours of Vocal Ensemble (Music 290) are required. In the instrumental program, 32 semester hours of the major instrument and 4 semester hours of Instrumental Ensemblé (Music 288) are required. If a keyboard instrument is not the major, one must be chosen as a minor.

For the program in Theory and Composition, the basic courses in General Education for the instrumental major are required. In addition, the following courses are required: Piano ( 8 hours), Music 601, 602, 604, 605 (Theory of Music), Music electives ( 8 hours), General electives (16 hours).

A minimum of 8 hours in musical
organizations in required. Participation in a major organization is required throughout the course. Recital Attendance (Music 050) is also required for each semester of the course.

## REQUIREMENTS FOR ENTRANCE AND GRADUATION

Preliminary examinations in piano, the applied major and theory must be taken by all students majoring in music regardless of the curriculum selected.

## GENERAL INFORMATION

Attendance at a minimum of 15 recitals per semester is required for graduation. Concert offerings include the following: student and faculty recitals; major organization concerts; and all subscription series.

Practice room privileges are included in the fees for students who are enrolled in applied music.

## APPLIED MUSIC REQUIREMENTS FOR THE PROGRAM IN APPLIED MUSIC

Piano Majors: Students majoring in piano must pass grade 6 upon entrance and complete grade 10 by the end of the senior year.

Voice Majors: Students majoring in voice must pass grade 2 of the voice curriculum and grade 2 of the piano curriculum upon entrance and complete grade 6 in voice and grade 4 in piano by the end of the senior year.

Organ Majors: Students majoring in organ must pass grade 6 of the piano curriculum upon entrance and complete grade 4 of the organ curriculum by the end of the senior year.

String Majors: Students majoring in strings must pass grade 6 of the major instrument upon entrance and complete grade 10 by the end of the senior year. In addition, all string majors must pass grade 1 in piano for entrance and complete grade 3 by the end of the senior year.

Wind Majors: Students majoring in wind instruments must pass grade 4 on their major instrument upon entrance and complete grade 8 by the end of the senior year. In addition, all instrumental majors must pass grade 1 in piano for entrance and complete grade 3 by the end of the senior year.

## APPLIED MUSIC REQUIREMENTS FOR THE PROGRAM IN MUSIC EDUCATION

Piano Majors: Students majoring in piano must pass grade 3 in piano upon entrance and complete grade 7 by the end of the senior year.
Voice Majors: No specific entrance requirements. However, a student should possess the ability to sing in time and in tune. Students majoring in voice must pass grade 2 in piano upon entrance. For graduation, voice majors must complete grade 4 of the voice curriculum and grade 4 of the piano curriculum.
Organ Majors: Students majoring in organ must pass grade 3 of the piano curriculum upon entrance and complete grade 2 of the organ curriculum by the end of the senior year.

String Majors: Students majoring in strings must pass grade 3 on their major instrument and grade 1 of the piano curriculum upon entrance. They must complete grade 7 of the major instrument and grade 3 of the piano curriculum by the end of the senior year.
Wind Majors: Students majoring in wind instruments must pass grade 1 on their major instrument and grade 1 of the piano curriculum upon entrance. They must complete grade 5 on the major instrument and grade 3 of the piano curriculum by the end of the senior year.

Outlines of each of the curricula in music may be secured upon request from the Chairman of the Department of Music. In each case, the major applied area should be specified.

## GRADUATE STUDY

Graduate work leading to the degrees Master of Music and Master of Arts is offered in the Department of Music.

Prerequisite to work in the Graduate Program is the completion of a 4 -year undergraduate curriculum leading to the degrees B.M., B.M.E., or B.S. in Music Education, with graduation requirements substantially equivalent to those of the music curricula in this University.
For the degree Master of Music, either Music Education or Applied Music may be chosen as a field of concentration, equalling a
minimum of 14 semester hours including a Master's Report. In the field of Music Education such cognate courses as Psychology of Music, Problems in Music, Research in Music and Master's Report may be used for partial fulfillment of this requirement. In the field of Applied Music, a graduate recital is required.

Electives to the extent of ten semester hours credit are required in the fields of Music Literature and Music Theory. If Music Education is the field of concentration, electives to the extent of 4 semester hours in Applied Music are required, provided proficiency warranting enrollment for graduate credit can be shown at time for enrollment.
For the degree Master of Arts, the field of concentration may be in Music Literature equalling a minimum of 14 semester hours including a Master's Report. In addition, 4 semester hours of applied music is required. A minor carrying a minimum of 6 semester hours may be chosen from courses in one department other than the Music Department in which the candidate is qualified to carry courses on the graduate level.
Facilities for advanced work in this department include an extensive library of music and records, adequate practice facilities and a growing collection of the most important reference works.

## Courses in the Theory of Music

UNDERGRADUATE CREDIT
257 100. Music Fundamentals. (3). I, II, S. Elementary instruction in the Theory of Music. 3 hours recitation a week.
257 201. Theory of Music I. (3). I, II, S. An integrated course comprising ear-training, sight-singing, and elementary part-writing. Principles of diatonic harmony and melodic construction with emphasis on choral arranging. 5 hours recitation a week.
257 202. Theory of Music II. (3). I, II, S. Continuation of Music 201; keyboard arranging, harmonic analysis, and writing in small forms. 5 hours recitation a week. Pr.: Music 201 or consent of instructor.
257 303. General Principles of Harmony. (3). Offered on demand. A course - designed for the general student who is interested in music - which presents such basic concepts as tonality, modality, chord structure and progression. Not open to students majoring in music or music education. Pr.: Ability to read music.
257 304. Theory of Music III. (3). I, II, S. Continuation of ear training and sight-singing. Chromatic melody and harmony: modulatory technique and harmonic analysis of selected 19th century works. 5 hours recitation a week. Pr.: Music 202 or consent of instructor.

257 305. Theory of Music IV. (3). I, II, S. Continuation of ear training and sight-singing. Basic 2 and 3 part counterpoint in the 18th century style; emphasis on analysis. 5 hours recitation a week. Pr.: Music 304 or consent of instructor.
257 390. Problems in Music I, II. (1-3). Offered on demand. Pr.: Background of courses needed for problems undertaken.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

257 401. Counterpoint I. (2) I, S. Devices of counterpoint and imitation leading to the writing of short contrapuntal compositions in two voices. Analysis of choral preludes and inventions. Pr.: Music (Theory) 305.
257 402. Counterpoint II. (2). II, S. Continuation of Music 401. Contrapuntal composition in three or four voices; analysis of the fugue. Pr.: Music (Theory) 401.
257 503. Instrumentation and Orchestration. (3). II, S. Instruments of the band and orchestra studied with relation to range, function and tone color. Simple and more difficult familiar and non-familiar composition scored for ensembles, full orchestra and full band. 1 hour lab. each week as needed. Pr.: Music (Theory) 305.
257 506. Musical Form and Analysis I. (2) I. Forms used in composition: the Music of Bach, Haydn, Mozart, Beethoven, Schumann, Chopin, Brahms, Wagner and others. Pr.: Music (Theory) 305.
257 507. Musical Form and Analysis II. (2). II. Continuation of Music 506. Forms and compositional techniques as used by major composers of the 20th century. Pr.: Music (Theory) 506 or consent of instructor.
257 516. Conducting I. (2). I, S. Basic meters and the proper manner of executing each; introduction to score reading and transposition. Pr.: Music (Theory) 305.
257 517. Conducting II. (2). II, S. Continued stress on acquiring basic mechanical skills; analysis of differences between instrumental and choral conducting; study of the stylistic factors which are involved in the interpretation of representative compositions from the various historical periods. Pr.: Music (Theory) 516.
257 521. Composition I. (2). I, S. Composition in the small forms for piano, voice and instruments; development of style concept. Pr.: Music (Theory) 402, or consent of instructor.
257 522. Composition II. (2). II, S. Continuation of Music 521 with emphasis on more complex treatment of the small and compound forms. Pr.: Music (Theory) 521.

## UNDERGRADUATE AND GRADUATE CREDIT

257 601. Advanced Analysis I. (2). I and alternate S. Combination of harmony, counterpoint and form as used in compositions in their historical settings. Pr.: Music (Theory) 506, or consent of instructor.
257 602. Advanced Analysis II. (2). II and alternate S. Modern chord structures, atonality, polytonality and form used in contemporary compositions. Pr.: Music (Theory) 601.
257 604. Composition III. (2) Offered on demand. Continuation of Composition II. An exploration of larger forms of music. Pr.: Music (Theory) 522.

257 605. Composition IV. (2). Offered on demand. Continuation of Composition III. Pr.: Music (Theory) 604.

257 611. Practical Composition and Arranging. (2). Offered on demand. Explanation of styles and techniques applicable to contemporary commercial music. Practical arranging for the stage band. Pr.: Music 305 or consent of instructor.
257 614. Advanced Orchestration. (2). Offered on demand. The study of contemporary ( 20 th century) orchestra and band scores. Exercises in orchestrating this type of music for different choirs of instruments, as well as scoring for full orchestra and symphonic band. Pr.: Music 503 or consent of instructor.
257 632. Seminar in Electronic Musical Acoustics. (2). Offered on demand. Techniques of modern experimental music; related music theory; voltage-controlled systems and computational synthesis. Individual projects. Pr.: Music 522, or consent of instructor.

## Courses in Music History and Literature

## UNDERGRADUATE CREDIT

257 150. Music Listening Laboratory. (1). I, II. A direct listening laboratory. Includes recorded musical works of all major periods and styles. Performances from the major university organizations and faculty artists. Limited to non-music majors. 2 sessions a week.
257 241. The Opera. (2). Offered on demand. Survey of the history of the opera, with a review of a number of the most important operas. Course is designed for students majoring in curricula other than music.
257 243. The Symphony. (2). Offered on demand. Survey of the history of the symphony with presentations of a number of the most important symphonies. The course is designed for students majoring in curricula other than music.
257 245. Program Music. (2). Offered on demand. The presentation of a number of programmatic compositions with non-musical sources from which they are derived. This course is designed for students majoring in curricula other than music.
257 250. Appreciation of Music. (2). I, II, S. A study of musical materials forms and styles that will enable the listener to enjoy more fully the music which he may hear at concerts, in broadcasts, and on records.
257 399. Honors Seminar in Music. (1). Offered on Demand. Not open to music majors. Pr.: Honors students only.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD.

257 421. History of Music I. (2). I, S. Chronological study of significant musical trends; the influence of cultural forces upon musical developments; the contributions of individual composers.
257 422. History of Music II. (2). II, S. Continuation of Music 421. Pr.: Music 421.

## UNDERGRADUATE AND GRADUATE CREDIT

257 609. Music of the 20th Century. (2). Offered on demand. The historical aspect in musical analysis of composition since the romantic period. Pr.: Music 422 and Music (Theory) 506.

257 613. Afro-Americ:an Music. (3). II. Negro music of the new world viewed in a culture historical framework. Examination of the social conditions under which Africarı and European music istyles came into contact in the New $/$ World and the ways in which they blended to form the unique styles of caly/pso, blues, and jazz.
257 651. Music Literature I. (2). I, S. Style charac teristics of music as revealed through a careful analysi; of the music of different periods. Pr.: Music (Musiに History and Literature) 422, and Music (Theory) 305.
257 652. Music Literature II. (2). II, S. Continuation of Music 651. Pr.: Music (Music History and Literature) 651.

257 661. Bach and Handel. (2). In alternate years. A comparison of the musical styles of Bach and Handel is reveaied by a careful analysis of representative works. Pr.: Music (Music History and Literature) 652, or senior standing and consent of instructor.
257 662. Haydn and Mozart. (2). In alternate years. A comparison of the musical styles of Haydn and Mozart ias revealed by a careful analysis of representative workis. Pr.: Music (Music History and Literature) 652, or seni or standing and consent of instructor.
257 663. Beethoven. (2). In alternate years. A study of Beethoven's musical style through the careful analysis of selected works. Pr.: Music (Music History and Literature) 652 or senior standing and consent of Instructor.
257 664. Music sf the Romantic Period. (2). In alternate years. A study of musical trends in the 19th century through the analysis of works by representative composers. Pr.: Mu:sic (Music History and Literature), $65^{\prime} 2$ or senior standing; and consent of instructor.
257 799. Problems in Music. Credit arranged. I, Ill, S. Pr.: Background of courses needed for problem undertaken.

## GRADUATE ©CREDIT

257 801. Graduate Seminar in Music. (2). I, S. Lit)rary procedures, research methods and practice in prep.aring scholarly papiers.
257 803. Sensinar in Music History. (3). S. The History of Music with emphasis on the correlation of stylistic factors and rnan's cultural environment. Pr.: Graduate standing or consent of instructor.
257 999. Research in Music. Credit arranged. I, II, S. Pr.: Registr:ation in the graduate school with sufficient training to c:arry on the line of research undertaken.

## Courses in Music Education <br> UNDERGIRADUATE CREDIT

257 405. Music for Elementary Teachers. (3). I, II, S. The contribution of music to child development in elementa ry schools. A study of Music literature suited to children through the development of purposive listening and the expressive phases of music including; rythmic response:, singing, playing, reading and writing. Laborat ory ( 2 hours without credit) required of all students; who have had insufficient piano experience. Pr.: Ju nior standing or consent of instructor. (Course open to elementary education majors only.)

## UNDERGRADUATE CREDIT IN MINOR FIELD

257 412. School Music I. (\%). I. Methods and materials for teaching music in kindergarten, primary and intermeditate grades. Pr.: Music (Theory) 202 or consent of instructor.
257 413. School Music II. (3). II. Methods and teaching materials suitable for junior and senior high school. Pr.: Music (Music Education) $4: 12$ or consent of instructor.

## UNDERGRADUATE AND GRADUATE CREDIT

257 606. Survey of Choral Literature. (2). Offered on Demand. Repertoire of mixeed, male and women's choral ensembles; techniques for effective program building. Pr.: Graduate standing or consent of instructor.
257 607. Choral Adminiistration, Methods and Techniques. (2). Offered on demand. Administration and organization of the choral program; study and discussio a of method and techniques used for effective chor al presentation. Pr.: Senior standing or consent of instructor.
257 610. School Music Electronics. (2). S. A cours ;e to acquaint the teacher with el ectronic instruments. U' ise of voltage-controlled systems, musique concrete, nota ،tional procedures and teaching applications. Individual C ir team projects. Pr.: Senior or graduate standing.
257 612. The Junior High Music Program. (3) . II, S. A methods course dealing with the particular pr/ oblems of this age group such as the changing voict $\approx$, the importance of the general music class, and the $\mathrm{p}^{\prime}$ anning and selecting of music literatur e for the Junior $\mathrm{F}_{\text {igh student. }}$ Pr.: Consent of instructor.
257 621. Workshop in Jun ior High School Vocal Music. (1). S. Survey of the miethods, matel rials, and the teaching techniques of vor:al music for the junior high school.
257 622. Workshop in Jelementary Music. (1). S. Organizing old and new rnaterials for : various levels of elementary music, correlation of acar demic subjects with the music program.
257 623. Workshop in Gecondary ${ }^{\top}$ Jocal Music. (1) S. Choral techniques and interprf station of Baroque, Classical, Romantic, and Modern styles.
257 624. Workshop in Instrum ental Music. (1). S. Teaching techniques, miethods; and materials for woodwind, brass, string, and percussion sections of bands and orchestras.
257 625. Workshop in Pia no P edagogy. (1). S. Methods, materials, and teaching techr iques for all grade levels. 257 626. High School Music. Theory. (3). Offered on demand. The High School Tr leory course, its objectives and content; ear training ter shniques and development of creative work; music histor y and appreciation in a high school program. Pr.: Mus: ic 305.
257 627. Music Theory in the Junior College I. (3). Given in alternate summers and on demand. A course presenting a thorough re' siew of music fundamentals and the methods of presen' ting sight-singing, ear training part-writing and keybor ard harmony to first year classes in Music theory in the Junior College. Pr.: Graduate standing or consent 0 f instructor.
257 628. Music Ther ory in the Junior College II. (3). Given in alternate su mmers and on demand. Methods of presenting elemen tary counterpoint, contemporary
idioms, and correlated ear training procedures for second year classes in Music Theory in the Junior College. Pr.: Music 627.
257 629. Music History and Appreciation in the Junior College. (3). Given summers on demand. A study of course content, texts, and materials leading to effective courses in music history and music appreciation in the Junior College. Pr.: Graduate standing or consent of instructor.
257 630. Instrumental Adıninistration, Methods and Techniques. (3). II, S. The school instrumental program, its administration, training and materials. Emphasis on senior and junior high problems. Pr.: Junior standing. 257 631. Marching Band and Stageband Techniques.
(3). S. Show ideas and organization, music selection, rehearsal techniques, organization and administration of ti 'e marching band and stage band. Pr.: Junior standing.
25: ${ }^{7}$ 660. Survey of Writings on Music and Music Ed ncation. (3). II, S. A survey of writings in the field of aest hetics, criticism, psychology of music, and philo. sophy of music education. Pr.: Graduate standing or col 2 sent of instructor.

## Courss es in Applied Music

## UNDER GRADUATE CREDIT

257 050. 1 Recital Attendance. (0). I, II.
257 111. C oncert Choir. (1). I., II. Membership by tryout.
257 115. Ba nd. (1). I, II. Membership by tryout.
257 121. Coll 'egiate Chorale. (1). I, II, S.
257 125. K-St. ate Singers. (1). I, II. Membership by tryout. (not op en to Music niajors.)
257 130. Orche: itra. (1). I, I I. Membership by tryout.
257 135. Varsity Men's Glee IClub. (1). I, II, Membership by tryout.
257 140. Women's Glee Club. (1). I, II. Membership by tryout.
257 203. Voice Clas: s. (1). I, II, S. Basic rudiments of voice production and fundamentals of singing. Not open to majors in voice.
257 206. Piano Class I. (1). I, II. Instruction in the rudiments of playing the ? piano. Open to students without previous study.
257 207. Piano Class II ('1). I, II. Continuation of Music 206.

257 208. Piano Class III. ( 1). I, II. Continuation of Music 207.

257 209. Piano Class IV. (1, ). I, II. Continuation of Music 208.

257 233. Wind Techniques aı $1 d$ Materials. (2). II, S. The fundamentals of playing and i nethods for teaching wind instruments.
257 234. String Techniques ant Materials. (2). I, S. The fundamentals of playing and methods of teaching stringed instruments.

The following undergraduate co urses in Applied Music offered each semester and summ ler carry from 1 to 4 hours per semester, with a maxim um of 32 hours in any one applicable to a degree.
257 252. Baritone
257 254. Bassoon

257 256. Clarinet
$25 \%$ 258. Double Bass
257 260. Flute
257 262. French Horn
257 263. Harpsichord
257 264. Oboe
:357 266. Organ
:357 268. Percussion
: 257 270. Piano
〔.57 272. Saxophone
\{:57 275. Trombone
257 276. Trumpet
257 278. Tuba
2!57 280. Viola
2:77 282. Violin
2:i7 284. Violoncello
2:i7 286. Voice
${ }_{2}^{2}$ : 77 287. Singer's Diction (0). I, II, ©S. For all Applied Visice majors and Music Education rnajors with voice option. Rules for pronouncing and translating foreign language texts. Requirements: 6 semesters with a minimum grade of C. Normal sequence: Freshman, It:alian diction; Sophomore, German diction; Junior, $\mathrm{F}_{1} \cdot \mathrm{en}^{2} \mathrm{ch}$ diction.
25:7 288. Instrumental Ensemble. (1). I, II, S. Elective for $\cdot$ selected students.
25il 290. Vocal Ensemble. (1). I, II, S. Elective for selected students.
257' 291. Madrigal Singers. (1). I, II.
257 350. Studio Accompanying. (1). Offered on demand. Pianno student assigned to studio instructor. Accompanies applied lessons for at least 2 hours per w'eek. Ensemble credit for pianists. Pr.: Consent of instr uctor.
257 351. Recital Accompanying. (1). Offered on demand. Piano student assigned to a music major preparing for graduation recital. Pianist: accompanies student in his lessons and presents the formal public progiram as course requirement. Pr.: C'onsent of instructor.

## UNDIERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

257 403. Piano Proficiency. (0). I, II, S. .Required for graduation of all music majors.
257 47!5. Opera Workshop. (1-6). I, II, S. Courses may be repeatied until 6 semester hours of credit have been earned. Principles and techniques of operatic and musical theatre production, with emphasis on class rehearsial and performance of selected scenes from opera and musical drama; brief survey of the history of opera. Offered jointly by the Departments of Music and Speech. Vocal Ensemble credit may be earıned in this course. Same as Speech 475.
257 530. Advanced String Techniques and Materials. (2). II. Playing and teaching skills beyond func lamentals and pressentation of materials suitable for private and public school instruction at the secondary level. Required of brass and woodwind majors in the Music Eiducation program. Pr.: Music (Applied) 234.
257 531. Advanced Woodwind Techniquies and Materialsi. (2). I, II. Playing and teaching skills; beyond
fundamentals and presentation of materials suitable for private and public school instruction at the secondary level. Required of string and brass majors in the Music Education program. Pr.: Music (Applied) 233.
257 532. Advanced Brass Techniques and Materials. (2). I, II. Playing and teaching skills beyond fundamentals and presentation of materials suitable for private and public school instruction at the secondary level. Required of string and woodwind majors in the Music Education program. Pr.: Music Applied 233.

## UNDERGRADUATE AND GRADUATE CREDIT

257 610. Techniques of Vocal Instruction. (2). S. An analytical presentation of vocal methods and techniques, with primary emphasis on preparing the students to give studio lessons. Included are advanced repertoire and diction. Pr.: Senior or graduate standing.
257 637. Literature for Pipe Organ I. (2). I. Survey of organ literature of the Renaissance and Baroque Eras. Pr.: Music (Applied) 266 and consent of instructor.
257 638. Literature for Pipe Organ II. (2). II. Continuation of Music 637, with emphasis on literature from the Romantic and Modern Eras. Pr.: Music (Applied 637).

257 640. Ensemble. (1). I, II, S. A graduate course in ensemble techniques and materials. Pr.: Consent of instructor.
257 642. Methods and Materials for the Studio. (1). I, II, S. Methods of teaching fundamental techniques; selection of teaching materials; outlining courses of study. For students in the curriculum in Applied Music. Taught in divisions according to the major.
257 644. Practice Teaching in Applied Music. (1). II, S. Studio teaching for students in Applied Music. Pr.: Music Applied 642.

## GRADUATE CREDIT

257 802. Repertoire in the Fields of Applied Music. (2). I, II, S. A required course for graduate students majoring in Applied Music, taught in divisions according to major. May be repeated for credit.

The following courses in Applied Music offered each semester and summer carry from 1 to 4 hours credit per semester.

## 257 852. Baritone

257 854. Bassoon
257 856. Clarinet
257 858. Double Bass
257 860. Flute
257 862. French Horn
257 863. Harpsichord
257 864. Oboe
257 866. Organ
257 868. Percussion
257 870. Piano
257 872. Saxophone
257 875. Trombone
257 876. Trumpet

257 878. Tuba
257 880. Viola
257 882. Violin
257 884. Violoncello
257 886. Voice

## Fees for Private Music Lessons

University students enrolled in the Applied Music or Music Education curriculum or the Bachelor of Arts degree with a major in music are exempt from fees for private music lessons and music practice facilities.
University students not majoring in one of the three music curricula may take private music instruction by paying one of the following fees:

Two 30-minute lessons a week per semester - \$42.
One 30-minute lesson a week per semester - \$24.
Two 30-minute lessons a week, summer session - \$21.
One 30 -minute lesson a week, summer session - $\$ 12$.
Single lessons, each - \$4.

## Philosophy

## B. R. TilGHMAN,* Head of Department

Professors Miller* and Tilghman;* Associate Professor Scheer; * Assistant Professors Greenberg and Reagan.

The program in philosophy is designed to give the student a broad knowledge of philosophy, its history, problems, and methods. Philosophy is the study of the conceptual foundations of virtually every area of human thought and activity, art, science, religion, moral conduct, politics, etc., and anyone who engages in any kind of reflective thinking about these areas of thought and activity is bound to encounter problems of a philosophical nature. Courses in philosophy are intended to teach students to identify these problems and to deal with them in an intelligent and informed manner.
While at the present time the only professional opportunities for trained philosophers are in college and university teaching, philosophy is recommended as a highly suitable major for undergraduates desiring general training in the liberal arts and as excellent preparation for specialized graduate study in a number of other disciplines and as preparation for professional training in such fields as law, the ministry, and government service.

## UNDERGRADUATE STUDY

A major in philosophy requires 30 hours in philosophy and must include the following courses: Phil. 171, 221, 450, and 451. At least 15 of the 30 hours must be in courses numbered 400 or above.

## GRADUATE STUDY

Requirements for the Master of Arts degree in philosophy are: completion of the general requirements; passing an examination in one foreign language; passing written comprehensive examinations covering (1) the history of philosophy, (2) logic, (3) ethics, and (4) one of the following: epistemology, metaphysics, philosophy of science, aesthetics, social and political philosophy; a thesis; and successful performance on the final oral examination.

Students seeking admission to the graduate program should have adequate undergraduate preparation in logic, ethics, and the history of philosophy. When evidence of such preparation is lacking students may be required to take the appropriate undergraduate courses before being admitted to full graduate standing.

## Courses in Philosophy

## UNDERGRADUATE CREDIT

259 165. Introduction to Philosophy. (3) I, II, S. An introduction to the main problems of philosophy based on the study of selected writings of important philosophers, both classical and contemporary. Not open to juniors and seniors.
259 166. Honors Introduction to Philosophy. (4) I, II. An introduction to the main problems of philosophy. For freshmen and sophomores in the Honors Program.
259 170. Introduction to Logic. (3) I, II, S. An introduction to both deductive and inductive logic. A study of elementary formal logic and problems about the nature of knowledge and scientific method.
259 171. Symbolic Logic I. (3) I, II, S. A systematic introduction to modern logic. Truth-functions, truthtables, and calculus of propositions, classes and relations.
259 175. Introduction to the Philosophy of Religion. (3) I. A course designed to acquaint the student with the nature of religious experience, the central concepts of religion, and to examine critically the language and literature of religion.
259 221. Ethics. (3) I, II, S. An examination of philosophical problems concerning the nature of morality and conduct based on a study of the writings of historically important philosophers.
259 397. Experimental Studies in Philosophy. (1-6). I, II. Experimental and interdisciplinary studies in
philosophy. Topics selected in consultation with instructor. Pr.: Permission of instructor.
259 398. Honors Colloquium. Credit arranged. I or II. Open only to juniors in the Arts and Sciences Honors Program.
259 399. Honors Seminar in Philosophy. Variable credit. I or II.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

259 400. Comparative Religion. (3) I. A course which analyzes and compares the central concepts of world religions-such as Hinduism, Buddhism, Taoism, Zen, Zoroastrianism, Judaism, Christianity, and Islam. Cannot be counted toward the major in philosophy nor as satisfying a philosophy requirement.
259 414. Philosophies of South Asia. (3) II, S. Historically important systems and modes of thought associated with orthodox Hinduism, Buddhism, Jainism, Sufism, Carvaka, Islam, and Sikhism.
259 420. Existentialism. (3) I or II. A study of prominent thinkers in the existentialist tradition. Pr.: One course in philosophy or permission from the instructor.
259 425. Philosophy in Literature. (3) I or II. An examination of philosophical ideas encountered in selected writings of the world's great poets, novelists, essayists. Pr.: One course in philosophy and one in literature.
259 430. Social-Political Philosophy. (3) I or II and alt. S. A combined systematic and historical examination of social and political philosophy from antiquity to the present. Pr.: One course in philosophy or consent of instructor.

259 450. History of Philosophy I. (3) I. The development of philosophical ideas in the West through the medieval period, with special emphasis on ancient Greek philosophy.
259 451. History of Philosophy II. (3) II. The development of philosophical ideas from the Renaissance to the nineteenth century.
259 500. Introduction to the Philosophy of the Social Sciences. (3) II. An examination of the possibility of a science of man and of specific issues in the social sciences such as models and measurement, reduction, functional analysis, ideal types and axiomatization. For students in sociology, anthropology, political science, psychology, geography and history. Pr.: One course in philosophy or permission of the instructor.
259 515. Aesthetics. (3) I or II, S. A study of philosophical problems concerning the nature of art, its appreciation, and criticism. Pr.: One course in philosophy and one course in art, literature, or music.
259 545. Philosophy of Religion. (3) II. A course designed to examine philosophically the basic concepts of religion, e.g., truth and faith, God and atheism, reason and revelation, morality and religion, evil, man, sin, salvation, eschatology. Pr.: One course in philosophy or consent of instructor.

UNDERGRADUATE AND GRADUATE CREDIT
259 600. The Philosophy of Science. (3) I or II. Philosophical problems concerning science, its methods, laws and theories. Pr.: One course in philosophy or consent of instructor.

259 610. Studies in Ancient Philosophy. (3) I. A detailed study of a selected philosopher or movement in the history of Greek and Roman philosophy. Pr.: Phil. 450 or consent of instructor.
259 612. Studies in 17th and 18th Century Philosophy. (3) II. A detailed study of a selected philosopher, school, or problem drawn from the history of philosophy in the 17 th and 18 th centuries. Pr.: Phil. 451 or consent of instructor. 259 614. Recent Continental Philosophy. (3) I or II. An examination of important issues and movements in 20th century European philosophy. Emphasis upon existentialism and phenomenology. Pr.: One course in philosophy or consent of instructor.
259 616. The Development of Analytical Philosophy. (3) I. The history of analytical philosophy in the first four decades of the 20th century. A study of the work of Moore, Russell, the early Wittgenstein, and the logical positivists. Pr.: One course in philosophy or consent of instructor.
259 630. American Philosophy. (3) I or II in alt. years, S. A study of great American philosophers from earliest times to the present including Royce, Peirce, Dewey, Santayana, and others. Pr.: Phil. 165 or consent of instructor.
259 632. Recent British-A merican Philosophy. (3) II. A detailed study of selected philosophical writings of current interest in Great Britain and the United States. Pr.: One course in philosophy or consent of instructor.
259 695. Advanced Ethics. (3) I or II in alt. years. Examination of moral discourse and its relation to thought, emotion, and action. Pr.: Phil. 221 or consent of instructor.
259 705. Epistemology. (3) I. An examination of philosophical problems about the nature of our knowledge of the world. Pr.: one course in philosophy or consent of instructor.
259 710. Metaphysics. (3) II. A critical examination of theories about things and their qualities, causality, space, and time. Both traditional and contemporary sources will be used, but emphasis will be placed on the latter. Pr.: one course in philosophy or consent of instructor.
259 715. The Philosophy of Mind. (3) I. The philosophy of psychology. An examination of philosophical problems about such psychological concepts as mind, consciousness, thinking, emotion, and dreaming. Pr.: one course in philosophy or permission of instructor.
259 720. Recent Aesthetic Theory. (3) II. A study of selected work of current importance in the philosophy of art. Pr.: Phil. 515 or consent of instructor.
259 760. Symbolic Logic II. (3) I. An advanced study of logical systems and problems in logical theory. Pr.: Phil. 171 or consent of instructor.
259 765. The Philosophy of Language. (3) I or II. Philosophical problems concerning the nature of language and such concepts as meaning and truth. Pr.: one course in philosophy or consent of instructor.
259 780. Problems in Philosophy. Credit arranged. I, II, S. Independent study for qualified students. Pr.: Background of courses required for problem undertaken.

## GRADUATE CREDIT

259 800. Tutorial in Philosophy. (3) I, II. Directed study of a topic selected in consultation with the instructor. Designed to develop skill in philosophical techniques, paper writing, and library research. Required of all philosophy students in first semester of graduate study. 259 810. Special Topics in Philosophy. (2-5) I, II. Intensive study of topic chosen in consultation with instructor. May be taken more than once for credit.
259 820. Seminar. (3) II. Required of all graduate students in philosophy. May be repeated once for credit. Pr.: Phil. 800.
259 898. Research in Philosophy. Credit arranged, I, II, S. Pr.: Registration in the Graduate School, with sufficient training to carry on the line of research undertaken.

## Physical Education

## ChARLES B. CORBIN,* Head of Department

Professors Corbin," Evans* and Geyer;* Associate Professor Wauthier;* Assistant Professors McKinney, Merriman, Snyder,* and Thompson;* Instructors Bolan, Gench, Lauri, Poole, and Wardell; Emeritus: Professor Myers.

## UNDERGRADUATE STUDY

Each student receives a physical examination before enrollment in the Department of Physical Education. All freshman students enroll in Basic Physical Education 011 to satisfy the physical education requirement. All university students, after completion of 011 or equivalent, are also encouraged to enroll an any one of the following: Ph. Ed. 107, 109, 110, 111, 116, 118, 124, 125, 126, 127, 128, 129, 130 where an opportunity will be given for gaining knowledge, skills and appreciation in activities for leisure-time pursuit and physical will-being.
For the major, a student should take the following:
For Women: Ph. Ed. 158, 206, 290, 306, 320, $331,351,356,366,380,461,481,486,506$ or 560 , 515, 526, 555, 566, 575, 580.
For Men: 206, 217, 218, 225, 230, 235, 241, 245, $290,351,356,450,455,460,461,486,615$. Sports Option (six hours to be chosen from Ph. Ed. 415, 420, 426, 430); and Physical Education Option (two hours to be chosen from Ph. Ed. 111, 116, 481, and course not selected in Sports Option). For a minor, a student should enroll in the following courses: Ph. Ed. 206, 216," 230, 235, 356, 450, 455, 481, physical education

[^17]elective, four hours, sports elective, four hours chosen from 415, 420, 426, 430.

For a minor in Health Education a student should enroll in the following courses: Biol. 121, 122, " Foods \& Nutrition 132, Ph. Ed. 356, 375, 461, 481, 486.

## GRADUATE STUDY

Graduate study leading to the degree Master of Science in Physical Education is offered in the Department of Physical Education.
Prerequisite to the work in the graduate program is the successful completion of a four-year undergraduate curriculum substantially equivalent to that required of undergraduate students at this University.

Persons desiring to do major work should have sufficient preparation in the biological and social sciences, and in health and physical education to prepare a person for the advanced work in physical education.

Of the total hours required for the graduate degree, a person must complete a minimum of 18 semester hours in the major field and a minimum of nine hours in a minor outside the field.

Facilities available for graduate work in physical education include a well-equipped library containing bulletins, journals, books and other publications. In addition, a new modern, well-equipped gymnasium will furnish numerous possibilities for experimental work in collecting data for problems and research studies of various types relating to the field of health, physical education, and recreation.

## Courses in Physical Education for Men

## UNDERGRADUATE CREDIT

The following undergraduate courses in Physical Education offered each semester and summer carry from 0 to one hour credit, with a maximum of two credit hours applicable to a degree.
261 011. Basic Team Sports. (0)
261 012. Basic Varsity Baseball (0)
261 013. Basic Varsity Basketball (0)
261 014. Basic Varsity Football (0)
261 015. Basic Varsity Golf (0)
261 016. Basic Varsity Gymnastics (0)
261 017. Basic Judo Sports (0)
261 018. Basic Varsity Rowing (0)
261 019. Basic Varsity Swimming (0)
261 020. Basic Varsity Tennis (0)
261 021. Basic Varsity Track (0)

261 022. Basic Varsity Wrestling (0)
261 023. Basic Individual Activities. (0)
261 024. Basic Beginning Swimming. (0)
261 025. Basic Intermediate Swimming. (0)
261 026. Basic Tumbling and Trampolining. (0)
261 027. Basic Wrestling. (0)
261 028. Basic Calisthenics and Weight Conditioning Exercises. (0)
261 029. Basic Tennis. (0)
261 030. Basic Recreational Activities. (0)
261 031. Basic Bowling. (0)
261 032. Basic Rhythms. (0)
261 033. Basic Bait and Flycasting. (0)
261 034. Basic Gymnastics and Apparatus. (0)
261 035. Basic Beginning Golf. (0)
261 107. Beginning Bowling (1)
261 109. Advanced Bowling (1)
261 110. Coeducational Bowling (1)
261 111. Tennis and Golf (1)
261 112. Advanced Varsity Baseball (1)
261 113. Advanced Varsity Basketball (1)
261 114. Advanced Varsity Football (1)
261 115. Advanced Varsity Golf (1)
261 116. Sports Officiating (1)
261 117. Advanced Varsity Gymnastics (1)
261 118. Advanced Judo Sports (1)
261 119. Advanced Varsity Rowing (1)
261 120. Advanced Varsity Swimming (1)
261 121. Advanced Varsity Tennis (1)
261 122. Advanced Varsity Track (1)
261 123. Advanced Varsity Wrestling (1)
261 124. Apparatus and Trampolining (1)
261 125. Bait and Fly Casting (1)
261 126. Gymnastics and Tumbling (1)
261 127. Recreational Sports (1)
261 128. Beginning Swimming (1)
261 129. Advanced Swimming (1)
261 130. Weight Training (1)
261 131. Scuba Diving (1)
261 132. Trap Shooting (1)
261 111. Tennis and Golf. (1) II. Study of rules, theory, and practice; methods of coaching.
261 116. Sports Officiating. (1) I. Principles and practices of officiating athletic games.
261 217. Wrestling for Elementary and Secondary Schools. (1) I, II. Study of rules theory; techniques and practices; methods of coaching wrestling in elementary and secondary school physical education programs. Three hours of lab. a week. Pr.: Sophomore standing.
261 218. Team Individual and Gymnasium Games for Elementary Schools. (2) I, II. Methods and practice in teaching soccer, speedball, volleyball, handball, gymnasium, and adaptive games for elementary and secondary school physical education programs. One hour rec. and two hours lab.

[^18]261 225. History of Phys ical Education. (2) I. The leaders in development of the Physical Education Program. Early European through today's public school systems. Pr.: Ph. Ed. 206.
261 230. Nature and Functi on of Play. (2) I. 'Theoretical explanations of play; age and sex characteristics which influence play; values of play to individual and community. Pr.: Psych. 110.
261 235. Tumbling, Balancing and Trampolining for Elementary and Secondary Sichools. (1) II. Practice and teaching methods in calisthe nics; the gymnastic lesson; tumbling and trampolining. Three hours lab. a week.
261 241. Apparatus Activities for Elementary and Secondary Schools. (1) I. Methods and materials for teaching graded exercises an d activities on gymnasium apparatus and pyramids for use on apparatus. Three hours lab. a week.
261 245. Swimming for Elomentary and Secondary Schools. (1) I, II, S. Methocls of teaching swimming, water safety, theory and practice of "drown-proofing,"
diving, Red Cross swimm ing strokes; competitive swimming, its stroke theory and meet organization.
261 415. Technics of Basketball. (2) I. Study of rules, theory, and practices; melhods of coaching. Pr.: Sophomore standing.
261 420. Technics of Baseba 11. (2) I. Study of rules, theory, and practices; methods of coaching. Pr.: Sophomore standing.
261 426. Technics of Track an d Field. (2) II. Study of rules, theory, and practices; m ethods of coaching. Pr.: Sophomore standing.
261 430. Technics of Football. (2) II. Study of rules, theory, and practices; metho d s of coaching. Pr.: Sophomore standing.
261 450. Methods and Materials; in Physical Education for Elementary and Secondary Schools. (3) I, II. Educational, health, and recreative significance of the physical education program; methods of teaching, materials, content, and types of :activities in elementary grades, junior and senior higll schools. Pr.: Senior standing.
261 455. Athletic Injuries and First Aid. (3) II, S. Principles and practice of massage, taping, and care of minor athletic injuries. Pr.: Biol. 215.
261 460. Practice Teaching in Ph ysical Education. (2) I. Supervised students assist in physical education class and officiate in intramural games. Six hours lab. a week.

## Courses for Men and Womien

261 206. Introduction to Physical Education. (1) I. Introductory survey of the field arid study of the principles of health and physical education.
261 290. Kinesiology. (2) II. Mechianics of movement; body movements analyzed and priuciples involved applied to the teaching of physical educ ation. Pr.: Biol. 215.
261 341. Life Saving and Water Safeity Instruction. (1) I, II. Methods of teaching swimming aind lifesaving. Upon satisfactory completion of this cour'se a certificate is awarded by the American Red Cross a is a senior lifesaver and a water safety instructor. Three hours lab. a week. Pr.: Advanced Swimming.

2:61 351. Rhythms for Elementary and Secondary Sichools. (2) II. Fundamental rhythms and music, m.iethods and materials for teaching folk, square, and scicial dance in elementary and secondary schools. Four ho urs lab. a week.
2611 356. Personal and Community Health. (3) I, II, S. Presents scientific and well-balanced information concerning personal, family, and community health, so vitally essential to the individual in meeting the needs of daii'y living, professional, parent, and conmmunity responsibilities.
261 3:75. First Aid. (2) I, II, S. Prevention of accidents and the treatment of injuries in an emergency. Upon satisfactory completion of this course a certificate is awarded by the American Red Cross and the holder is in line for consideration as an instructor in first aid. Not open to :students in Physical Education.
261 461. Adapted Physical Education. (3) II, II. Developm ental, Remedial and Corrective Physical Education. Emphasis placed on adaptations designed to meet the ne eds of individuals requiring special attention beyond the regular physical education program. Pr.: Biology 215, 245 ; Ph. Ed. 261290 , or consent of instructor. 261 481. Tea ching Health in Elementary and Secondary Schools. (2) Il. Materials and methods of teaching h ealth in elementary, junior and senior high schools. Pr.: Ph. Ed. 356; Biol. .215, 425
261 486. Adm inistration of Health and Physical Education in El ementary and Secondary Schools. (i3) I, II. Policies and procedures in organization and administration, with emphasis on elementary and sec:ondary school healt h and physical education. Pr.: Jur.ior standing.
261 560. Evaluation in Physical Education (2) II. Designed to give the: student a foundation in techniques of evaluation, including elementary statistical procedures, the preparation and administration of skill and written tests, and the use of? other evaluative materials in the field. Pr.: Junior sta nding or consent of instructor.
261 570. Methods in Physical Education in Elementary Schools. (2) II, S. Me thods of teaching and organization of material for a progi essive elementary school physical education program. Pr.: Ph. Ed. 380.

## UNDERGRADIJATE A ND GRADUATE CREDIT

261 600. Physiology of Exercise. (2) II, S. Effects of exercise on the tissues, s.ystems, and organs of the body. 261 610. Test; and Measurements in Physical Education. (3) I, S. A stııdy of capacity, achievement, knowledge, and skill tests, for purposes of classification and measurement of schowl progress.
261 615. Community Rectreation. (2) II, S. A study of organization and administr ation of municipal recreation programs including club work for youth, camping, playgrounds andl indoor rec reation centers. Pr.: Ph. Ed. 230, Psych. 110.
261 620. Admin istration of Physical Education in Colleges and Uniiversities. (2') I, S. Study of policies and procedures in the ? organization and administration of the total program of: physical eclucation, with special emphasis from the :standpoint of colleges and universities. 261 630. Curric:ulum Consitruction in Physical Education. (2) II, S. A study of materials, problems, and
guiding principles involved in curriculum construction. Pr.: Ph. Ed. 450 or equiv.
261 650. Advanced Methods of Teaching Physica I Education. (2). A study of Physical Education teaching methods applied to instruction at the secondary schorl level; organization of teaching materials arıd managernent of Physical Education classes.
261 675. Seminar in Physical Education. Credit arranged. Recent trends and problems in physiral education. Pr.: Senior standing and consent of instruct.or. 261 700. Seminar in Health Education. Credit arran'ged. Recent trends and problems in health education. Pr. : Ph. Ed. 486, and consent of instructor.
261 799. Problems in Physical Education. (Jredit arrang.ed. Pr.: Background of courses need'ed for proble $m$ undertaken.

## GRADIUATE CREDIT

261820 . Supervision of Physical Education. ('2) II, S. A study of the objectives, organization, and nathods of super vision for elementary and secondary schools. Pr.: Educ. 477, Ph. Ed. 486.
261 840. Administration of School Health ${ }_{4}$ Education Program. (2) I, S. A study of the organization and administration of health service, health ins truction, and health environment for primary and secondary schools; health councils. Pr.: Ph. Ed. 481.
261 :860. Advanced Athletic Coaching. (1-3). Underlying prin ciples and psychology of major spor ts strategy, the desi.gning of plays, methods of teaching, and controlling pla'yers; special problems of management connected with selecting, handling equipment, a nd making trips. Three hours maximum credit. Pr.: For advanced students with graduate standing and on e year of coaching ex:perience.
2fil 999. Research in Physical Fiducation. Credit arranged. Pr.: Sufficient training to carry on the line of research undertaken.

## Courses in Physical Education for Women

barbara gench, In Charge
Recreational swimming is offered on Mondays, Tuesdays, and T'hursidays at 4:30 o'clock for women registered in college.
For a major, a student should enroll in one of the curriculums in physi cal education. (See page 83). For a minor, a student should enroll in the following courses: l?h. Ed. 306, 320, 331, $351,356,366$ or 515 ; 380, 4:81, 570 and 575,526, 555, 566," and 580.

## UNDERGRADUATE CREDITT

262 051. Basic Beginning Swimming. (1)) I, II, S. Activities offered: Swimming, Body Mecha nics, Individual and Team Sports, Modern F olk and Sorcial Dance, and Recreational Activities. Asssignmentt to swimming follows a swimming test. Rfequired of all freshmen two semesters.
262 052. Basic Int. Swimrring. (0).
262 053. Basic Adv. Swim.ming. (0).
262 054. Basic Beginning Bowling. ( $0^{\circ}$ ).

262 055. Basic Adv. Bowling. (0).
262 056. Basic Beginning Modern Dance. (0).
262 057. Basic Tumbling anil Gymnastics. (0).
262 058. Basic Rhythms. (0) .
262 059. Basic Golf. (0).
262 060. Basic Tennis. (0).
262 061. Basic Fencing. (0)
262 062. Basic Team Sports; (0).
262 063. Basic Individual S ports. (0).
262 064. Basic Fitness and Conditioning. (0).
262 065. Basic Billiards an d Table Tennis. (0).
262 066. Basic P.E. for Frieshman majors. (0).
262 067. Basic P.E. for Sopphomore majors. (0).
The following undergracluate courses offered each semester and carrying one credit hour with a maximum of two credit hours are applicable to a degree.
262 151. Beginning Bowling (1)
262 152. Advanced Bowling (1)
262 153. Tennis (1)
262 154. Beginning Swimnaing (1)
262 155. Intermediate Swi mming (1)
262 156. Advanced Swimnaing (1)
262 157. Synchronized Swiimming (1)
262 158. Intermediate Mo dern Dance (1)
262 159. Advanced Moder $n$ Dance (1)
262 160. Recreational Sp orts (1)
262 161. Tumbling (1)
262 162. Gymnastics (1)
262 163. Badminton (1)
262 164. Archery (1)
262 165. Golf (1)
262 166. Riflery (1)
262 167. Advanced Gynınastics (1)
262 065. Physical Education W Lectures. (0) I, II. Required of women enrolled in the Curriculum in Physical Education for VVomen. Orientation and general survey of health, physic al education, and recreation.
262 306. Tumbling and Gymnastics. (2) II. Theory and practice of tumbling and gymnastics. One hour rec. and three hours lab. a weels.
262 320. Recreational Leadership W. (2) II in even years. Principles and methods of organizing communities for leisure ac tivities.
262 325. Track and Field W. (1) II. Methods of teaching Track and field. Two l.ours lab each week.
262 331. Individual Activities. (2) II. Methods of teaching tennis, badm inton, and archery. One hour rec. and three hours lab. a ، week. Pr.: Ability to play tennis, badminton, and arch ery.
262 360. Dance Comıposition. (1) I, II. Principles and methods of modern dance composition. Discussion of costuming and staging dance. Three hours lab. a week. Pr.: Ph. Ed. 011, one semester of modern dance, or consent of instructor:. May not be taken more than four semesters for credi $t$.

262 366. Team Sports I. (1-3). Methods of teaching softball, hockey and volleyball and principles and practice officiating these sports. Two hours rec. and three hours lab. a week. Pr.: Ability to play softball, hockey and volleyball.
262 380. Physical Education Material for Elementary Schools. (3) I, II, S. Games, rhythms, stunts, and other activities suitable for different age periods in the elementary schools. One hour rec. and four hours lab. a week. Pr.: Sophomore standing and Educ. 200 or consent of instructor.
262 382. Camp Counseling. (2) I. Basic principles and skills in camping for future counselors. Pr.: Sophomore standing or consent of instructor.
262 385. Fencing and Golf (2) II. Methods of teaching fencing and golf. One hour recitation and three hours lab. a week. Pr.: Sophomore standing or consent of instructor. For majors in physical education only.
262 460. Supervised Teaching in Physical Education (1) I, II. Supervised students assist in basic physical education classes. Two hours lab. a week. Pr.: Junior standing or consent of instructor. May be repeated once for credit.
262 515. Team Sports II. (3). Methods of teaching soccer, speedball and basketball and principles and practice officiating these sports. Two hours rec. and three hours lab. a week. Pr.: Ability to play soccer, speedball and basketball.
262 526. First Aid and Athletic Injuries. (3) II. First aid training for prevention and treatment of injuries in an emergency; and principles and practice of taping, and care of minor athletic injuries. Pr.: Biology 215, Junior standing or consent of instructor.
262 555. Principles and Philosophy of Physical Education. (3) I. Aims and objectives, historical development, relation to general education, and analysis of programs and methods of physical education. Pr.: Senior standing.
262 560. Evaluation in Physical Education (2) II. Designed to give the student a foundation in techniques of evaluation, including elementary statistical procedures, the preparation and administration of skill and written tests, and the use of other evaluative materials in the field. Pr.: Junior standing or consent of instructor.
262 566. Methods and Materials of Dance. (2) I. History of the dance; methods of teaching dance. One hour rec. and three hours lab. a week. Pr.: Semester each of beginning and intermediate dance.
262 575. Methods in Physical Education in Secondary Schools. (3) I. Organization of physical education material for a progressive program in junior and senior high school; teaching methods to achieve desired aims of education. Pr.: Ph. Ed. 306, 331, 336, 515.
262 581. Life Saving and Water Safety Instruction (1) II. Methods of teaching swimming and lifesaving. Upon staisfactory completion of this course a certificate is awarded by the American Red Cross as a senior lifesaver and a water safety instructor. For majors in physical education only.

## Physics

CHARLES HATHAWAY, ${ }^{*}$ Head of Department
Professors Bark,* Cardwell,* Curnutte,* Dale,* Dragsdorf,* Ellsworth,* Leachman,* and Williams;* Associate Professors Bhalla,* Crawford," Hathaway,* Legg,* Macdonald, ${ }^{*}$ Seaman,* Shore," and Spangler;* Assistant Professors Brown, Cocke,, Eck,, ${ }^{*}$ Evans,* Folland,* Lee,* Rosenkilde,* Tumolillo,* Weaver, Zollman; Instructor Green, Lecturers Hammaker, Kregar; Research Associates Robertson, Rudy, Vilcov; Emeritus Associate Professors Avery, Chapin,* and Maxwell.
Physics is a quantitative science based on observation and experiment. A student of physics learns, often by performing experiments himself, how a body of experimental data suggests an experimental law. Then he sees how this experimental law can be generalized and always tested by further experiment. However, it is as the originator of the next step in the method of science that physics emerges as the foundation of our technological age. The collection of experimental laws is studied and when properly generalized and tested is unified into a fundamental physical principle. This is a continuing process in which the only limitations are the minds of man and nature's willingness to divulge her secrets.

## UNDERGRADUATE STUDY

A major in physics equips a liberal arts student with a broad education which is uniquely adapted to our time. The program for majors is designed for the individual who will apply his knowledge in research or teaching. Although physics does not exclude the intuitive mind, the emphasis on mathematics tends to favor the more analytically inclined.
In addition to the general requirements for the Bachelor of Science degree a physics major must complete the following core courses: Phys. 310, 311, 400, 432, 472, 502, 503; Math. 220, 221, 222, 240.
Also, the student must elect one of the following options and fulfill the course requirements listed for that option. These courses are chosen in consultation with the student's departmental advisor. Option I. Physics and Astronomy: Nine additional hours in physics and mathematics, usually Phys. 640,645 and Math. 551. Option II. Engineering Physics: Nine additional hours in physics or approved engineering courses.

Option III. Physics Teaching: Requirements of the College of Education for a Teaching Certificate.

## GRADUATE STUDY

The Department of Physics offers work leading to the degrees, Master of Science and Doctor of Philosophy. Students planning a career in research or teaching physics in a college or university should plan a program leading to an advanced degree. Students planning a career in teaching physics at the high school or junior college level might consider a program leading to the degree, Master of Science in Physical Science Teaching. The latter program provides a broader choice of course work in several science fields, than do the professionally oriented programs.
Students who plan to teach physics in college should consider a program administered by the College of Education leading to the degree, Doctor of Philosophy in Education with a specialty in College Physics Teaching. Courses are taken in both physics and education and a student's thesis research may involve work in either area.

For admission with full graduate standing into an advanced degree program in physics a student must have completed undergraduate courses equivalent to those in the undergraduate physics core described above. Prospective graduate students whose undergraduate training does not meet these requirements may be admitted on a provisional basis. Such students are required to remedy deficiencies in their undergraduate preparation by completing the undergraduate courses without receiving graduate credit.

Information on the undergraduate and graduate programs, the supporting facilities, financial support, and the research activities in physics may be obtained from the Head, Department of Physics. (Some of the major items of scientific equipment are described under the heading "Scientific Equipment" on page 17).

## Courses in Physics

## UNDERGRADUATE CREDIT

265 101. Man's Physical World I. (3) I, II, S. A general education course in physical science concerned with the concepts of matter and energy and their interactions. Three hours lec. a week. Open only to freshmen, sophomores, and first semester transfer students (effective September 1971).

265 102. Man's Physical World II. (3) I, II. Cont. of Phys. 101. Three hours lec. a week. Not open to seniors. Pr.: Phys. 101.
265 103. Man's Physical World I Laboratory. (1) I, II, S. Two hours lab. a week. Pr.: Phys. 101 or conc. enrollment.
265 104. Man's Physical World II Laboratory. (1) I, II. Two hours lab. a week. Pr.: Phys. 102 or conc. enrollment.
265 112. Descriptive Physics. (4) I. Three hours lec., one hour quiz, and two hours lab. a week. Pr.: High School algebra.
265 126. Physics for Musicians. (3) II. Selected topics applied to the physics of music and musical instruments. 265 131. Descriptive Astronomy. (3) I, S. A qualitative study of the sun and planets, stars and galaxies; a survey of what is known and how it is known. Occasional planetarium and telescopic observing sessions.
265 135. Descriptive Meteorology. (3) II, S. Nontechnical treatment of the fundamentals of modern meteorology and associated physical processes.
265 140. Freshman Physics Seminar I. (1) I. Topics of special interest to freshmen majoring in physics. Subjects discussed include possible careers in physics, current research at KSU, and selected developments illustrating the methodology of physics.
265 143. Freshman Physics Seminar II. (1) II. Continuation of 265140.
265 211. General Physics I. (4) I, II, S. Mechanics, heat, and sound. Two hours lec., one hour rec., one hour quiz, and two hours lab. a week. Pr.: Math. 150.
265 212. General Physics II. (4) I, II, S. Magnetism, electricity, light, and modern physics. Two hours lec., one hour rec., one hour quiz, and two hours lab. a week. Pr.: Phys. 211.
265 310. Engineering Physics I. (5) I, II, S. Mechanics, heat, and sound; for technical students. Two hours lec., two hours rec., one hour quiz, and two hours lab. a week. Pr.: Math. 221 or conc. enrollment.
265 311. Engineering Physics III. (5) I, II, S. Magnetism, electricity, and light; for technical students. Two hours lec., two hours rec., one hour quiz, and two hours lab. a week. Pr.: Phys. 310; Math. 221.
265 398. Junior Honors Colloquium. Variable credit. Open only to juniors in the Arts and Sciences Honors Program.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

265 400. Atomic Physics. (3) I, II, S. An introduction to contemporary theories and problems in physics. Pr.: Phys. 212 or 311; Math. 222.
265 401. Microclimatology. (3) I. (See Agron. 401). A description of the climatological conditions near the ground and their application to the biological sciences. Pr.: Phys. 211, Math. 100.
265 405. Physics for Science Teachers. (2) Apparatus and demonstration methods in teaching physics. One hour rec. and three hours lab. a week. Offered on sufficient demand. Pr.: Phys. 212 or 311.
265 407. Intermediate Physics I. (3) I. The application of analytic geometry, calculus, vector analysis, and elementary differential equations to the description of
physical phenomena and the solution of physical problems in mechanics, electricity, and magnetism. Pr.: Phys. 212 or 311; Math. 222 or conc. enrollment.
265 408. Intermediate Physics II. (3) II. Cont. of Phys. 407. Pr.: Phys. 407.

265 410. Light. (3) I. Alt. years. Pr.: Phys. 311 or 407; Math. 240.
265 421. Geophysics. (3) II. alt. years. Principles and methods of exploration geology by physical methods. Pr.: Phys. 212 or 311; Math. 221.
265 425. Solar Physics. (3) II. A quantitative study of the sun's atmosphere: the quiet sun; the photosphere and chromosphere; sunspots and solar activity; the solar corona; solar-terrestrial relations. Occasional observing sessions. Pr.: Phys. 212 or 311; Math. 221.
265 432. Mechanics I. (3) I. Principles of statics and dynamics of particles and rigid bodies by the methods of the calculus. Pr.: Phys. 311 or 407 ; Math. 240 or conc. enrollment.
265 472. Electricity and Magnetism I. (3) II. A study of electric and magnetic fields using the calculus. The development and solution of Maxwell's equations. Pr.: Phys. 311 or 407 ; Math. 240 or conc. enrollment.
265 473. Electromagnetic Circuits and Measurements. (2) I. alt. years. A study of d. c. and a. c. circuits and measuring instruments. One hour rec. and three hour lab. a week. Pr.: Phys. 212 or 311; Math. 222.
265 502. Physics Laboratory I. (3) I. See Phys. 610. One hour rec. and six hours lab. a week. Pr.: One year of college physics.
265 503. Physics Laboratory II. (3) II. Cont. of Phys. 502. See Phys. 610. One hour rec. and six hours lab. a week. Pr.: Phys. 502.
265 535. Radioactive Tracer Techniques. (3) (See Chem. 535.) Physics and chemistry of radioactive substances in the fields of biological and physical science. Two hours rec. and three hours lab. a week. Taught in cooperation with the Department of Chemistry. Pr.: Consent of instructor.

## UNDERGRADUATE AND GRADUATE CREDIT

265 602. Electronic Physics. (3) II. alt. years. Basic vacuum tube and transistor circuit analysis. Studies of pulsed circuits and circuit logic. Pr.: Phys. 473.
265 604. X-ray and Crystal Physics. (3) II. alt. years. Pr.: Phys. 472.
265 607. X-ray Laboratory. (1) II. alt. years. Three hours lab. a week. Pr.: Phys. 604 or conc. enrollment.
265 610. Advanced Physics Laboratory. (1-3) I, II. The courses Phys. 502, 503, and 610 are designed to give the advanced student an opportunity to perform experiments of historical and current significance and to develop skill in making precise physical measurements involving the use of high-grade mechanical, optical, electrical, and thermal instruments. Pr.: Consent of instructor.
265 613. Introduction to Astrophysics. (3) I. alt. years. The physics of astronomy. A qualitative survey of astronomical objects: the sun and planets; stars and galaxies; radio sources. A quantitative study of astronomical observations: magnitudes; parallax; stellar motions and statistics; stellar spectra; planetary motion. Occasional observing sessions. Pr.: Phys. 432, 472.

265 630. Semiconductor Physics. (3) II. alt. years. The physics of conduction in homogeneous semiconductors and semic onductor device structures. Pr.: At least senior standing in physics or electrical engineering and consent of instructor.
265 632. Mechanics II. (3) II. Cont. of Phys. 432. Pr.: Phsy. 432.
265 640. Introductory Quantum Mechanics I. (3) I. Methods of quantum mechanics and soution of selected problems in atomic, molecular, solid-state and nuclear physics. Special theory of relativity. Pr.: Phys. 432, 400; Math. 240.
265 642. Introductory Quantum Mechanics II. (3) II. Cont. of Phys. 640. Pr.: Phys. 640.
265 645. Thermodynamics and Statistical Physics. (3) II. Pr.: Phys. 432; Math. 240.

265 672. Electricity and Magnetism II. (3) I. Cont. of Phys. 472. Pr.: Phys. 472.
265 675. Nuclear Physics. (3) II. Modern theories of nuclear physics. Pr.: Phys. 640.
265 685. Introduction to Optics. (4) I. Introduction to modern concepts in the study of optics: electromagnetic waves, interference, coherence, Fraunhofer and Fresnel diffraction. holography, non-linear optics, lasers, photon counting. Three hours lecture and three hours lab. a week. Pr.: Phys. 472 or E. E. 497.
265 701. Journal Club. Credit arranged. I, II. Seminar in current topics in physics. Pr.: Consent of instructor.
265 705. Introduction to Theoretical Physics. (3) I. Pr.: Consent of instructor.
265 710. Electrodynamics I. (3) II. Pr.: Phys. 705.
265 720. Introduction to Solid State Physics. (3) I. Pr.: Phys. 640.
265 725. Atomic Spectra. (3) I. Atomic energy levels and the origin of spectra. Pr.: Phys. 640.
265 726. Molecular Spectra. (3) II. Molecular energy levels and the origin of spectra. Pr.: Phys. 640.
265 730. Astrophysical Processes. (3) II. alt. years. A quantitative study of atomic processes in astrophysics: opacity; radiative transfer; reaction rates in plasmas; gas dynamics and shock waves; equilbirium properties of hot gasses; plasma spectroscopy. Pr.: Phys. 640, 645 or conc. enrollment; Phys. 613 recommended.
265 740. Colloquium in Physics. (0) I, II. Required of graduate majors and undergraduate majors.
265 799. Topics in Physics. Credit arranged. I, II, S.

## GRADUATE CREDIT

265 825. Advanced Dynamics. (3) II. Pr.: Phys. 705.
265 835. Electrodynamics II. (3) I. Pr.: Phys. 710.
265 855. Statistical Mechanics. (3) II. Pr.: Phys. 640, 645, 825.
265 860. Advanced Statistical Mechanics. (3). Offered on sufficient demand. Pr.: Phys. 855, 865.
265 865. Quantum Mechanics I. (3) I. Pr.: Phys. 640, 705, 825.
265 875. Quantum Mechanics II. (3) II. Pr.: Phys. 865. 265 885. Advanced Quantum Mechanics. (3) I. Relativistic quantum mechanics; scattering theory; second quantization and the many-body problem; introduction to quantum electrodynamics. Pr.: Phys. 875.

265 890. Stellar Physics I. (3) I alt. years. Quantitative theory of the atmospheres of stars: radiative transfer; formation of spectral lines; atmospheric instablilities; hydromagnetics. Application to the analysis and syntheses of solar and stellar spectra. Pr.: Phys. 725, 730.
265 891. Stellar Physics II. (3) II. alt. years. Quantitative theory of the interior of stars: equilibrium structure of stars; energy sources; synthesis of elements; models of stars and stellar evolution. Application to the sun, stellar classification, cosmology. Pr.: Phys. 705, 730, 865.
265 899. Problems in Physics I. (1) Independent study of the solution of advanced problems in physics at a level appropriate to the M.S. degree. Pr.: Graduate standing and consent of instructor.
265 915. Advanced Topics in Molecular Spectroscopy. (3) I. Critical studies of selected advanced topics. May be repeated once for credit. Pr.: Consent of instructor.
265 916. Advanced Topics in Optics. (3) II. Critical studies of selected advanced topics. May be repeated once for credit. Pr.: Consent of instructor.
265 925. Advanced X-ray Physics. (3) Offered on sufficient demand. Pr.: Phys. 604; Math. 240.
265 936. Solid State Physics. (3) I. Pr.: Phys. 720, 855, 875 or conc. enrollment.
265 937. Advanced Topics in Solid State Physics. (3) II. Critical studies of selected advanced topics. May be repeated once for credit. Pr.: Consent of instructor.
265 945. Advanced Nuclear Physics I. (3) I. Pr.: Phys. 675, 865.
265 946. Advanced Nuclear Physics II. (3) II. Cont. of Phys. 945. Pr.: Phys. 945.
265 955. Advanced Topics in Mathematical Physics. (3) II. Critical studies of selected advanced topics. May be repeated once for credit. Pr.: Consent of instructor.
265 970. Quantum Field Theory. (3) Offered on sufficient demand. Pr.: Consent of instructor.
265 997. Advanced Topics in Nuclear Physics. (3) I. Critical studies of selected advanced topics. May be repeated once for credit. Pr.: Consent of instructor.
265 998. Problems in Physics II. (1) Independent study of the solution of advanced problems in physics at a level appropriate to the Ph. D. degree. Pr.: Phys. 899 and consent of instructor.
265 999. Research in Physics. Credit arranged. I, II, S. Pr.: Consent of instructor.

## Political Science

## H. PIERRE SECHER,* Head of Department

Professors Secher, ${ }^{*}$ Douglas, ${ }^{*}$ and Franklin;* Associate Professors Gustafson,* Hajda,* Suleiman,* and Williams;* Assistant Professors Althoff, Brady, Herzon, Linford,* Lynn, and Richter;* Emeritus Professor: Iles.

## UNDERGRADUATE STUDY

The major in political science acquaints the student with the political aspects of society and encourages the student to develop a critical and imaginative spirit with which to
look at public issues. Since political issues reflect the broader contemporary situation, the program in political science also provides the foundation for a liberal education on which to build a continuing, responsible interest in political activity and public affairs. At the same time, scientific training in the analysis of political problems is intended to equip the student with the skills necessary to choose among a wide variety of careers in public service, both national and international, business, teaching, research, and administration. Qualified students whould be stimulated to seek advanced training in political science at the graduate level.

A political science major should complete a broad liberal arts program which includes study in related social sciences, such as economics, history, psychology, sociology, anthropology, and geography. The political scientist should also develop awareness of the intimate relationships between social and physical science. In addition, the major will find familiarity with statistics and mathematics indispensable in using the tools now available for describing and explaining political phenomena.

## Advisory Services

A pre-law program may be pursued through a major in political science. An especially qualified pre-law adviser will help the student select an appropriate course of study leading toward a career in law, and offer individual assistance in selecting a law school.

Several members of the department have backgrounds in non-academic careersincluding national and international government service, business, party politics, and journalism-besides their professional training in political science. Students contemplating careers in these and other fields will find non-academic perspectives available to help them in their choices.

## Specialized Curricula

The department takes part in several interdepartmental programs whereby students can coordinate their course work around a specific set of phenomena. Two such firmly established programs include:

## South Asia Area Studies

The department participates in the

University-wide South Asia Area Studies (see detailed information under South Asia Center, page 160).

## Armed Forces and Society

Political science and several other departments offer coordinated coursework in military phenomena and security processesranging from the technology of war and military policy making to the problems of civil-military relations in peacetime and the development of viable disarmament policies. Some of the relevant courses include Political Science 620, 720, and 739; History 761, 762; Geography, 645 and 750; Sociology 450; Economics 627; and Nuclear Engineering 200.

## Requirements for the Major

A major consists of a minimum of 24 hour credits in political science, distributed as follows:

Fundamental Courses. (Minimum of nine hours.) Principles of Political Science (269 110 or 269 111), and either United States Politics (269 325) or World Politics (269 333) should normally be taken during the freshman or sophomore year. The third fundamental course, Political Behavior (269 301) or an acceptable substitute, should normally be taken during the sophomore or junior year after completing at least six hours of political science.

Advanced Courses. (Minimum of 15 hours.) The remaining minimum 15 hours of the major should include at least one course in each of four political science fields: political philosophy and empirical theory; United States politics; comparative politics; and international relations.

## Information for Non-Majors

To encourage the widest possible undergraduate involvement in systematic political analysis, most political science courses numbered 100 through 799 are open to non-majors without prerequisite courses and without prejudice to non-majors in mixed classes of majors and non-majors. As a discipline, the study of politics is expansive enough to permit intraclass adjustments to different backgrounds and objectives, while not compromising with the rigor sought in social science.

Principles of Political Science (269 110) is designed for freshman and sophomoremajors, non-majors, and undeclared majors. American Democracy (269 444)-not open to political science majors-has no prerequisite and is especially recommended for juniors and seniors who seek a single, fundamental upper division course in United States government and political theory. United States Politics (269 325) and World Politics (269 333) are not normally open to juniors and seniors. Non-majors with questions about opportunities and requirements for nonmajors in political science courses should consult the head of the department or faculty members concerned. The Political Science Association, a student group of majors, also is a source of information and guidance for undeclared majors and non-majors.

## GRADUATE STUDY

In accordance with Graduate School requirements, an M. A. degree in political science consists of a minimum of 30 semester hours of which 24 shall be in political science. Each candidate must take Political Science 800 , at least one graduate seminar in political science in each of two fields, as set out above, in which he chooses to offer himself for comprehensive examinations, plus an acceptable thesis, or a substantial research paper in which case he will complete 32 semester hours.
Facilities for research include the resources of the University and Departmental libraries, and in the vicinity of the University - Eisenhower and Truman libraries, and the State Historical Library and other research centers and libraries.

## Courses

UNDERGRADUATE CREDIT
269 110. Principles of Political Science. (3). Introduction to principles and major fields of Political Science.
269 111. Principles of Political Science. (Honors). (4). Introduction to principles and major fields of Political Science. Prerequisite: Membership in Arts and Sciences Honors Program.
269 301. Political Behavior. (3). An examination and explanation of the basic terms and distinctions necessary for the study of politics, government and political behavior emphasizing the dimensions of political behavior including, politicization, identification, ideology, participation, socialization, class, structure and situations.
269 320. State and Local Government. (3) The American system of federalism with emphasis on the
government and politics of the American states and their subdivisions.
269 325. United States Politics. (3). The national government with emphasis on constitutional principles, basic structure, functions, and the political process.
269 333. World Politics. (3). Introduction to the study of politics among nations, including a survey of major contemporary problems of world politics and focusing on the international struggle for power and order.
269 345. The Politics of Developing Nations. (3). Comparative analysis of politics in emergent states with emphasis on processes of modernization and nation building.
269 399. Honors Seminar in Political Science. (1-3).

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

269 405. Introduction to the Civilization of South Asia I. (3). An interdisciplinary survey of the development of civilization in South Asia, including consideration of the geographical and demographic context, dominant philosophical and social concepts, social and political institutions, literature and historical movements. (Same as Hist. 405, Geog. 405, Soc. 405, Anthro. 405).
269 406. Introduction to the Civilization of South Asia II. (3). Interdisciplinary survey of recent and contemporary civilization in India, Pakistan, Ceylon, Nepal, and Afghanistan, including recent history, current economy, religion, culture, languages and literature, geography, social and political structures and ideas. (Same as Geog. 406, Hist. 406, Soc. 406, Anthro. 406).
269 444. The American Democracy. (3). Emphasis on extending, deepening, and intensifying understanding of the American political system. Designed especially for upper-division majors of other departments who have had no previous course in political science. Not open to students who have had Political Science 110 or 220 or equivalent.
269 505. Internship in Politics. (1-3). Supervised field work or internship at international, national or subnational levels of government, parties and other voluntary associations. Prerequisite: A minimum of 12 hours in political science and consent of the instructor. Not open for graduate credit.
269 555. Senior Honors Seminar. (3). Open to senior majors who have attained a 3.0 Grade Point Average in political science.

## American Government and Politics

UNDERGRADUATE AND GRADUATE CREDIT
269 605. The American Presidency. (3). The presidency as an institution, its evolution, Congressional relationships, executive organization.
269 616. Urban Politics. (3). Fundamental problems of political power and decision-making in urban-suburban governmental settings.
269 617. The Administrative Process. (3). Public administration treated as a process of organization and methods management with emphasis on conditions, elements, and problems common to all levels and functions of bureaucracy.
269 620. National Security Policy and Process. (3). Formation and management of contemporary U.S. security policies and establishment of domestic and
international politics with emphasis on arms-control, competition for resources, civilian-military relations, and interaction among Congress, the President, and the bureaucracy.
269 621. The Legislative Process. (3). Legislative decision making in modern democracy with emphasis on the United States, the concept of representation, and political behavior of participants in the legislative process.
269 623. The Judicial Process. (3). Values of the rule of law and how they are maintained in Western democracies; general significance of the legal order; private rights and public duties; nature of the judicial process.
269 625. Constitutional Law I. (3). Legal foundations of the American political system as defined by constitutional provisions and judicial interpretation. Pattern of governmental power; federalism, separation of powers, judicial review. Constitution as a positive instrument of government: the commerce of power.
269 626. Constitutional Law II. (3). Constitution as a positive instrument of government: fiscal powers over foreign affairs. Constitution as a negative restraint on government: substantive and procedural limitations.
269 665. Civil Liberties. (3). History, theory, and development of Constitutional liberties in the Bill of Rights and the Fourteenth Amendment.
269 670. Sex and Politics. (3). Analysis of the role of sex in political behavior, including sexual differences in voting and political participation, legal and cultural restrictions on women's rights and political activity, and women's liberation and other sex-based political movements.
269 677. Political Parties and Elections. (3). Origins, structure and function of political parties. Dynamics of the two-party system. Roles of third parties. Analysis of election results and voting behavior.
269 681. Interest Groups and Political Opinion. (3). Group theory and politics. Structure, internal politics, and techniques of interest groups and their impact on public policy. Analysis of formation and measurement of political data, and utilization of computers in political research.
269 690. Research Methods in Political Science. (3). Principles of research design, measurement of political phenomena, methods for collecting and analyzing political data, and utilization of computers in political research.

## Comparative Government and Politics

269 711. European Political Systems. (3). Comparative analysis of British democracy, totalitarianism, and contemporary Continental European political systems. 269 712. Latin American Politics. (3). Comparative analysis of selected political systems of Latin America emphasizing political inputs, political organization, and political outputs. Special consideration is given to problems of political change. Pr.: Intro. to Political Science.
269 713. South Asian Political Systems. (3). Analysis of selected political systems of South Asia.
269 714. Middle Eastern Political Systems. (3). Comparative analysis of selected political systems in the Middle East including nationalism and the conflict of
differing ideologies. Validity and usefulness of various theories of political development are tested.
269 715. Southeast Asian Political Systems. (3). Comparative analysis of selected political systems in Southeast Asia including consideration of problems of nationalism and political development.
269 716. African Political Systems. (3). Comparative analysis of selected political systems of sub-Sahara Africa, including consideration of problems of nationalism and political development.
269 717. The Soviet Political System. (3). Government and politics of the Soviet Union.
269 720. Comparative Security Establishments. (3). Politics of conceiving, organizing, using and reconciling military and related security forces as societal functions in the United States, selected other politics, and international organizations.
269 721. Administration in Developing Nations. (3). Administrative problems of developing nations of Asia, Africa, and Latin America; principal models for study of comparative public administration; programs in development administration.

## International Relations

269 731. International Relations. (3). Analysis of the nature of international relations with emphasis on contemporary theories explaining the international behavior of states.
269 733. American Foreign Policy. (3). Examination of American external relations since 1945 and evaluation of processes involved in the formulation and conduct of contemporary foreign policy of the United States.
269 735. International Politics of Europe. (3). Relationships among post-World War II European constitutional development, national politics, foreign policies and European communities, with attention to European considerations in global international politics. 269 737. International Law. (3). Theories of international law, and general problems, such as: recognition, responsibility, war crimes, sources, evidence, codification, and settlement of disputes.
269 739. International Defense Strategies. (3). Contemporary international strategies, and defense policies with emphasis on nuclear, conventional, and guerrilla war, arms control and disarmament, diplomatic and political roles of the military.
269 741. International Organization. (3). Structure, functions, values, and effectiveness of international organizations with emphasis on the United Nations, Common Market and other regional arrangements.
269 742. International Politics of South Asia. (3). Consideration of regional problems of the South Asian area and international roles and foreign policies of South Asian states.
269 743. International Politics of the Middle East. (3). Consideration of the Arab-Israeli conflict, inter-Arab relations, foreign policies of Middle Eastern states, and the impact of the major foreign powers on the area.
269 745. The Professional Diplomat and Foreign Policy Formulation. (3). Present day foreign policy formulation in the United States Government, including especially the role therein of the Professional diplomat and foreign affairs specialist.

## Political Thought

269 751. Political Thought: Classical to 16th Century. (3). Systematic study of ideas about law, politics, and government of great philosophers of Western Civilization from Greek antiquity to the sixteenth century.
269 753. Political Thought: Since the 16th Century. (3). Study of the development of Western political thought from the 16 th century to the twentieth century.
269 757. American Political Thought. (3). Political ideas underlying the American union, including the doctrine of rights, the nature of union, liberty, property, and democracy.
269 761. Modern Political Thought. (3). Study of contemporary political ideas and social thought.
269 765. Church and State. (3). The history, theory, and development of church-state relationships in the United States. A theoretic and legal analysis of the relationship. 269 766. Psychological Bases of Politics. (3). Interrelations between personality and political behavior. Implications for the stability of democratic political systems. Authoritarianism, the organization of opinion, and analysis of dictatorship and totalitarianism. Prerequisite: 2 social science courses or consent of the instructor.

## Readings and Problems

269 785. Readings in Political Science. (1-3). Students will undertake directed reading and discussion of a selected topic in political science.
269 790. Problems in Political Science. (1-3). Students will complete a research project and prepare an original paper under the supervision of a faculty member. Pr.: Consent of the instructor.

## GRADUATE CREDIT

269 800. Seminar: Scope and Methodology of Political Science. (3). Exploration of theoretical foundations of political science, and critique of various analytical models in the study of political phenomena; construction and application of research designs and techniques. Required of all graduate students in political science.
269 801. Seminar: Public Policy and Decision Making. (3).

269 805. Seminar: American Government Problems (3).

269 811. Seminar: International Politics. (3).
269 813. Seminar: International Political Communication. (3).
269 821. Seminar: Political Thought. (3).
269 831. Seminar: Public Administration. (3).
269 841. Seminar: Comparative Politics. (3).
269 842. Seminar: Comparative Ideologies. (3).
269 845. Seminar: South Asian Politics. (3).
269 851. Seminar: Public Law. (3).
269 861. Seminar: Political Organization and Behavior.
(3).

269 890. Research in Political Science. (1-3).

## Psychology

## E. JERRY PHARES,* Head of Department

Professors Brown,* Danskin,* Langford, ${ }^{*}$ Perkins,* Phares,* Rohles,* Samelson,* and Sinnett;* Associate Professors Griffitt, ${ }^{*}$ Mitchell, ${ }^{*}$ Rappoport, ${ }^{*}$ and Thompson;* Assistant Professors Frieman ${ }^{*}$ and Wampler; Emeritus: Professors Alm and Showalter.

## UNDERGRADUATE STUDY

Psychology is the systematic study of behavior. The undergraduate curriculum at Kansas State is designed to serve several functions: (1) to give the student, as part of a liberal education, some familiarity with the principles, methods and findings of psychology, (2) to provide knowledge and skill requisite for study at the graduate level, and (3) to provide valuable background for students preparing for work in a variety of professions and jobs, such as medicine, law, theology, business, teaching, and engineering.

The undergraduate major requires Stat. 320 or 520 and an additional 22 hours of course work, including Psych. 110, 350, and either Psych. 560, 575 or 580, and either Psych. 605 or 720. Additional courses are determined in consultation with the student's adviser.

Students majoring in psychology can obtain, depending on their interests, either the B.S. or the B.A. degree by fulfilling the appropriate curricular requirements, which are explained on p. 81.

Students interested in the industrial relations field should take relevant electives in economics, Business Administration, and Sociology, selected in consultation with their adviser. Students interested in teaching or guidance work in the secondary schools should prepare for teacher certification with a major in psychology.

## GRADUATE STUDY

Professional training in psychology is obtained in graduate programs of study leading to the M.S. and Ph.D. degrees.

At KSU, doctoral programs are offered in six areas of general-experimental and personality-social psychology. These areas are: sensation and perception, physiological psychology, animal learning and behavior, human learning, social psychology, and personality.
At the master's level, students may specialize in most of the traditional areas of
psychology (training in clinical and counseling psychology is not available). However, primary emphasis is placed on work leading to the doctoral degree. Students who complete the doctoral program are thus eligible for a variety of positions, including teaching and research positions in colleges and universities, governmental agencies, and industry.

For most students, the master's program requires two years beyond the bachelor's level - the doctorate, two more years. Prerequisite to admission into the graduate program are a superior academic record and background work essentially equivalent to our undergraduate major, especially courses in experimental psychology and statistics. In some cases, deficiencies in preparation can be made up after admission to the program.

A detailed description of the graduate programs, as well as information about financial support, may be obtained by writing to the Director of Graduate Studies in the department.

## Courses in Psychology

## UNDERGRADUATE CREDIT

273 110. General Psychology. (3) I, II, S. An introduction to the study of behavior, with emphasis on human behavior. A survey of the methods, data, and principles of psychology.
273 111. General Psychology (Honors). (4) I, II, S. An introduction to the study of behavior. Pr.: Participation in Honors Program or consent of instructor.
273 300. Applications of Research to Human Behavior. (2). Interim Sem. Applications and evaluation of psychological research findings in such areas as education, psychotherapy, psychopathology, childrearing, etc. Pr: Psych 110 and consent of instructor.
273 302. Drugs and Behavior. (2) Interim Sem. Effects of drugs on human performance, cognition, and physiological processes will be discussed and the empirical evidence surveyed and critically evaluated in relation to both use and abuse of drugs in society. Pr.: Psych 110 and consent of instructor.
273 350. Experimental Methods in Psychology. (4). Laboratory investigation of learning, motivation, socialpersonality processes, and perception and sensation. Includes two hours recitation and four hours lab per week. Pr.: Psych 110 or consent of instructor.
273 390. Innovative Studies in Psychology. (1-6) I, II. Topics selected in consultation with the instructor. To be used for interdisciplinary and innovative approaches to psychological topics.' Pr.: Consent of instructor.
273 399. Honors Seminar in Psychology. (1-3). Selected topics. Open to non-majors in the Honors Program.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

273 405. Abnormal Psychology. (3). An introductory study of behavior pathologies, with emphasis on their etiology and treatment. Pr.: Junior standing; Psych. 110 or consent of instructor.
273 415. Psychology of Childhood and Adolescence. (3). Survey of behavioral development from birth through adolescence. Pr.: Sophomore standing; Psych. 110.
273 420. Personality Development. (3). Introduction to developmental and psychodynamic views of personality, emphasizing psychoanalytic and social learning theories, and empirical studies of personality development from adolescence to old age, supplemented by case material; considers origins of personality in heredity and early experience, socialization practices, conflict, and defense mechanisms. Pr.: Psych. 110; sophomore standing.
273 425. Psychology of Exceptional Children. (3) I, II, S. Psychological aspects of the superior, the subnormal, the emotionally disturbed and the physically handicapped child, with attention to early identification and treatment. Pr.: Psych. 415 or Educ. 202.
273 435. Social Psychology. (3). Psychology of the individual in society: social attitudes and behavior (e. g., voting, prejudice), their measurement, development and change in relation to individual personality and social incluence. Pr.: Psych. 110.
273 440. Psychology of Individual Differences. (3) I. Introduction to principles and methods of psychological testing; discussion of problems and findings in the study of individual and group difference in behavior; role of biological and social factors. Pr.: Psych. 110.
273 465. Psychology of Art. (3). The role of psychological facts and principles in the production and appreciation of visual art, with emphasis on pictorial art. Pr.: Sophomore standing; Psych. 110 or consent of instructor. 273 510. Psychology in Business and Industry. (3) II. Survey of psychological principles and facts as they are applied in such areas as: consumer problems, advertising, personnel selection, and other business and industrial activities. Pr.: Sophomore standing; Psych. 110.

273 550. Group Dynamics. (3). Behavior in small groups, including a consideration of communication, the development of standards, the effect of pressures, the characteristics of leadership. Pr.: Six hours in psychology or consent of instructor.
273 560. Fundamentals of Learning. (3). I. Empirical and theoretical approaches to the study of human and animal learning. Pr.: Psych. 350 or consent of instructor.
273 561. Laboratory in Learning. (1). I. May be taken only in conjunction with Psych. 560. Supervised experimentation in learning. Pr.: Conc. enrollment in Psych. 560.
273 570. Psychobiology. (3). Human and animal behavior from viewpoints of psychology, physiology, and zoology. Includes neurophysiology, control of behavior by simple "brains," homeostasis in mammals, and the regulation of behavior by internal and external events. Pr.: Biol. 205, Psych. 110, or consent of instructor.
273 575. Principles in Motivation. (3). II. Empirical and theoretical approaches to the situdy of motivation, including its physiological basis. Pr.: Psych. 350 or consent of instructor.

273 567. La boratory in Motivation. (1). II. May be triken only in conjunction with Psych. 575. Supervised experimenta tion in motivation. Pr.: Conc. enrollme nt in Psych. 575;
273 580. F undamentals of Perception and Sensation I. (3). I. Empiric:al and theoretical approaches to phenome nna of sensation and perception. Pr.: Psych 350 or consent of instructor.
273 581. L aboratory in Perception and Sensation. (1). I. May be taken only in conjunction with Psych. 5'80. Supervis $\epsilon$ d experimentation in perception and sensation. Pr.: Cons: enrollmen't in Psych. 580.

## UNDER GRADUATE, AND GRADUATE CREDIT

273 605. Foundations of Social Behavior. (3). II. Sel ected empiricial and theoretical approaches to such arreas as attitude: , social influence, and the social bases of human behavio r. Pr.: Psych. 435 and either Psych. 560, ${ }^{\text {' }}$ 575, 580 or consent of instructor.
273 611. Introduction to Physiological Psychologsy. (4). A survey rof basic concepts and experiments in thre study of physiolıogical correlates of behavior, including sensory and motor processies, learning, motivation an d emotion. Three lours rec. and three hours lab. al week.. Pr.: Biol. 205 and Psych. 110) or consent of instructor.
273 62! ;. Engineering Psychology. (3). T.'he role of behavioral factors in the design and uperation of machi nes and equipment. Pr. : Psych. 110, S.tat. 320 or 520 and cionsent of instructor.
273 7010. Psychological Measurement. (4). A review of the logic and methodology underlying the eonstruction of psyclnological measuring instruments from the psych rophysical restimate of threshold to the scaling of complex psychological variables. Three $r$ iours rec. and two hours lab. a week. Pr.: Psych. 110 and § Stat. 520.
273 705. Quantitative Methods in Psy'chology. (3). Exarnination of the nature of statistical inference in psychological research: hypothesis testing and statistical estimation, including a survey of nonparametric methods; consideration of correlational techniques useful with different kinds off psychological data. Pr.: Stăt. 320 or 520 or equiv.
273 716. Comparative Psychology. (3). Behavior at different phylogenetic levels as an aid to the clarification of behavioral principles. Pr.: Consent of: instructor.
273 720. Psychology of Personality. (3). Discussion of diffierent approaches to the study of person iality. Pr.: An y of the following: Psych. 409, 410, 700 and consent of i . structor.
273 775. History of Current Trends. (3). A review of the con tributions of individuals and intellect ual movem ents to the dlevelopment of modern psycholofgy. A surv ey of the oretical systems currently of influence. Pr.: F'sych. 110 ; either nine additional hours of psychology or c onsent of insstructor; senior standing.
273. 780. Experimental Psychology Senıinar. (2:-3). Inter isive discussion of selected topics. May be r'epeated. Pr .: Psych. 560, 575, 580, or consent of instructor.
27:3 785. Personality-Social Seminar. (2-3). Intensive dis scussion of selected topics. May be repeiated. Pr.: P! sych. 605, 720, or consent of instructor.
27 790. Topics in Psychology. Credit arrang, ed. I, II, S. Pr.: Psych. 110 and consent of instructor.

273 7'99. Problems in Psychology. Credit arrianged. I, II, S. $\mathrm{P}_{1}$.: Psych. 110 and consent of instructor .

## GRAI UUATE CREDIT

273800 . Advanced Measurement. (3). The logic of measıarement, scaling theory', psychophysics and pisychometrics, and problems in classificiation and predic tion. Pr.: Psych. 700.
27.380 1. Logic and Methods of Psychology. (3) . Methods of psychological research including general seientific and theoretical problems. Emphasis on methods of empirical investigation in such rejoresentative areas as lear ning, motivation, perception, and personality-social. Pr.: Consent of instructor.
273 8105. Experimental Design in P'sychology. (3). Introduc etion to techniques of research planning and experime ental design, including critical evaluiation of selecterd experiments. Pr.: Psych. 705 or Stat. 521 or consent of instructor.
273 808. Advanced Physiological P'sychology. (3). A study of the neural and endocrinological correlates of behavior. Pr.: Psych. 611 and consent of instru ctor.
273 809. Se.nsory Processes. (3). Experimental situdy of sensory arıd perceptual processes, with emphasis on recent devilopments in the field. Pr.: Psych. 409 or consent of instructor.
273 810. Motivation and Learning. (3). Experi mental study of learning and motivation, with emphasis on recent developments in the field. Pr.: Psych. 410 or consent of in structor.
273 811. Visicon. (3). Principal facts of space and color perception, with emphasis on specification and measurement: of stimulus conditions; the constancies; elementary pirinciples of refraction; color blindness and other visual iznomalies. Lectures and demonstrations. Pr.: Psych. 409 or 809 or consent of instructor.
273 812. Perception. (3). Various systematic: approaches to perception, with emphasis on experim ental and quantitati ve data. The role of perception in affectivity, motivation, and personality theory is stre:ssed. Pr.: Psych. 809 or consent of instructor.
273 814. Humaı Learning and Retention. (3). Analysis of processes involved in human learning, transfer and retention, with emphasis on current developments ir 1 the field. Pr.: Psych. 810 or consent of instructior
273 815. Experimental Analysis of Behavior. (3). E'very ot her year or u pon sufficient demand. The use of ope rant co. nditioning leechniques in the study of sensory pro cesses, cha ining, stimulus control and punishmient; app lications to psychopharmacology, unusual enviror. ments, an d psychotherapy. Pr.: Psych. 810.
273 8ء:0. Persomality Theory. (3). A comparative exami nation of' contemporary theories of personatlity structu're. Pr.: Psych. 720 or consent of instructor.
273 821. Experimental Study of Personality. (3). Anal:ysis and dist ?ussion of experimental results in persona lity research, particularly as they relate to theories of personality. Empirical work in such areas as anxie ty, defense m rechanisms, perception, needs, and devel opment will be covered. Pr.: Psych. 820.
273 822. Ps ychopathology. (3). A systematic review of behavior di. sorders, their etiology and treatment. Pır.: Psych. 405 a nd 720 or consent of instructor.

273 825. Psychological Development of Children. (3). Analysis of theoretical and empirical approaches to the study of psychological child development. Includes representative approaches such as cognitivedevelopmental, S-R, and psychoanalytic. Pr.: Psych. 415 or equiv. and consent of instructor.
273 830. Pro-seminar in Social Psychology. (3). Discussion of empirical findings and theoretical approaches to selected problem areas, such as attitude change, personality and social structure, person perception, small group processes. Pr.: Psych. 435.
273 831. Advanced Social Psychology. (3). Intensive examination of the social determinants of behavior, with emphasis upon problems of current professional interest. May be repeated. Pr.: Psych. 830 or consent of instructor.
273 835. Introduction to Clinical Psychology. (3). Survey of the problems and methods of the clinical psychologist. Pr.: Nine hours of psychology and consent of instructor. 273 836. Techniques of Individual Intelligence Testing. (1). May be taken only in conjunction with Psych. 835 (Introduction to Clinical Psychology). Supervised practice in interviewing and in the administration and interpretation of selected individual intelligence tests. Pr.: Conc. enrollment in Psych. 835.
273 837. Projective Techniques. (3). Theory and techniques of personality assessment, with emphasis on the administration, interpretation, and research data of selected projective techniques. Pr.: Psych. 820, 822, 836 and consent of instructor.
273 847. Performance Theory. (3). Analysis of skilled human performance and complex man-machine systems, both military and civilian, with particular attention to the role of the human operator. Pr.: Psych. 805, 809,810 , or consent of instructor.
273 851. Seminar in Physiological Psychology. (1-3). Selected topics in physiological psychology. May be repeated with consent of supervisory committee. Pr.: Consent of instructor.
273 852. Seminar in Sensory Processes. (1-3). Selected topics in sensory psychology. May be repeated with consent of supervisory committee. Pr.: Consent of instructor.
273 853. Seminar in Personality. (1-3). Intensive discussion of current problems of theoretical and empirical interest in the field of personality. May be repeated with consent of supervisory committee. Pr.: Consent of instructor.

273 854. Seminar in Experimental Psychology. Credit arranged. Intensive discussion of a problem of current interest based on the class's study of the pertinent original literature. May be repeated with consent of supervisory committee. Pr.: Psych. 809, or 810, or consent of instructor.
273 855. Seminar in Animal Behavior. (1-3). Discussion of selected topics of current experimental interest in the areas of animal learning and-or comparative psychology. May be repeated with consent of supervisory committee. Pr.: Consent of instructor.
273 856. Seminar in Psychological Measurement. Credit arranged. Intensive discussion of a problem of current interest, based on the class's study of the pertinent original literature. May be repeated with consent of supervisory committee. Pr.: Consent of instructor.

273 857. Seminar in Cognitive Processes. (1-3). Selected topics in the study of human thinking and cognition. May be repeated with consent of supervisory committee. Pr.: Consent of instructor.
273 859. Seminar in Social Psychology. (1-3). Emphasis on discussion of advanced topics of current interest in social psychology. May be repeated with consent of supervisory committee. Pr.: Consent of instructor.
273 860. Practicum in Counseling Psychology. Credit arranged. Supervised practical experience in counseling. Pr.: Consent of instructor.
273 865. Internship in Psychology. Credit arranged. Pr.: Consent of the supervisory committee.
273 868. Seminar in Professional Problems. (1-3). Intensive study and discussion of current professional problems in psychology. May be repeated with consent of supervisory committee. Pr.: Consent of instructor.
273 870. Seminar in Human Performance. (1-3). Discussion of current professional problems in psychology. May be repeated with consent of supervisory committee. Pr.: Consent of instructor.
273 999. Research in Psychology. Credit arranged. Pr.: Consent of supervisory committee.

## Sociology and Anthropology

EUGENE A. FRIEDMANN, Head of Department
Professors Friedmann,* Rohrer,* and Schnur;* Associate Professors Edelman, ${ }^{*}$ Hiebert, ${ }^{*}$ and Taylor;* Assistant Professors Dushkin, C. Flora, ${ }^{*}$ Miley, ${ }^{*}$ O'Brien, ${ }^{*}$ H. Ottenheimer, M. Ottenheimer, Peters;" and Lecturers Orbach* and Shanline; Emeritus Hill* and Long. ${ }^{*}$

## SOCIOLOGY

Sociology is the study of the development and the interaction of the individual in society. Some of the principal areas considered are the origin and development of cultural patterns; the growth, distribution, and characteristics of populations; the major social institutions and their trends; the problems of modern societies; community and organization planning for the orderly development of our society.

The trained sociologist is prepared for professional work with community planning and service agencies, teaching in the social sciences, and social research. Undergraduate work in sociology is also a desirable background for further professional training in other social sciences, law, social work, medicine and other fields. The student who desires to major in sociology should refer to the general requirements for the A.B. or B.S. degree (see page 81). The student interested in sociology who also desires to prepare for teaching in secondary schools should prepare
for teacher certification with a major in sociology. (see page 184) The student interested in preparing for social work can enroll in the Pre-Professional Program in Social Work with a major in sociology.

The requirements in the A.B. or B.S. degree programs with a major in sociology (page 81) are: 24 semester hours of sociology beyond the introductory course (Soc. 211) including Soc. 410, 620, and 710 and two of the following: Soc. 430, 440, 450, and 460. Nine hours of electives in sociology are to be taken, all at or above the 500 course level.

Students enrolled in the Pre-Social Work Option will be required to take 27 semester hours of sociology beyond the introductory course; Soc. 260 and 510 are required courses in this curriculum in addition to the other requirements of the sociology major; six hours of electives will be taken at the 500 level or above.
Students preparing for professional careers in correctional administration may enroll in courses which will prepare them for this career. These courses are intended to help people prepare for a variety of correctional positions concerned with integrating and reintegrating law violators into society. These positions include, among others: Probation and parole officers, prison classification officer, reformatory counselors, juvenile institution case manager, probation and parole supervisors, regional and state directors of probation and parole, parole board members, community correction center positions, institutional supervisors and program directors, deputy and associate wardens, superintendents, wardens, directors and commissioners of state correctional systems, teachers, and researchers. Students interested in preparing for careers in correctional administration should enroll in 27 hours of sociology beyond the introductory course to include the following: Soc. 211, 410, $620,658,659,660,710$, and 761 ; plus two of the following: Soc. 440, 450, 460.

Major work leading to the degree of Master of Arts is offered in the following areas: Sociological Theory and Research Methods, Demography and Human Ecology, Social Organization and Social Structure, Social Interaction and Processes, Deviant Behavior and Social Disorganization.

Prerequisite to major graduate work in these fields is the completion of the bac-
calaureate at a recognized college or university, superior academic standing, and background work in sociology preparing the student for advanced study.

At least 50 per cent of the course work for an M.A. in Sociology is to be graduate level seminars in sociology (at least 12 semester credit hours). A candidate for the master's degree will be required to pass a written comprehensive examination over his graduate course work and associated topics. This examination will be given three or four weeks before the final examination week of the semester preceding the student's final semester of work for the degree.

## Courses in Sociology

## UNDERGRADUATE CREDIT

277 104. Freshman Interdisciplinary Honors. (4) A freshman honors course focusing on selected sociological problems, conducted by faculty from several departments. Pr.: Conc. enrollment in Western Civilization 106. 277 130. Rural Sociology. (3) I, II. Social and cultural life of rural people, principal groups, institutions and organizations and their functioning in communities.
277 150. Courtship and Marriage. (2) II. Basic principles and problems which pertain to family life
277 211. Introduction to Sociology. (3) I, II, S. Development, structure, and functioning of human groups; social and cultural patterns; and the principal social processes. 277 214. Introduction to Sociology. H (4) II. Development, structure and functioning of human groups; societal and cultural patterns; the nature of sociological inquiry. Lecture, discussion and independent study.
277 260. Introduction to Social Work. (3) II. A survey of the fields of social work, the relationship of social work to other social developments and vocational opportunities.
277 301. Topics in Sociology. (3). Supervised independent and-or interdisciplinary study projects. Pr. : Soc. 211 and consent of instructor.
277 399. Honors Seminar in Sociology. (1-3) I, II. Readings and discussion of selected topics. Open to nonmajors in the Honors Program.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

277 405. Introduction to the Civilizations of South Asia I. (3) I. Interdisciplinary survey of the development of civilizations in South Asia; geographical and demographic context; philosophical and social concepts; social and political institutions, literature and historical movements. (Same as Hist. 405, Geog. 405, P. Sci. 405, Anthro. 405.) Pr.: Soc. 211.
277 406. Introduction to the Civilizations of South Asia II. (3) Interdisciplinary survey of recent and contemporary civilizations in India, Pakistan, Ceylon, Nepal, and Afghanistan, including literature, geography, social and political structure, ideas. (Same as Hist. 406, Geog. 406, P. Sci. 406, Anthro. 406.) Pr.: Soc. 211.

277 410. Senior Seminar in Sociology. (3) II. Summarization and integration of courses in sociology. Pr.: Soc. 211 or consent of instructor.
277 430. Population and Human Ecology. (3) I. Theories, policies, growth, composition, spatial aspects, movements, and world population trends. Pr.: Soc. 211 or consent of instructor.
277 440. Social Organization and Institutions. (3) I. The development and character of the major social institutions in contemporary American society; functions, interrelationships, and trends. Pr.: Soc. 211 or consent of instructor.
277 450. Group Behavior and Primary Interaction. (3) I. Modes of group organization, processes that tend to maintain or change these forms of organization, relations between groups, and effects of individual behavior. Pr.: Soc. 211 or consent of instructor.

277 460. Social Problems. (3) I, II, some S. Problems of personal and social disorganization, such as adolescence, juvenile delinquency, crime, mental illness, unemployment, and family instability; methods of prevention and treatment. Pr.: Soc. 211 or consent of instructor.
277 510. Social Welfare as a Social Institution. (3) II. The development and present status of social welfare in meeting changing human needs and the requirements in other parts of our social system; the analysis of presentday philosophy and functions of social welfare. Pr. : Soc. 211.

277 530. Community Organization and Leadership. (3) II. American community organization; special emphasis on community problems and planning. Pr.: Soc. 211 or consent of instructor.
277 531. Urban Sociology. (3) I. Growth, development, and structure of the city as determined by geographical, ecological, and social factors; relation of rural and urban communities; problems of the city and various approaches to their solution. Pr.: Soc. 211 or consent of instructor.

277 540. Racial and Cultural Minorities. (3) II, some S. Racial and cultural groups; attitudes, prejudices, and conflicts; approaches to understanding and control or race and minority group relations. Pr.: Soc. 211 or consent of instructor.

277 541. Industrial Sociology. (3) II in odd years. Human relations in industry, interrelationships of industry and the social order. Pr.: Soc. 211 or consent of instructor.
277 542. The Social Organization of the Future (3) Examination of alternative social arrangements presented in speculative and science fiction. Consideration of fictional extrapolations of social, scientific and technological trends in terms of specific institutions. Analysis of possible social and interpersonal structures imaginatively conceived. Pr.: Soc. 211 or consent of instructor.
277 565. Social Service Field Placement. (3) An introductory course in social agency functioning. Part-time field placement in social service agency under supervision of agency staff. Observation and participation in agency function plus weekly seminar meetings. Pr. : Soc. 260. Junior standing. Consent of instructor required.

## UNDERGRADUATE AND GRADUATE CREDIT

277 610. Development of Social Thought. (3) I in odd years. Development of social thought from ancient civilization to the middle of the nineteenth century; approaches to the study of society; ideas on human origins and human nature, character and results of associative life, social trends, and social betterment. Pr. : Soc. 211 and junior standing or consent of instructor. 277 618. Religion in Culture. (3) I or II. The nature of religion in nonliterate and peasant societies, and its manifestations in different cultural systems. Pr.: Anthropology 200 or Sociology 211 or consent of instructor. 277 620. Methods of Social Research I. (3) Treatment of the logic and procedures involved in the formulation of a research problem and the difficulties encountered in conducting research. Examines problems of explanation and prediction, the process of inquiry, elements of the scientific method, the design of research and analysis in the social sciences. Pr.: Soc. 211, Stat. 320 or consent of instructor.
277 621. Methods of Social Research 11. (3) Treatment of current sociological research techniques and applications. Examines the logic and strategy of sociological measurement, data gathering procedures, and data analysis. Considers problems of conceptualization and operationalization, measurement and scaling, sampling, the construction of research instruments, the presentation and analysis of data in tabular and graphic form, and the selection and application of standard techniques for data analysis. Pr.: Soc. 620 or consent of instructor.
277 630. Advanced Rural Sociology. (3) II. The development of rural sociology; comparative rural life in the United States and other countries though the use of case studies of rural social organization and cultures. Pr.: Soc. 130.
277 635. Human Ecology. (3) The interrelationships among population, technology, environment, and social organization. An examination of the origins and development of human ecology in sociology, and recent attempts to redefine the area. Special emphasis on current theoretical and research efforts. Pr.: Soc. 211 or consent of instructor.
277 640. Sociology of the Family. (3) I. Origin and development of marriage customs and systems of family organizations; the preparation for family life under present conditions. Pr.: Soc. 211.
277 643. Sociology of Occupations and Professions. (3) II in even years. The social nature of work and related phenomena; occupational structure, recruitment and training, adjustment problems, and the interpersonal relationships at work. Pr.: Soc. 211 or consent of instructor and junior standing.
277 650. Sociology of Mass Communications. (3) I even years. Social organization and change as influenced by the control, structure, and function of mass communications. Pr.: Soc. 211 or consent of instructor and junior standing.
277 658. Criminology. (3) I, II, some S. Nature, extent, and causes of crime; programs for prevention and treatment. Pr.: Soc. 211 or consent of instructor.
277 659. Correctional Communities and Their Administration. (3) II. The world of the prisoner; an analysis of the society of captives and their captors
within the total correctional process. Pr.: Soc. 211 and junior standing.
277 660. Juvenile Delinquency. (3) I. Nature, extent, and causes of delinquency; characteristics of delinquents; means of prevention and treatment. Pr.: Soc. 211 or consent of instructor and junior standing.
277 661. Classification, Training and Treatment in Correctional Institutions. (3) The organization and delivery of classification, training, and treatment services in prisons, reformatories, and other correctional institutions. Evaluation of the impact of these services upon subsequent criminal behavior. Pr.: Soc. 659 or consent of instructor.
277 662. Security, Custody and Discipline in Correctional Institutions. (3) Analysis of the maintenance of security, custody, and discipline in prisons, reformatories, and other correctional institutions. Purpose, principles, definitions, problems and the role of social control in institutions. Implications for the integration and reintegration of law violators. Pr.: Soc. 659 or consent of instructor.
277 701. Problems in Sociology. Credit arranged. I, II, S. Pr.: Soc. 211 and junior standing.
277 710. Recent and Contemporary Social Thought. (3) I. A survey and appraisal of Western social thought in the late nineteenth and twentieth centuries; explanations of human origins and potentialities, socialization and control of behavior, character and results of associative life, social trends, and methods of social analysis. Pr.: Soc. 211 and junior standing.
277 730. Methods of Demographic Analysis. (3) Procedures and techniques for the collection, evaluation and analysis of demographic data, measures of population composition and of fertility, mortality and migration. Construction of life tables; population estimates and forecasts.
277 740. Social Systems. (3) I in odd years. Comparison of social systems in the Orient, Middle East, Europe, and the Americas. Pr.: Soc. 211 and junior standing.
277 741. Social Differentiation and Stratification. (3) I. Analysis of societal organization based on age, sex, residence, occupation, community, class, caste, and race. Pr.: Soc. 211 and junior standing.

277 742. South Asian Social Systems. (3) II. Survey of contemporary research and analysis of family and caste structures, demography, mobility, urbanization and modernization in India and Pakistan. Focus on social change: intentions, methods, consequences. Pr. : Soc. 211 or Anthro. 200 and either Soc. 405, Anthro. 405 or Anthro. 645 , or consent of instructor.
277 750. Social Control. (3) II. How social groups control the behavior of their members through the socialization process, sanctions, norms, rewards, and punishments; the effect that size and kind of group have on social control. Pr.: Soc. 211 and junior standing.
277 751. Social Change. (3) I in even years. Social and cultural evaluation, including diffusion and parallel development; the lag hypothesis; influential factors in, and consequences of, social change; the process of social change, contemporary theories, including directed social change. Pr.: Soc. 211 and junior standing.
277 760. Correctional Communities and Their Administration. (3) II. The world of the prisoner; an
analysis of the society of captives and their captors within the total correctional process. Pr.: Soc. 211 and junior standing.
277 761. Probation and Parole. (3) Probation and parole systems; roles of judges, parole board members, and professional personnel; criteria for parole selection and evaluation of success; attitudes toward probation and parole.

## GRADUATE CREDIT

277 811. Seminar in Sociological Theory. Credit arranged. I or II in odd years. Contemporary sociological theory as systems of explanation of social phenomena and as bases for empirical research. Particular attention given to problems of conceptualization, system building and verification. Pr.: Soc. 620 and 710 or equiv.
277 820. Seminar in Sociological Research. Credit arranged. II. Application of scientific techniques in the design and execution of research. Pr.: Soc. 620 or equiv. 277 830. Seminar in Community Analysis. Credit arranged. I or II in even years. Various aspects of the structural and functional analyses of communities: demographic, ecological, organizational, institutional. Pr.: Soc. 530 or equiv.
277 831. Seminar in Demographic Analysis. Credit arranged. I or II in even years. Demography as a professional scientific discipline with intensive analysis of demographic techniques. Pr.: Soc. 430 or equiv.
277 840. Seminar in Social Organization. Credit arranged. I. Detailed discussion of a selected approach to organizational analysis, aspect of organizational phenomena, or type of organization. May be repeated once. Pr.: Consent of instructor.
277 843. Research in Family Organization. (3) Selected research topics in the analysis of contemporary family structures; the relations of the family to other societal systems; comparative perspectives and the use of crossnational data in family research.
277 850. Seminar in Primary Group Structure and Process. Credit arranged. I or II in odd years. Longitudinal and cross-sectional analyses of the basic elements in social interaction. Pr.: Soc. 450 or equiv.
277 851. Seminar in Societal and Institutional Dynamics. Credit arranged. I or II in even years. Analyses of change of societies and institutions; consideration of rates, degree, and direction of change, and of means employed to plan change in modern or emerging nations. Pr.: Soc. 751 or equiv.
277 862. Seminar in Deviant Behavior and Social Disorganization. Credit arranged. I. Analysis in detail and depth of selected forms of deviant behavior and their relevance to social disroganization. Pr.: Consent of instructor.
277 900. Research in Sociology. Credit arranged. I, II, S. Research for thesis or master's report.
277 901. Research in Rural Sociology. Credit arranged. I, II, S. Research for thesis or master's report.

## ANTHROPOLOGY

Anthropology emphasizes the interdependence of man's genetically inherited and socially learned characteristics in the study of human nature. Accordingly, it is comprised of two main divisions: physical anthropology and cultural anthropology. Additionally, anthropologists base their generalizations on the most diverse possible sample of biological types and cultures, including those of nonliterate or folk peoples and those of the prehistoric past. Thus, physical anthropologists study both presentday races and the fossil remains of extinct groups; and cultural anthropologists study existing cultures of various levels of complexity as well as prehistoric cultures.

Professional anthropologists engage in teaching or research at the university level or work in applied areas such as the designing of garments or equipment for the miliatry, identification of human remains, mental health research, public health research, consultation and research in the administration of dependent peoples, and training programs for those who work among culturally alien peoples. Those who wish to work as professional anthropologists should plan to obtain a graduate degree.

The undergraduate major is of special value for those who expect to work in technical assistance programs, foreign missionary enterprises, the diplomatic service, or in any other capacity involving dealing with culturally different persons in the United States or in other countries. It is relevant to all lines of endeavor which require an understanding of how human cultures function, for example, social work, religious ministry, counseling, personnel administration, teaching, and industrial relations.

Course work is available in five areas: ethnology (the comparative and generalizing study of culture), ethnography (the descriptive study of nonliterate or folk cultures), linguistic anthropology (the crosscultural study of languages), archaeology (the study of prehistoric cultures), and physical anthropology (the study of man's evolution and racial variation).

The requirements for the B.A. and B.S. degrees with a major in anthropology (p. 81) are: Anthro. 200, 260, 280, 460, 610, 620. an area ethnography course (630-659), an
area archaeology course (500; 700-719), and three additional hours elected by the student.

## Courses In Anthropology

## UNDERGRADUATE CREDIT

278 200. Introduction to Cultural Anthropology. (3) I, II, S . Introduction to basic anthropological concepts; technological, social and religious characteristics of nonliterate cultures.
278 201. Introduction to Cultural Anthropology. H (4). Introduction to basic anthropological concepts; technological, social, and religious characteristics of nonliterate cultures; discussion and independent study. 278 260. Introduction to Archaeology. (3) I. History of archaeological research; survey of concepts and methods of the field and laboratory; brief outlines of the major Old and New World cultural sequences.
278 280. Introduction to Physical Anthropology. (3) II. History of research; principles of evolution and human genetics; man's primate relations; fossil evidence of the evolution of man; the study of modern race; culture and evolution.

278 399. Honors Seminar in Anthropology. (1-3) Offered on demand. Readings and discussion of selected topics. Open to non-majors in the Honors Program.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

278 405. Introduction to the Civilizations of South Asia I. (3) Interdisciplinary survey of the development of civilizations in South Asia; geographical and demographic context; philosophical and social concepts; social and political institutions; literature and historical movement. Pr.: Anthro. 200. (Same as Hist. 405, Geog. 405, P. Sci. 405, Soc. 405.)
278 406. Introduction to the Civilizations of South Asia II. (3) Interdisciplinary survey of recent and contemporary civilizations in India, Pakistan, Ceylon, Nepal, and Afghanistan, including recent history, current economy, religion, culture, languages, literature, geography, social and political structure, ideas. Pr.: Anthro. 200. (Same as Hist. 406, Geog. 406, P. Sci. 406, Soc. 406.) 278 430. Folk Cultures. (3) Culture as a concept for understanding human behavior; comparative study of technological, economic, kinship, associational, political, religious, aesthetic, and ideological customs of several nonliterate or folk cultures. Pr.: Three hours of anthropology or consent of instructor.
278 510. Survey of World Prehistory. (3) A discussion of the stages of evolution of man's culture from that point at which he began to make patterned tools to the rise of high civilizations of the Near East, and the Americas. Areas stressed will include Europe, East Africa, India, China, the Near East, Mexico, and Peru. Pr. : Anthro. 200 or 260.

## UNDERGRADUATE AND GRADUATE CREDIT

278 600. Cultural Dynamics. (3) Cultural processes and their conditions and consequences; mechanisms by which customs originate and become culturally significant; development, modification, and decline of customs and cultures; processes and consequences of intercultural contact; applied anthropology. Pr.: Anthro. 200 or consent of instructor.

278 602. Anthropological Theory. (3) Investigation and evaluation of major theoretical approaches in anthropolcigy; evolutionism, historicalism, diffusionism, functionalism, configurationalism, philosophical and psychological apıroaches; contemporary methodology and theory. Pr.: Anthro. 200 or consent of instructor.
278 604. Culture and Personality. (3) Anthropological contribidtions to personality study; cross-cultural comparisons to personality types; means of personality formation in nonliterate and folk cultures; culture change and personality. Pr.: Three hours of anthropology or consent of instructor.
278 610. Social Organization in Nonliterate Cultures. (3) Families; lineages, clans, age sets, tribal fraternities, secret societies, tribes, nations, and other groups found among the world's folk peoples. Special emphasis on how these rellate to human behavior. Pr.: One of Anthro. 200, 430 , Soc. 211, or consent of instructor.
278 613. Afro-American Music. (3) Negro music of the New World viewed in a culture-historical framework. Examination of the social conditions under which African and Eur ()pean music styles came into contact in the New World arid the ways in which they blended to form the unique s;tyle of calypso, blues and jazz. Pr.: Anthropolog! 200 or consent of instructor.
278 618. Fteligion in Culture. (3) The nature of religion in nonlitera te and peasant societies, and its manifestations in different cultural systems. Pr.: Anthropology 200 or Sociology 211 or consent of instructor.
278 620. S enior Seminar. (3) Review and integration of the severcil aspects of anthropology. Pr.: Senior standing and 15 hours of anthropology.
278 622. S pecial Topics in Anthropology. (3) Offered on sufficient (lemand. Variable topics within cultural anthropology, anthropological linguistics, archaeology, or physical a nthropology. Pr.: Relevant anthropology courses or consent of instructor.
278 625. Inclependent Reading and Research in Anthropology. (1-3) Guided reading and research on a specific anth ropological topic of student interest, leading to preparatio $n$ of a research paper. Topic and credit to be arranged. Pr .: Three hours of anthropology and consent of instructor.
278 630. Indians of North America. (3) Aboriginal cultures of Caı iada and the United States; culture contact and change aı nong surviving groups.
278 632. Indian s of Middle America. (3) Description and comparison of Tarahumara, Aztec, Maya, Cuna, and other civilizations and non-literate cultures of Mexico, Central Americ:a, and the Caribbean ring. Culture contact and change in surviving tribes.
278 634. Indian 1 Jultures of South America. (3) A survey of the nature ant $d$ variability of the aboriginal cultures of South America. Analysis of sample cultures, stressing economic, social!, political, and religious structures.
278 645. Cultures of South Asia. (3) Cultural survey of the contemporary tr ibes and Hindu caste communities in their historical and geographical context followed by a more intense ana lysis of selected Indian and Pakistani village case studies stressing indigenous economic, social, political aı 1 d religious structures.
278 650. Cultures of Africa. (3) Description and comparison of the abou iginal cultures of Africa south of the Sahara. Culture ccintact and change.

278 660. Linguistic Anthropology (3) The functions of language as an aspect of culture; diversily, distribution, and dynamics of language; linguistics in anthropology. Pr.: Three hours of anthropology or consent of instructor.
278 705. Archaeology of North America. (3) Peopling of the New World; the Archaic period; spread of agriculture; prehistoric village community life. Specific cultural sequences of the U.S. and Arctic. Pr.: Anthro. 200 , or 260 , or consent of instructor.
278 710. Precolumbian Civilization of Mexico and Guatemala. (3) Early man, the beginnings of agriculture; the rise of civilization; the classic rempires of the Maya, Aztec, Tarascans, and their nei ghbors; relationships with the Southeastern and South western United States. Pr.: Anthro. 220, or 260 , or conse nt of instructor.
278 718. Archaeology of the Old World. (3) Ori.gin and evolution of human culture and technology; the major prehistoric sequences of Asia, Africa and Eurc pe; emphasis on period of plant and animal domestica tion and the European sequences. Pr. : Anthro. 200, 260, or ' consent of instructor.
278 720. Archaeological Field Methods. (3) Archaeological site survey, site excavation, and la،boratory analysis of sites and artifacts from the Mianhattan, Kansas, region. Field work on Saturday, 8:00-5::00, while weather permits, laboratory work thereafter. Pr.: Consent of instructor.
278 730. Field and Laboratory Techniques; in Archaeology. (8) Participation in archaeolo gical excavations; techniques, methods, and proced ures in a field research situation. The laboratory work of cleaning, cataloging, analyzing and preliminary report preparation of materials recovered. Credi.t may be received twice for this course if the area or problem involved are different. Pr.: Anthropology $2(10$ or 260 or consent of instructor.
278 740. Race and Culture. (3) The biologi cal meaning of race; the interrelationships of biological and cultural traits in human evolution; processes of racial formation of man; methods of classifying human ra ces; cultural inheritance; the distinction of race, culture, personality, and intelligence; a review of modern racisin; race as an evolutionary episode.
278 741. Fossil Man and Human Evolutio n. (3) Human origins and evolution as indicated by fossil evidence; interpretation of man-apes, Pithecanth ropus, Neanderthal, Cro-Magnon and other major fossil groups within the context of evolutionary theory, primate comparisons, and cultural evolution. Pr.: Anthro. 200, or 280 , or consent of instructor.

## Center for South Asian Studies

PROFESSOR ALBERT B. FRANKLIN; Director
The general scope of the Sout'h Asia Center is described under the rieading "Interdisciplinary Programs" on $\dagger$ गage 86 of this catalog.

The core of the Center's arrea offerings is the Introduction to the Civiliz:ations of South

Asia which is offered for credit by the departments of Anthropology, Art, Economics, Geography, History, Political Science and Sociology, as well as in the Center's own numbered listing below. The South Asia Center participates to a greater or less degree in the presentation of all the following courses which it considers to be part of the developing South Asia Curriculum.

## UNDERGRADUATE CREDIT

209 399. Honors Seminar in Art. (1-3) I. Selected topics in art (South Asian art). May be taken for credit more than once. Pr.: For students in the Honors Program only.
269 345. The Politics of Developing Nations. (3). Comparative analysis of politics in emergent states, with emphasis on processes of modernization and nation building.
280 399. Honors Seminar in Hindu Thought. (1-3) I. Selected topics in ancient and modern Hindu philosophy and thought. May be taken for credit more than once. Pr.: For students in the Honors Program only.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

010 401. International Agricultural Development. (3) II. A study of economic conditions in underdeveloped countries, with emphasis on population, food supply, and agricultural conditions. Attention is directed toward principles of economic growth and national and international policies that will stimulate development. Pr.: Econ. 110.
209 400. History of South Asian Art. (3) I, II. History of South Asian art (including Islamic art) from the third millenium B.C. to the 19th century A.D. and related history of art of Ceylon, Nepal and Indo-China.
253 471. Languages in South Asia. (3). Survey of South Asian languages from genetic, sociological, descriptive, and comparative points of view. Pr.: Introduction to Linguistics desirable, but not necessary.
280 400. Religions of South Asia. (3) I. An analysis and comparison of the central concepts of the religions of South Asia. The course will focus upon the historically important systems and modes of thought associated with Saivite and Vaishnava modes of Hunduism, Mahayana and Hinayana Buddhism, Jainism, Islam, and Sikkism. Pr.: South Asia 405.
280 405. Introduction to the Civilizations of South Asia I. (3) I. Interdisciplinary survey of the development of civilization in South Asia, geographical and demographic context, philosophical and social concepts, social and political institutions, literature and historical movements. (Offered also as Anthro. 405, Econ. 405, Geog. 405, Hist. 405, Pol. Sci. 405, and Soc. 405.) Pr.: May be required depending upon the department for which course is being offered.
280 406. Introduction to the Civlizations of South Asia II. (3) II. Interdisciplinary survey of recent and contemporary civilization in India, Pakistan, Ceylon, Nepal and Afghanistan, including recent history, current economy, religion, culture, languages and literature, geography, social and political structure and ideas.
(Offered also as Anthro. 406, Econ. 406, Geog. 406, Hist. 406, Pol. Sci. 406, and Soc. 406.) Pr.: May be required depending upon the department for which course is being offered.
280 470. Indian and Pakistani Literature in Translation. (2). Translated short stories and folk literature from Pakistan and India; introduction to the cultural background of the sub-Continent.

## UNDERGRADUATE AND GRADUATE CREDIT

225 682. Development Economics. (3) II, some S. An analytical study of the nature of, the obstacles to, and the future possibilities for the economic growth of nations. Special emphasis will be placed upon the "underdeveloped" nations and will include various theories of economic growth in relation to economic, political and sociological factors. Case studies of particular nations will be utilized. Pr.: Econ. 120.
235 735. Geography of East Asia. (3). Relationships between Oriental land resources, agriculture, industry, and population; trends in economic and political development in Eastern and Southern Asia, with concentration in India, China, and Japan. Pr.: Six hours of geography or junior standing.
241 680. South Asia History I. (3) I, II. The traditions and civilization of South Asia-Pakistan, India and Ceylonprior to the intrusion of the Europeans. Examination of social, intellectual, religious and political history. Pr.: Junior or senior standing.
241 681. South Asia History II. (3) I, II. The rise of European powers in South Asia, creation of the British Empire in India, growth of nationalism and the creation of India, Pakistan, and Ceylon to the present. Pr. : Junior or senior standing.
241 685. Nationalist Leaders of South Asia. (3) I, II, S. Using a biographical approach, this course will examine the social and religious movements of the nineteenth century and the nationalist movements of the twentieth century that led to the creation of the modern states of India and Pakistan. Pr.: Junior or senior standing.
241 690. Topics in Non-Western History. (3) I, II, S. Intensive study of a particular phase of non-Western history. Topics will vary. May be repeated for credit.
269 713. South Asian Political Systems. (3) Analysis of selected political systems of South Asia.
269 721. Administration in Developing Nations. (3). Administrative problems of developing nations of Asia, Africa, and Latin America; principal models for study of comparative public administration; programs in development administration.
269 742. International Politics of South Asia. (3). Consideration of regional problems of the South Asian area, and international roles and foreign policies of South Asian states.
277 742. South Asian Social Systems. (3). Survey of contemporary research and analysis of family and caste structures, demography, mobility, urbanization and modernization in India and Pakistan. Focus on social change: intentions, methods, and consequences. Pr.: Soc. 211 or Anthro. 200, Soc. 405, Anthro. 645, or consent of instructor.
278 645. Cultures of South Asia. (3) I. Cultural survey of the contemporary tribes and Hindu caste communities in their historical and geographical context followed by a
more intense analysis of selected Indian and Pakistani village case studies stressing indigenous economic, social, political and religious structures.
280 692. Tamil I. (5). The elementary study of the principal modern Dravidian tongue. Pr.: some knowledge of another foreign language desirable.
280 693. Tamil II. (5). Continuation of Tamil I. Pr. : South Asia 692.
280 780. Introduction to Hindi. (5). Concentration on Devanagari script and Hindi idiom with graded readings and grammatical exercises. Pr.: South Asia 791 or equivalent.
280 781. Individual study in Hindi. (5). Readings, composition and conversational practice relevant to the students' interests and disciplinary needs. May be repeated for credit.
280 790. Urdu I. (5). The week's work consists of five hours of grammar, vocabulary study, reading and supervised conversation, and three hours of laboratory work. Urdu is a major language of both India and Pakistan, and the chief link language between them. Pr.: None. Some knowledge of another foreign language desirable.
280 791. Urdu II. (5). Coninuation of Urdu I. Pr.: South Asia 790.

280 792. Urdu III. (4). Readings in graded texts, conversation drills and applied grammar. Pr.: South Asia 791 or equivalent.
280 793. Urdu IV. (4). Continuation of Urdu III. Reading and discussion of contemporary literature and grammatical analysis. Pr.: South Asia 792 or equivalent.
280 794. Urdu V. (4). Individual study in Urdu. Readings, composition and conversational practice relevant to the student's interests and disciplinary needs. Pr.: South Asia 793 or equivalent. May be repeated for credit.

## GRADUATE CREDIT

010 801. Seminar in International Agricultural Development. (3) II. Reading, study, analysis and group discussion of (a) important problems of agricultural development in underdeveloped regions, (b) relevant development theories and (c) approaches to agricultural development, including contribution of education, development of institutions and other actions to advance the welfare of rural people. Intended mainly for persons interested in careers in International Agricultural Development. Pr.: Econ. 110.
010 811. Seminar in Agricultural Policy. (3) I. An analysis of the relation of government to the economic aspects of farming as individual enterprise and agriculture as an industry, including the international aspects of United States agriculture. Pr.: Consent of instructor.
241 850. Seminar in South Asian History. (3) I, II, S. Pr.: Consent of instructor.

269 845. Seminar: South Asian Politics. (3).
405 868. International Education. (3) I, II, S. Developing, administering, conducting, and evaluating educational programs from a world perspective. Pr.: Teaching experience or consent of instructor.

## Speech

NORMA D. BUNTON,* Head of Department

> Professors Bunton,* W. Dace, ${ }^{*}$ Engler, ${ }^{*}$ and Flanagan;* Associate Professors Burke,* Climenhaga, ${ }^{*}$ Fedder, ${ }^{*}$ and Rainbolt;* Assistant Professors Carlson, Cleary, Hinrichs,* Longhurst,* Lowe,* Ollington, Van Tassel,* Wistrand; ${ }^{*}$ Instructors Aseneta, Barnes, Knowles, Thoms, Williams; Emeritus: Given. ${ }^{*}$

## UNDERGRADUATE STUDY

The Department of Speech offers study in the areas of General Speech, Linguistics, Theatre, and Speech Pathology-Audiology.

The undergraduate major requires at least 21 hours in one of the four areas and nine hours in other areas within the department.

## GRADUATE STUDY

In the Department of Speech major work is of fered leading to the degree Master of Arts in the following fields: General Speech, Linguistics, Speech Pathology-Audiology, and Theatre. (see Interdepartmental Program in Linguistics, p. 86)

A student majoring in any of the above areas may select a minor field either outside the department or within the department. Only certain areas are approved for minor work within the department when the major is also within the department.

Prerequisite to major graduate work in these fields is the completion of the four-year undergraduate program substantially equivalent to that required of general arts and science students, the curriculum to include sufficient elementary work in the appropriate area of speech to prepare the student for the advanced field chosen.

The Master of Arts degree may be pursued by students in the department under one of the following plans: Plan A: A minimum of 30 semester hours of graduate credit including a master's thesis of six to eight semester hours. Plan B: A minimum of 30 semester hours of graduate credit including a written report of two semester hours either of research or of problem work on a topic in the major field. Plan C: A minimum of 30 semester hours of graduate credit in course work only, but including a project which discloses evidence of creative ability.

Students in Theatre and Linguistics may, with graduate faculty approval, elect any one of the plans: $\mathrm{A}, \mathrm{B}$, or C .

Students in General Speech may, with graduate faculty approval, elect plans A or B. Students in Speech Pathology-Audiology may, with graduate faculty approval, elect plans A or C.

Written and oral examinations will be required in all areas.

## Courses In General Speech

## UNDERGRADUATE CREDIT

281 070. ${ }^{*}$ Spoken English for International Students. (3) I, II. Semi-intensive aural-oral familiarization in American English as a second language.
281 080. Speech Seminar. (0). Special topics and lectures for speech majors. Required of all majors each semester.
281 105. Oral Communication I. (2). Selection and outlining of speech material, with emphasis on content, organization, and oral presentation.
281 106. Oral Communication Ia. (3) Alternate to Spch. 105, permitting greater emphasis on preparation and delivery of speech material. Credit not granted for both Spch. 105 and 106.
281 107. Oral Communication Ib. (3). Speaking, reading, and writing for international student whose linguistic ability in American English is below that of the native American student; emphasis on aural-oral approach to structural patterns of spoken English. Pr.: Satisfactory score on the Speech Proficiency examinations and English Readiness Examinations for. International Students.
281 108. Oral Communication IH. (2) Honors - Participation in and analysis of oral message situations, with emphasis on communication purposes, message design and presentations.
281 109. Oral Communication IaH. (4). Honors Speech preparation and delivery; a survey of topics basic to rhetoric, communication and linguistics. For Arts and Sciences Honors students.
281 120. Debate and Drama Participation. (1 or 2). Four hours maximum credit. Pr.: Consent of director of the activity.
281 176. Argumentation and Debate. (3). Basic theories of argumentation, with emphasis on their application in academic debate. Pr.: Spch. 105 or 106.
281 200. Oral Communication II. (2). Cont. of Spch. 105 and 106. Study and practice of persuasive appeals in oral and written communication, with special consideration and analysis of the use of these appeals in contemporary speeches. Pr.: Spch. 105 or 106.
281 360. Language and Communication. (3). Basic studies in general semantics, communication models and related materials; emphasis upon problems of reference, definition and meaning in a communicative context.
281 398. Junior Honors Colloquium. Variable credit. I, II. Open only to juniors in the Arts and Sciences Honors Program.

[^19]281 399. Honors Seminar in Speech. (1-3). Readings and colloquia on selected topics. For non-speech majors in the Honors Program. Pr.: Honors students only.

## UNDERGRADUATE AND GRADUATE CREDIT

281 608. Persuasion. (3). The study of communication as persuasion; examination of contemporary approaches to persuasion.
281 616. Group Discussion Methods. (3). Examination of research, techniques and principles regarding the activities of face-to-face groups; emphasis upon achieving creative group endeavor through discussion.
281 618. Discussion and Conference Leadership. (3). Principles and functions of leadership in face-to-face groups.
281 640. Seminar in General Semantics. (3). The writings of Alfred Korzybski and other germinal contributors to a modern theory of relationships among experience, linguistic habits and behavior. Pr.: 360.
281 655. History of American Public Address. (3). Study of American speakers, from the time of Jonathan Edwards to the present, including their training, speeches, and effectiveness. Pr.: Junior standing and consent of instructor.
281 665. Rhetorical Theory and Criticism. (3). Study of rhetorical theory and criticism from early Greek to modern times.
281 733. Modern Rhetoric. (3). Readings in the rhetorical theories of Kenneth Burke and other twentieth century contributors. Pr.: 665.
281 799. Problems in Speech. Credit arranged. Open to students in any speech area. Pr.: Junior standing and consent of instructor.

## GRADUATE CREDIT

281 999. Research in Speech. Credit arranged. Pr.: Sufficient training to carry on the line of research undertaken and consent of instructor.

## Linguistics

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

281 230. Introduction to the Study of Language. (3). Survey of the scientific study of language and of the field of linguistics. Presupposes no previous formal work in linguistics.
281 455. General Phonetics. (3). Theory of articulatory phonetics and classification of speech sounds according to place and mode of articulation: to prepare students to recognize, transcribe, and reproduce speech sounds both familiar and exotic. Laboratory sessions, by arrangement, are an integral part of the course. (Same as Engl. 455 and Mod. Lang. 455.)

## UNDERGRADUATE AND GRADUATE CREDIT

281 652. Introduction to Linguistics. (3). Study of the basic concepts of modern descriptive linguistics. (Same as Engl. 652 and Mod. Lang. 652.)
281 664. Topics in Applied Linguistics. (3). Principles of contrastive structural analysis, especially EnglishFrench, English-Spanish, and English-German. Course on another topic may be repeated for credit. Pr.: Speech

652, Mod. Lang. 652, or English 652. (Same as Engl. 664 and Mod. Lang. 664).
281 669. Language Typology. (3). Presentation and discussion of the languages of the world and the variant methods of their classification. (Same as Engl. 669 and Mod. Lang. 669).
281 672. Transformational Grammar. (3). Close examination of the transormational-generative theory of grammar. The varying schools of thought are considered, as well as extant transformational descriptions of languages. Practical work in the writing of transformational statements is an integral part of the course. Pr.: Spch. or English or Mod. Lang. 652 and 677, or consent of instructor and junior standing. (Same as Engl. 672 and Mod. Lang. 672).
281 673. Introduction to Historical Linguistics. (3). Methods of historical linguistics as used in the reconstruction of earlier forms and stages of a language. Pr.: Junior standing. (Same as Engl. 673, Mod. Lang. 673).
281 674. Methods and Techniques of Learning a Second Language. (3). Linguistics applied to the learning of a foreign language, especially English as a foreign language. Pr.: 12 hours of a modern language, including English, or Mod. Lang. or Spch. 652. (Same as Engl. 674 and Mod. Lang. 674).
281 675. Generative Phonology. (3). Study in depth of the distinctive features approach to classification of speech sounds, and development of phonological rules for various languages, with particular reference to English. Pr.: Speech 455 and 676.
281 676. Phonetics and Phonemics of English. (3). Phonemic theory, with particular reference to English but including reference to sound systems of other selected languages. Pr.: Spch., English, or Mod. Lang. 455 and 652, or consent of instructor and junior standing. (Same as Engl. 676 and Mod. Lang. 676.)
281 677. Morphology and Syntax of English. (3). Consideration of current theories of grammar with emphasis on American structuralist, tagmemic, and trans-formational-generative approaches, with particular reference to English but including references to grammar systems of selected other languages. Pr.: Engl. 451 or Spch., English, or Mod. Lang. 652. (Same as Engl. 677 and Mod. Lang. 677).
281 678. Field Methods in Linguistics. (3). An introduction to field work dealing with selection of informants, collection of data, elicitation techniques, use of electronic aids such as tape recorders, and sound stretchers, and the processing of field data. Work in a language previously unknown to the student forms a laboratory part of the course. Pr.: Spch., English, or Mod. Lang. 455 and 652 , or consent of the instructor. (Same as Mod. Lang. 678).

## GRADUATE CREDIT

281 879. Current Trends in Linguistics. (3). A close examination of the state of current theory and research in an aspect of linguistics seen as a new development in the field, or an indication of new trends. Pr.: Twelve semester hours in linguistics, or equivalent.

## SPEECH PATHOLOGY/AUDIOLOGY

The Speech Pathology-Audiology program exists to train professional personnel who are competent to help children and adults with communicative problems of speech, hearing and language. As a minimum, Speech Pathology-Audiology undergraduate majors complete 18 hours in courses concerned with normal communicative processes. Selected courses from the disciplines of Speech and Hearing Science, Linguistics, and Human Development meet this requirement.

Evidence of meeting the professional competency requirements includes 42 hours in courses which provide information about the training in the management of speech, hearing, and language disorders, and other supplementary professional areas. Of these 42 hours, no fewer than nine may be in audiology. A maximum of six of these 42 hours may be in the several courses which provide academic credit for clinical practicum. Of the 42 hours, a minimum of 24 , exclusive of credit for thesis, must be in the speech pathology courses. Furthermore, 30 of these 42 hours must be acceptable for graduate credit toward the degree of Master of Arts. In addition, the graduate must have completed a minimum of 275 clock hours of supervised direct clinical experience with a variety of disorders and age groups in the Campus Speech and Hearing Clinic and the cooperating school and hospital training sites. Each student's specific course of study is selected in consultation by the student and his major adviser.

The Speech Pathology-Audiology program at Kansas State University has been designed to meet the January 1, 1969 requirements for Certification of Clinical Competence of the American Speech and Hearing Association and the State of Kansas Department of Education requirements for Speech Clinician.

## Courses in

## Speech Pathology/Audiology

UNDERGRADUATE CREDIT
281 110. Training of the Speaking Voice. (2) Understanding of the vocal mechanism and its relation to the production of speech; laboratory period for the study and practice of speaking skills. Intended for students who desire to improve deficiencies in their speaking ability. May be repeated for a maximum of four hours credit.
281 210. Elements of English Phonetics. (3) Analysis of sounds which make up English speech and consideration of how sounds vary phonetically and physiologically;
acquire skill in the transcription of speech into the symbols of the International Phonetic Alphabet.
281 213. Introduction to Speech Pathology. (3) A survey of all speech disorders and certain hearing and language problems; introduction to the clinical management of these disorders, and to the field which is responsible for them.
281 324. Orientation to Clinical Practicum. (2) An introduction to the clinical procedures, methodology and instrumentation employed in the treatment of individuals with speech and-or hearing disorders. Demonstration therapy included. Pr.: Spch. 213.
281 370. Speech and Hearing Mechanisms I. (3) Anatomy and physiology of normal and abnormal speech mechanisms, including respiration, phonation, resonance and articulation.
281 371. Speech and Hearing Mechanisms II. (3) Study of the ear and the mechanics of hearing. Pr.: Spch. 370.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

281 446. Speech Handicapped School Child. (3) Study of the disorders of speech, language, and hearing found among school age children, their educational implications, and how the classroom teacher can facilitate the rehabilitative process. Pr.: Junior standing.

## UNDERGRADUATE AND GRADUATE CREDIT

281 621. Experimental Analysis of Vocal Behavior. (3) Study of behavior modification principles which are relevant to the experimental analysis of vocal behavior. The types of vocal behavior investigated extend from uncoded utterances to complex language responses.
281 622. Hearing Problems and Hearing Tests. (3) Study of social, emotional, and educational problems of the deaf and hard of hearing; experience in the use of the screening audiometer for pure tone hearing testing. Pr.: Spch. 371.
281 623. Audiology. (3) Theory and techniques of audiometric evaluation including supervised practice in a simulated clinical setting with selected auditory tests. Pr.: Spch. 622.
281 632. Speech and Language Development. (3) Research and theory of early development of vocalization, phonology, morphology, syntax, and semantics are reviewed. Variables which influence acquisition are discussed.
281 645. Modification of Communication Disorders. (3) Behavior modification principles are utilized to develop techniques for attenuating, establishing, and maintaining vocal behavior of individuals who possess communication deficits. Pr.: Spch. 621.
281 646. Disorders of Articulation. (3) Research, theories, and principles concerning the diagnosis and management of articulation disorders. Pr.: Spch. 213. 281 668. Speech Reading and Auditory Training. (3) Methods of instructing the hard-of-hearing and the deaf in principles and techniques of speech reading. Pr.: Spch. 622.
281 679. Functional Analysis of Language Retardation.
(3) Application of behavior modification principles to communication habilitation of language retarded children. Pr.: Spch. 632 and Spch. 621 or 645.

281 710. Hearing Conservation and Rehabilitation. (3) Principles and practices involved in conservation, preservation, and rehabilitation of hearing. Pr.: Spch. 622.

281 720. Cleft Palate and Laryngeal Disorders. (3) Research and theory concerning causes, evaluation and management of speech disorders resulting from cleft lip and-or cleft palate. Pr.: Spch. 370 and 646.
281 742. Practicum in Audiology. (0-6) Supervised clinical procedures in screening and diagnostic hearing examinations as related to rehabilitative and medical orientations. Therapy procedures for the hard of hearing. Hearing aid selection. May be repreated for a maximum of six hours credit. Pr.: Major in Audiology or Speech Pathology.
281 750. Speech Disorders of the Orthopedically Handicapped (3) Diagnostic and therapeutic aspects of speech, hearing, and language disorders associated with cerebral palsy. Pr.: Speech 370 and 646.
281 761. Practicum in Speech Pathology. (0-6) Supervised clinical methods in speech pathology. Experience in screening, diagnosis, organization, and administration of therapy. May be repeated for a maximum of six hours credit. Pr.: Major in Speech Pathology or Audiology.

## GRADUATE CREDIT

281 802. Neuropathologies of Speech and Language. (3) Research and theory concerning nature, etiologies, evaluation, and principles of neuropathologies. Pr.: Spch. 645.
281 821. Experimental Phonetics. (3) Methods and logic for experimental analysis of the physical and perceptual properties of speech signals; function relation of the substructures of the speech mechanism to the speech signal; electronic analogs for the synthesis of speech and their relevance to the understanding of production and perception of speech; laboratory experience. Pr.: Spch. 370 and 652.
281 822. Advanced Audiometry and Hearing Aids. (3) Special speech and pure tone audiometric techniques for differentiating neutral from conductive impairments, for identifying recruitment, malingering, and other hearing problems; administration of test for hearing aid evaluations. Pr.: Spch. 623.
281 833. Research Techniques in Clinical Audiology. (3) Study of the auditory mechanism, with emphasis on critical evaluation of current methods employed in clinical audiology. Pr.: Spch. 623.
281 834. Stuttering. (3) Research and theory concerned with stuttering behavior, causes, developmental factors, evaluation, and remedial procedures. Pr.: Spch. 645.
281 845. Topics in Speech Pathology or Audiology. (3) Critical review of recent research related to measurement and modification of speech, hearing or language deficits. May be repeated for a maximum of nine hours with change in topic.
281 860. Diagnostic Methods in Speech Pathology. (3) Standardization and applications of tests and procedures utilized in the evaluation of speech and language disorders. Pr.: Spch. 370 and 646.
281 863. Psycholinguistic Analysis of Language Retardation. (3) Relation of current research and thoery in developmental psycholinguistics to bilingualism and subcultural language differences. Methodology of
research and assessment of psycholinguistic abilities in children is reviewed. Pr.: Spch. 632.

## THEATRE AND INTERPRETATION

The undergraduate program in Theatre exists to educate students who are interested in theatre as a profession or for cultural enrichment as an avocation. Three fields of concentration are offered: (1) a liberal arts program in theatre, (2) an experimental theatre and new play program, and (3) a repertory theatre training program. Students in all fields are required to take at least six semester hours of course work in each of the following groups: history, literature, and criticism of theatre; technical production, design, and lighting; and acting, directing, and playwriting. A detailed description of undergraduate requirements in each field of concentration may be obtained by writing the Director of Theatre in the department.

Course offerings are available leading to the degree of Master of Arts. Prerequisite to admission into the graduate program in Theatre are a superior academic record and background work essentially equivalent to our undergraduate major. In some cases, students are admitted on a provisional basis so they may make up deficiencies in undergraduate preparation. Graduate students in Theatre may elect any one of the plans: A, B, or C (as described on page 162). Six semester hours of graduate credit are required of all graduate students in each of the following groups: history, literature, and criticism of theatre; technical production, design, and lighting; and acting, directing, and playwriting. An additional 12 semester hours or more of graduate credit is required of each student. Each student's total program is decided upon through regular consultation between him and his graduate committee. Further information concerning opportunities for financial support of for a preparatory reading list for the written and oral examinations may be obtained by writing the Director of Graduate Studies in Theatre in the department.

In neither the undergraduate nor the graduate program in Theatre may the following courses be used to discharge group requirements (they may be used only to discharge elective requirements in the major): 120, 145, 150, 410, 449, 472, 536, 614, $627,639,730,735$, and 760.

## Courses in Theatre and Interpretation

## UNDERGRADUATE CREDIT

281 050. Theatre Laboratory. (0) Required each semester for all students enrolled in acting and-or directing courses. Planning and rehearsal sessions for student productions.
281 145. Introduction to Theatre. (3) Consideration of the basic elements of theatre: aesthetics, dramatic literature, theatre technology, and producing organizations.
281 150. Appreciation of Theatre. (2) Direct experience with live theatre through an investigation of theatrical materials, forms, and styles and attendance at the University theatrical productions.
281 235. Stage Movement. (3) An investigation of the techniques of movement in dramatic and musical productions. Major emphasis is placed on practical application.
281 253. Fundamentals of Acting. (3) Theory and practice of acting with emphasis on voice building, stage movement, fencing, and oral interpretation of dramatic literature.
281 255. Fundamentals of Technical Production. (3) An introduction to the technical problems of theatre production, including planning, painting, and mounting scenery as well as other aspects of backstage organization.
281 345. Fundamentals of Costuming for the Theatre. (3) A lecture-laboratory course covering the principles and techniques of construction and design of stage costuming.
281 350. Techniques of Makeup. (3) Techniques of makeup for stage, movies, and television.
281 353. Fundamentals of Playwriting. (3) Theoretical study and practical application of fundamentals of playwriting with regard to plot, characters, and production; emphasis placed on the one-act form.
281 363. Oral Interpretation of Literature. (3) Techniques of reading from the printed page, selecting portions from various forms of literature, including narrative poetry, essay, lyric, sonnet, nonfictional prose, scenes from plays, and sleected short stories.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

281 410. Opera Workshop. (0-6) Principles and techniques of operatic and musical theatre production, with emphasis on class rehearsal and performance of selected scenes from opera and musical drama; brief survey of the history of opera. Offered jointly by Departments of Music and Speech. Vocal ensemble credit may be earned in this course. Same as Music 475. May be repeated until six hours of credit have been earned.
281 433. Fundamentals of Directing. (3) Study of the principles and techniques of directing for the theatre; investigation into the historical emergence of the director; study of current theories.
281 436. History of the Theatre. (3) A survey of the development of the theatre from ancient times to the present day.
281 447. Vocal Expression for Actors. (3) Studies and application of vocal techniques for stage productions; emphasis on development of the actor's vocal
mechanism. May be repeated for a total of 9 hours credit by qualified students. Pr.: Consent of the instructor.
281 449. Advanced Stage Movement. (3) Studies in the techniques of stage movement for stylized dramatic and musical productions. Emphasis is placed on practical application. May be repeated for a total of 9 hours credit by qualified students. Pr.: Consent of the instructor.
281 472. Storytelling. (2) A consideration of literary materials appropriate for children in nursery schools, kindergarten, and elementary schools. Major emphasis is directed toward training in the art of storytelling. Pr.: Spch. 105 or 106.
281 536. Creative Dramatics. (3) Study of techniques for the training and development of creative imagination in primary and secondary school children by means of group improvisation of plays. Emphasis placed on both skillful guidance of the children and the pursuit of original research.

## UNDERGRADUATE AND GRADUATE CREDIT

281 603. Playwriting for Children's Theatre. (3) Study in the writing of dramatic and musical plays specifically intended for child audiences. May be repeated for a total of 6 hours credit by qualified students. Pr.: Spch. 353 or its equivalent and consent of the instructor.
281 607. Roman, Medieval, and Baroque Theatre. (3) Studies in the drama and stagecraft of the Roman, Medieval, and Baroque periods.
281 610. Advanced Costuming for the Theatre. (3) Studies in stage costuming: history, characterization, fabrics, construction and design. A lecture-laboratory course including student planning, construction, and designing of costumes for university productions. Pr.: Spch. 345 or consent of the instructor.
281 612. Greek Theatre. (3) Studies in the drama and stagecraft of the Greek period.
281 614. The Art of the Film. (3) History, critical theory, and techniques of the film as an art form from its inception to the present.
281 617. Romantic Theatre. (3) Studies in the drama and stagecraft of the Romantic era.
281 619. Modern European Theatre. (3) Studies in the European drama and stagecraft of the period from 1876 to the end of World War II.
281 620. Avant-Garde Theatre. (3) Studies in AvantGarde drama and stagecraft since World War II.
281 625. Aesthetics of the Theatre. (3) Principal emphasis on theoretical problems of dramatic art.
281 627. Theatre Management. (3) Theatre management, promotion, finance, organization; emphasis on contract negotiations and use of facilities.
281 628. Oriental Theatre. (3) Studies in the drama and stagecraft of India, China, and Japan.
281 629. Advanced Playwriting. (3) Further study in the writing of drama; emphasis on problems of writing fulllength plays. May be repeated for a total of 9 hours credit by qualified students. Pr.: Consent of instructor.
281 631. Practice in Directing. (3) A lecture-laboratory course with emphasis on directing dramatic productions under performance conditions. May be repeated for a total of 9 hours credit by qualified students. Pr.: Consent of the instructor.

281 633. Advanced Acting. (3) Studies in style, techniques, and characterization. May be repeated for a total of 9 hours credit by qualified students. Pr.: Consent of the instructor.
281 637. Reader's Theatre. (3) The nature, purpose and production of oral interpretation of literature in the theatre; emphasis on monologue, lecture-recital, and play reading. May be repeated for a total of 6 hours credit by qualified students. Pr.: Consent of the instructor.
281 639. Children's Theatre. (3) Introductory course in theory and practice for Children's Theatre. Reading, demonstrations, practice study of play scripts; play selection and production methods; operation of and assistance in production of plays for the child audience. Pr.: Consent of the instructor.
281 663. Scene Design. (3) Principles and styles of design for the stage, utilizing sketches, diagrams, plates, and models. May be repeated for a total of 6 hours credit by qualified students. Pr.: Consent of the instructor.
281 667. Stage Lighting. (3) History and technique of lighting for the stage and television.
281 680. Advanced Technical Production. (3) A lecturelaboratory course in advanced technical theatre problems of organization, planning, and execution of scenery, costumes, and lighting. May be repeated for a total of 6 credit hours by qualified students. Pr.: Consent of the instructor.
281 682. History of the Physical Stage. (3) A survey course in the emergence and development of the theatre building as a distinct architectural form, with particular emphasis on the effect of the physical environment on the play. Pr.: Spch. 255.
281 730. Repertory Theatre. (3) Concentrated studies in theory and practice of repertory theatre productions. Reading, demonstrations, study of play scripts; play selection and production methods; operation of and assistance in production of plays in repertory. May be repeated for a total of 12 hours credit by qualified students. Pr.: Consent of the instructor.
281 735. Practicum in Theatre. (0-6) Supervised participation in all aspects of theatre, with emphasis on problems of a concentrated production program. May be repeated for a maximum of 12 hours credit. Pr.: Major in Theatre and Interpretation; three of the following: Spch. 253, Spch. 255, Spch. 353, Spch. 433; and consent of the instructor. (For transfer students equivalent background will be required.)
281 760. Film Theory and Criticism. (3) Studies in film criticism based on the writings of Kracauer, Balasz, Eisenstein, Spottiswoode, and others.

## GRADUATE CREDIT

281 815. Seminar in Theatre. (3) Special problems in theatre research.

## Statistics

HOLLY C. FRYER,* Head of Department
Professors Feyerherm,* Fryer, ${ }^{*}$ Siotani;* Associate Professors Conover," Dayton, ${ }^{*}$ Gallagher," Nassar," and Waller;* Assistant Professors Milliken* and Perng;* Instructor Iman.

## UNDERGRADUATE STUDY

Statistics is a combination of classical mathematics, the theory of probability and some new concepts related to inductive reasoning which have developed during the last three-quarters of a centruy.
Almost all activities of plants and animals (including man) depend to some degree on chance events, and most decisions made by mankind depend on sampling information which also depends on chance events, and hence on probability. Consequently, the field of interest and activity for a statistician potentially is very broad.
Likewise, the professional activities open to a trained statistician are quite varied. The existence of high-speed calculating machines relieves the statistician of tedious computations and elevates his professional activity to that of an adviser, a consultant, a supervisor, and-or a person engaged in basic research.
As soon as man created numbers, he began to develop ways to calculate with them. The computations had to be done with some sort of tools; fingers and sticks in the dust, pencil and paper, beads, an abacus, mechanical desk calculators, electric desk calculators, analog computer, digital computers and now electronic digital computers. Calculations which were impossible or even unthought of 20 years ago are now routine.
A person wishing to major in statistics may seek a Bachelor of Arts degree by satisfying the general requirements of that degree ( p . 81) and completing Math. 222, 240, Stat. 320, either 321 or $510,410-411$ and $520-521$; or the student may seek a Bachelor of Science degree by satisfying the general requirements of that degree (p. 81) and completing the aforementioned courses in mathematics and statistics. The student should consult someone in the Department of Statistics about this choice before enrolling.

## GRADUATE STUDY

The Department of Statistics offers graduate studies leading to the Master of

Science and Doctor of Philosophy degrees in probability and statistics.

Many graduate majors in statistics have majored in some other area as undergraduates. If the student has had mathematics through the calculus and 12 additional credits in mathematics and-or statistics, the master's degree in statistics can be earned in the normal time.

Persons who have earned the master's degree in statistics can study toward the doctor's degree, enter industry or governmental service as statistical consultants, or join organizations which do scientific research in the biological, physical and social sciences or in the humanities. Holders of the master's degree also can be teachers in colleges and universities, but it is preferable to plan to obtain the doctorate if the student wishes to enter the teaching profession at the college or university level. Excellent fellowships and assistantships are always available for persons receiving the master's degree in statistics and wishing to study toward the doctorate.

It is possible for a graduate major in computer science to complete the requirements for the master's degree in 12 months, provided he or she has previously fulfilled all the requirements for a bachelor's degree in computer science. However, it is more usual to take two years and receive a strong master's degree and be prepared either to seek the Ph.D. degree thereafter or obtain an excellent job in industry, research, government service, or education.

## Courses in Statistics

## UNDERGRADUATE CREDIT

285 100. Fun With Statistics. (2) Interim Semester. A nonmathematical introduction to the foundations of probability and statistics. Topics discussed include nature of statistics; life and chance; history, limitations and potentials of statistics; fundamentals of collection and presentation of data; misuses of statistics; and insight to problem definition and solutions. Cannot be used to satisfy the A.B. requirement of one course in mathematics, statistics or logic.
285 320. Elements of Statistics. (3) I, II, S. A basic first course in probability and statistics; frequency distributions; averages and measures of variation; probability; simple confidence intervals and tests of significance appropriate to binomial and normal populations; correlation and regression, including confidence intervals and tests of significance for bivariate populations. Pr.: Math. 100.
285 321. Business and Economic Statistics. (3) I, II, S.

Application of statistical principles to business and economic studies and decisions; sources of data; index numbers; time series; business cycles; market research; seasonal variation; forecasting. Pr.: Stat. 320. 285 399. Honors Seminar in Probability and Statistics. (1) I, II, S. Selected topics of general interest and importance. Open to non-majors in the Honors Program. Pr.: One course in statistics or probability.

## UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

285 400. Introductory Biometrics. (3) I. Application of statistical concepts and methods to problems of population dynamics and forest mensuration; interpretation and presentation of quantitative measurements, with recognition of biological principles. Pr.: Stat. 320.
285 410. Introductory Probability and Statistics I. (3) I, S. Permutations, combinations, and principle of choice; random events and variables, sample spaces; simple measures and concepts of probability; marginal, conditional, and joint probability laws; mathematical expectation and moments; probability density and distribution functions for one or more discrete variables; normal distribution; moment generating functions; some concepts of sampling; applications. Pr.: Math. 222 or conc. enrollment.
285 411. Introductory Probability and Statistics II. (3) II, S. Law of Large Numbers, Chebycheff's Inequality; continuation of continuous random variables; uniform exponential, gamma, and beta distributions; Central Limit Theorem; sampling distributions for normal sampling; introduction to statistical inference. Pr.: Stat. 410, Math. 222.
285 510. Statistical Quality Control. (3) II. Elementary practical methods of estimating the uniformity of manufactured products; control charts; sampling acceptance procedures. Pr.: One previous course in statistics.
285 520. Statistical Methods I. (3) I, II, S. Development of concepts and techniques appropriate to experimental research; methods for estimating parameters and testing hypotheses about them; linear correlation and regression; introduction to analysis of variance. Pr.: Math. 100 and junior standing.
281 521. Statistical Methods II. (3) II, S. Analysis of variance and covariance; multiple linear regression methods; partial correlation; curvilinear regression; orthogonal comparisons; simple experimental designs. Pr.: Stat. 520.

## UNDERGRADUATE AND GRADUATE CREDIT

285 610. Theory of Statistics I. (3) I, S. Probability models, concepts of probability, random discrete variables, moments and moment generating functions, bivariate distributions, continuous random variables, sampling, Central Limit Theorem, characteristic functions. More emphasis on rigor and proofs than in Stat. 410 and 411. Pr.: Math. 222.
285 611. Theory of Statistics II. (3) II, S. Introduction to multivariate distributions; sampling distributions, derivation and use; estimation of parameters, testing hypothesis; multiple regression and correlation; simple experimental designs; introduction to non-parametric statistics and discrimination. Pr.: Stat. 610.

285 625. Digital Statistical Analysis. (3) I, II. Program languages; programming for analysis of variance and covariance, missing data, least-squares analysis, multiple regression and correlation, and chi-square. Pr.: Stat. 521 or conc. enrollment.
285 630. Multivariate Statistical Methods. (3) I, S. Multivariate analysis of variance and covariance; classification and discrimination; principal components and introductory factor analysis; canonical correlation; digital computing procedures applied to data from natural and social sciences. Pr.: Stat. 521, Math. 505.
285 710. Sample Survey Methods. (3) II in alt. yearsDesign, conduct, and interpretation of sample surveys in the social sciences. Pr.: Stat. 520.
285 716. Non-parametric Statistics. (3) II. Testing hypotheses when the form of the parent population is unknown; rank and sign tests. Pr.: Stat. 520 or 610.
285 720. Design of Experiments I. (3) I, S. Planning experiments so as to minimize error variance, and avoid bias; Latin squares; split-plot designs; switch-back, or reversal, designs; incomplete block designs; efficiency. Pr.: Stat. 521.
285 721. Design of Experiments II. (3) II, S. Incomplete block designs; theory of the construction and analysis of experimental design. Pr.: Stat. 720 and Math. 505.
285 731. Statistical Population and Quantitative Genetics I. (3) I, S. Equilibrium law of gene frequencies; forces that change gene frequency; gene frequency distributions; prediction equations for selection. Pr.: Stat. 521 and six semester hours of genetics.
285 732. Statistical Population and Quantitative Genetics II. (3) II. Estimation of genetic parameters; inbreeding, heterosis, level of dominance; epistasis, genetic load linkage; experimental approaches to statistical genetics. Pr.: Stat. 731.
285 734. Bioanalysis. (3) I in alt. years. Purposes and types of bioassays; direct assays; quantitative dosageresponse relationships; efficiency, reliability, and sensitivity; composite responses; quantal responses; time responses. Pr.: Stat. 521 or 611.
285 740. Theory of Statistics III. (3) Functional forms and properties of selected distribution functions. Characteristic functions. Limiting distributions. Pr.: Stat. 611. 285 741. The ory of Statistics IV. (3) II. Convolutions of distributions. Theory of Runs. Distributions of order statistics. Sequential analysis. Pr.: Stat. 740.
285 745. Practicum in Statistical Consulting. (3) Supervised experience in consulting with students and faculty regarding statistical problems associated with their research. One hour of lecture, six hours of lab per week. Pr.: Stat. 625 and 611.
285 750. Probability and Stochastic Processes I. (3) II. Random Variables; conditioning; independence; laws of large numbers; central limit theorems; generating functions, difference equations. Pr.: Math. 240.
285 751. Probability and Stochastic Processes II. (3) II. Markov chains; Markov processes; Wiener-Kolmogorov prediction theory; time series. Pr.: Stat. 750.
285 760. Discrete Probability Theory. (3) I. Occupancy problems; conditional probability and statistical independence; laws of large numbers; generating functions; recurrent events; runs and renewal theory; random walk. Pr.: Stat. 610.

285 765. Applied Stochastic Processes. (3) II. Study of types and applications of stochastic processes; Wiener, Poisson, renewal counting, generalized and compound Poisson, Markov chains. Pr.: Stat. 610.
285 799. Topics in Statistics. Credit arranged. I, II, S. Pr.: Consent of instructor.

## GRADUATE CREDIT

285 810. Seminar in Probability and Statistics. (1) I, II. Discussion and lectures on topics in probability and statistics; one seminar talk by each student registered for credit. Pr.: Graduate standing and at least two graduate courses in statistics.
285 850. Advanced Studies in Probability and Statistics. (3) I, II, S. Theoretical studies of advanced topics in probability, decision theory, Markov processes, experimental design, stochastic processes, and other advanced topics. May be repeated. Pr.: Stat. 611 and consent of instructor.
285 860. Linear Models I. (3) I in alt. years. Multivariate normal covariance matrix and operations with it; distribution of quadratic forms; some specific linear models; application to experimental design, analysis of variance and variance components. Pr.: Stat. 521, 611; Math. 505 or 701.
285 861. Linear Models II. (3) II. Generalized inverses; polynomial regression; experimental design, variancecomponent, and mixed models. Pr.: Stat. 860.
285 865. Multivariate Analysis. (3) I in alt. years. Likelihood estimates, vectors of random variables; Holtelling's $\mathrm{T}^{2}$; distribution of simple, partial, and multiple correlation coefficients; classification and discrimination; distribution of the sample covariance matrix and generalized variance; testing multivariate hypotheses. Pr.: Stat. 630, Math. 621.
285 890. Foundations of Probability I. (3) I. Distribution functions, characteristic function, sums of independent random variables, central limit theorem. Pr.: Math. 726. 285 891. Foundations of Probability II. (3) II. Conditional random variables, martingales, ergodic theorems. Pr.: Stat. 890.
285 895. Advanced Inference I. (3) I. Statistical decision problem, risk functions, and optimal procedures; classical and Bayesian sufficient statistics; estimation: least squares, moments, maximum likelihood, best unbiased, best invariant estimators; asymptotic optimal maximum likelihood procedures; minimax procedures. Pr.: Stat. 861, Math. 622.
285 896. Advanced Inference II. (3) II. Testing hypotheses: Neyman-Pearson Lemma; monotone likelihood ratio and exponential families; method of least favorable distribution; uniformly best unbiased and best invariant procedures; confidence sets and uniformly best test procedures. Pr.: Stat. 895.
285 999. Research in Statistics. Credit arranged. I, II, S. Pr.: Consent of instructor.


# THE COLLEGE OF BUSINESS ADMINISTRATION 

ROBERT A. LYNN, ${ }^{\text {D }}$ Dean<br>EUGENE J. LAUGHLIN,* Associate Dean<br>MILDRED E. BUZENBERG, Assistant Dean


#### Abstract

Professors Clark,* Jones,* Laughlin,* and Lynn;* Associate Professors Allen," Barton-Dobenin," Fox,* Gilkison," Gugler,' Mulanax," and Richards; Assistant Professors Buzenberg, Graham, Gudgell, Hubbard,* King, McManis, Rapp, Riley, Thiessen, Tuxbury and Vaden; ${ }^{*}$ Instructors Hathaway and Hollinger.


The main objective of the College of Business Administration is to provide a challenging opportunity for liberal education and professional study and development in business administration and accounting. Undergraduate and graduate programs alike are designed to facilitate maximum development of the student into an informed, capable and responsible individual.

Throughout a student's academic career, the business firm is examined as a vital social, economic and political institution. To equip the prospective executive and specialist for future professional responsibilities, the College organizes instructional activities around two themes: one, the businessman as the manager and decision maker of operations in a particular firm; two, the businessman as one who must analyze and adapt to the larger economic, social and political environment of which he and the firm are integral parts. Both subject matter and instructional techniques focus on decision making and implementation of decisions through critical and creative analysis.

In addition to its instructional programs, the College of Business Administration recognizes its responsibilities and opportunities to work closely with the business community. It provides to business, through the director of management services and the general faculty, professional services in accounting, finance, marketing and management. The College of Business Administration also sponsors numerous short courses and conferences for business and management groups.

## Undergraduate Study

At the undergraduate level, the College of Business Administration seeks to produce a graduate with: (1) a broad education in the arts, sciences and humanities, (2) a solid knowledge and understanding of the functioning of the business world, (3) sufficient knowledge and skill in a field of specialization to permit him to obtain a position in business, and (4) the proven ability to think creatively and analytically so he may progress into positions of greater responsibility in the future (To accomplish this purpose, the College is future oriented. To be of any lasting value, education for business must develop students' abilities to project their thinking and to shape the future).

During the first three years, students take work in written and oral communication; mathematics; statistics and quantitative analysis; social, behavioral and natural sciences; and the humanities. The required "core courses" in accounting, economics, business law, finance, management and marketing provide the fundamentals of business administration. Six fields of specialization are available for selection by advanced Business Administration majors.

## Honors Program

The College encourages high academic achievement with an honors program for undergraduate students majoring in business administration, accounting or pre-business education. The purpose of the honors program is to add breadth and depth to each student's curriculum. A special adviser is provided to help the honors student choose challenging and rewarding electives which will contribute to his intellectual development.

Entering freshmen are selected for the honors program by their ACT scores, and upper class transfer students by their grade point average.

## Bachelor of Science in Business Administration

Major in Business Administration. The major in Business Administration is designed from a general management viewpoint. During the junior and senior years, students, in consultation with faculty advisors, will select approximately 12 credit hours in a special area of interest. These fields of specialization include: Finance, General Business, Industrial Relations, Management, Marketing and Secretarial Science.

Effective for all students entering the College after January 1, 1971, and all students graduating after June 1, 1976.

| Communications |  |  |
| :---: | :---: | :---: |
| 229100 | English Composition 1 | 3 |
| 229120 | English Composition II | 3 |
| 281106 | Oral Communications la | 3 |
|  | Communication Electives | $2 \cdot 3$ |
| Social Science 11.12 |  |  |
|  |  |  |
| 269325 | U.S. Politics | 3 |
| 273110 | General Psychology | 3 |
| 277220 | Introduction to Sociology | 3 |
|  |  | 9 |
| Quantitative |  |  |
| 245100 | College Algebra | 3 |
| 285320 | Elements of Statistics | 3 |
| 245340 | Introduction to Analytic Processes | 3 |
| 285321 | Business and Economic Stat. | 3 |
| 286315 | Fundamentals of Computer Programming | . 3 |


| Social Science | 6 |
| :---: | :---: |
| Humanities | 6 |
| Natural Science* | 6 |
| Social Science, Humanities or Natural |  |
| Sciences |  |
|  |  |


| Business and Economics |  |  |
| :---: | :---: | :---: |
| 305275 | Fundamentals of Accounting | 4 |
| 305305 | Managerial Accounting | 3 |
| 225110 | Economics I | 3 |
| 225120 | Economics II | 3 |
| 305400 | Management Concepts | 3 |
| 305405 | Business Finance | 3 |
| 305425 | Business Law 1 | 3 |
| 305440 | Marketing | 3 |
| 305451 | Production Management | 3 |
| 305600 | Business Policy ........ | 3 |
| 305602 | Business and Society | 3 |
|  | Economics Electives |  |
|  | Field of Specialization | 12 |
|  | (see "Fields of Specialization"Below) Business Electives | 3 |
|  |  |  |
| Other |  |  |
|  |  |  |
| Physical Education (two semesters) |  |  |
| Free Electives ................................................ $11-12$ |  |  |
| Total credit hours required for graduation ................... 126 |  |  |

## Fields of Specialization

During the junior year, each student will select one field of specialization in consultation with his faculty adviser.

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Finance
Required
305 505 Investments
305615 Financial Managemen
Plus
Six Credit Hours Selected from the Following Courses
305 312 Insurance
305 507 Financial Institutions
305617 Controllership
225 410 Intermediate Macroeconomics
225420 Intermediate Microeconomics
225 430 Money and Banking
225 432 Public Finance
225681 International Trade
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## Management

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Required
305601 Advanced Management ......................................
305631 Organizational Behavior and Administration3
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305

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Six Credit Hours Selected from the Following Courses 305431 Personnel Administration
305610 Business Measurements and Forecasting
305630 Industrial Relations
225620 Labor Economics
273435 Social Psychology
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550451 Work Measurement

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General Business
Twelve credit hours may be chosen from among the courses isted under the finance, industrial relations, management and marketing fields of specialization. All 12 credits must be taken in the College of Business Administration, and at least 6 of the 12 credits must be in courses numbered 500 or above

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\section*{Labor Relations}
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Required
305421 Personnel
305630 Industrial Relations
Plus
Six Credit Hours Selected from the Following Courses
305530 Labor Legislation
305631 Organizational Behavior and Administration
305632 Contemporary Issues in Labor Relations
225620 Labor Economics
225627 Contemporary Manpower Problems ................................................ 3
550451 Work Measurement ..................

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\section*{Marketing}
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Required

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305640 Marketing Research
Plus
Six Credit Hours Selected from the Following Courses
305343 Sales Communication
305540 Retailing
305542 Sales Management
273435 Social Psychology
289320 Principles of Advertising
273510 Psychology of Business \& Industry ............................ 3

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'Students must take at least one scientific laboratory.

Secretarial Science
\begin{tabular}{|c|c|c|}
\hline \multicolumn{3}{|l|}{Requ} \\
\hline 305236 & Transcription 1 & 3 \\
\hline 305237 & Office Practice and Technique & 3 \\
\hline 305238 & Office Machines Lab & 0 \\
\hline 305301 & Office Management & 3 \\
\hline \multicolumn{3}{|l|}{Any course offered by the College} \\
\hline \multicolumn{3}{|l|}{of Business Administration numbered} \\
\hline \multicolumn{3}{|l|}{400 or above} \\
\hline & & 2 \\
\hline \multicolumn{3}{|l|}{\begin{tabular}{l}
Plus \\
Credit must be earned in the following course work. Such course
\end{tabular}} \\
\hline \multicolumn{3}{|l|}{work, however, will not be counted toward satisfying the "field of} \\
\hline \multicolumn{3}{|l|}{specialization' requirement of 12 credit hours.} \\
\hline 305230 & Intermediate Typing & 3 \\
\hline 305231 & Production Typing & 3 \\
\hline 305234 & Intermediate Shorthand & \\
\hline
\end{tabular}

\section*{Bachelor of Science in Business Administration}

Major in Accounting. Students majoring in Accounting have an opportunity to prepare for careers in public, industrial or governmental accounting. Satisfactory completion of the degree requirements qualifies the graduate to take the Uniform Certified Public Accounting Examination. The College has an internship program for qualified seniors in Accounting which provides valuable practical experience with recognized public accounting firms.

Effective for all students entering the College of Business Administration after January 1, 1971 and for all students graduating after June 1, 1976.
\begin{tabular}{|c|c|c|}
\hline \multicolumn{3}{|l|}{Communications} \\
\hline \multirow[t]{6}{*}{\[
\begin{array}{ll}
229 & 100 \\
229 & 120 \\
281 & 106
\end{array}
\]} & English Composition 1 & 3 \\
\hline & English Composition II & 3 \\
\hline & Oral Communications la & 3 \\
\hline & Communication Electives & 3 \\
\hline & & \\
\hline & & 11-12 \\
\hline \multicolumn{3}{|l|}{Social Science} \\
\hline \multirow[t]{4}{*}{\[
\begin{array}{ll}
269 & 325 \\
273110 \\
277 & 220
\end{array}
\]} & U.S. Politics & 3 \\
\hline & General Psychology & 3 \\
\hline & Introduction to Sociology & 3 \\
\hline & & \\
\hline \multicolumn{3}{|l|}{Quantitative} \\
\hline \multirow[t]{6}{*}{\[
\begin{array}{ll}
245 & 100 \\
285 & 320 \\
245 & 340 \\
285 & 321 \\
286 & 315
\end{array}
\]} & College Algebra & 3 \\
\hline & Elements of Statistics & 3 \\
\hline & Introduction to Analytic Processes & 3 \\
\hline & Business and Economic Statistics & \\
\hline & Fundamentals of Computer Programming & 3 \\
\hline & & 15 \\
\hline \multicolumn{3}{|l|}{General Electives} \\
\hline \multicolumn{2}{|l|}{\multirow[t]{5}{*}{Social Science Humanities Natural Science Social Science, Humanities or Natural Science}} & 3 \\
\hline & & \\
\hline & & 6 \\
\hline & & 6 \\
\hline & & \\
\hline & & \\
\hline \multicolumn{3}{|l|}{Business and Economics} \\
\hline \multirow[t]{2}{*}{305238
305} & Office Machines Lab & 0 \\
\hline & Fundamentals of Accounting & \\
\hline 225110 & Economics I & 3 \\
\hline 225120 & Economics 11 & 3 \\
\hline 305400 & Management Concepts & 3 \\
\hline 305405 & Business Finance & 3 \\
\hline 305425 & Business Law I & 3 \\
\hline 305440 & Marketing & 3 \\
\hline 305451 & Production Management & 3 \\
\hline \multirow[t]{3}{*}{305602} & Business Policy & 3 \\
\hline & Business and Society & 3 \\
\hline & Economics Electives & 6 \\
\hline & Business Electives .. & 3 \\
\hline & & 0 \\
\hline
\end{tabular}
305361 Cost Accounting
305371 Cost Accounting
305461 Advanced Cost Accounting

305461 Advanced Cost Accounting
305472 Intermediate Accounting II
305481 Taxation I
Accounting Electives
Other
Physical Education (two semesters) ..... 0
9.10
Total Hours required for graduation

A suggested freshman year program for the degree, Bachelor of Science in Business Administration:
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|l|}{Fall Semester} \\
\hline English & 229 & 100 & English Composition I & 3 \\
\hline Mathematics & 245 & 100 & College Algebra . . & 3 \\
\hline Psychology & 273 & 110 & General Psychology & 3 \\
\hline & & & Natural Sciences & \\
\hline \multirow{3}{*}{Physical Education} & & & and or Humanities & 6.7 \\
\hline & 261 & 011 & Basic Team Sports & 0 \\
\hline & & & & 15.16 \\
\hline \multicolumn{5}{|l|}{5pring Semester} \\
\hline English & 229 & 120 & English Composition II & 3 \\
\hline Speech & 281 & 106 & Oral Communications la & 3 \\
\hline \multirow[t]{3}{*}{Sociology} & 277 & 220 & Intro. to Sociology & 3 \\
\hline & & & Natural Sciences & \\
\hline & & & and or Humanities & 67 \\
\hline \multirow[t]{2}{*}{Physical Education} & 261 & 011 & Basic Team Sports & 0 \\
\hline & & & & 15.16 \\
\hline
\end{tabular}

\section*{Pre-Business Education}

Students preparing to teach business education in the junior and senior high schools are enrolled in a Pre-Business Education curriculum in the College of Business Administration for the freshman and sophomore years. Students will fulfill requirements for the B.S. Degree in the College of Education. During the four years, the adviser in the College of Business Administration aids in the selection of courses in the major. When students are accepted into the College of Education they are assigned to advisers in the College of Education.

Students must make application to the Teacher Education program during the sophomore year. Fifty-three semester hours are required for application to enter the College of Education and admission to the Teacher Education Program (see College of Education section for details).

\section*{Pre-Law}

Law schools emphasize various objectives in pre-law study for the development of basic skills and insights. These objectives are: (1) the acquisition of skills in comprehension and expression, (2) understanding human institutions, and (3) the ability to think clearly,

\footnotetext{
- Students must take at least one scientific laboratory
}
carefully and independently. The stated purpose of the undergraduate program in Business Administration is to achieve these objectives. A pre-law student enrolled in the College of Business Administration not only achieves these important goals, but also obtains a broad business background that is desirable preparation for the study of law.

\section*{Dual Degree in Business Administration or Accounting}

The dual degree programs allow a student to earn the Bachelor of Science in Business Administration or Accounting degree in addition to his non-business degree. Because of course sequence requirements, the program should be commenced during a student's junior year. Students must be enrolled in both the College offering their nonbusiness degree and the College of Business Administration. Advising for Business Administration courses must be done in the dean's offices in the College of Business Administration. The program is not intended for students who have completed their nonbusiness degree.

The following requirements are effective for all students entering the program after January 1, 1971, and all students graduating after June 1, 1976. To qualify for the degree in business, a student must take a minimum of 30 hours of course work not counted toward the first degree. These requirements must be completed either as part of the student's nonbusiness degree or in addition to it.
\begin{tabular}{|c|c|c|}
\hline 225 & 110 & Economics I \\
\hline 225 & 120 & Economics II \\
\hline 286 & 315 & Fundamentals of Computer Programming \\
\hline 305 & 275 & Fundamentals of Accounting \\
\hline 305 & 305 & Managerial Accounting \\
\hline 305 & 400 & Management Concepts \\
\hline 305 & 405 & Business Finance \\
\hline 305 & 425 & Business Law I \\
\hline 305 & 440 & Marketing \\
\hline 305 & 451 & Production Management \\
\hline 305 & 600 & Business Policy \\
\hline 305 & 602 & Business and Society \\
\hline & & Field of Specialization \\
\hline
\end{tabular}
\begin{tabular}{|c|c|c|}
\hline 225 & 110 & Economics I \\
\hline 225 & 120 & Economics II \\
\hline 286 & 315 & Fundamentals of Computer Programming \\
\hline 305 & 275 & Fundamentals of Accounting . \\
\hline 305 & 361 & Cost Accounting. \\
\hline 305 & 371 & Intermediate Accounting I \\
\hline 305 & 400 & Management Concepts \\
\hline 305 & 405 & Business Finance \\
\hline 305 & 425 & Business Law 1 \\
\hline 305 & 440 & Marketing \\
\hline 305 & 451 & Production Management \\
\hline 305 & 461 & Advanced Cost Accounting \\
\hline 305 & 472 & Intermediate Accounting II \\
\hline 305 & 481 & Taxation I \\
\hline 305 & 600 & Business Policy \\
\hline 305 & 602 & Business and Society \\
\hline
\end{tabular}

\section*{Graduate Study}

The College of Business Administration provides graduate work leading to a master of science degree in business administration or to a master of science degree in accounting. All graduate programs require study in behavioral management, quantitative techniques and the decision making processes. Specialization in a particular field is provided through the use of electives.

Admission to graduate study at Kansas State University is granted on three bases: (1) full standing, (2) provisional, or (3) probational. Recommendations concerning an applicant's qualifications and admission are made to the dean of the Graduate School by a faculty committee of the College of Business Administration. The final decision regarding admission of an applicant is made by the dean of Graduate School.

Admission in full standing to graduate study in business and accounting normally requires a minimum grade point average of 3.0 (B average) in an institution whose requirements for the bachelors degree are substantially equivalent to those of Kansas State University.

Applicants with grade averages below 3.0 but above 2.5 will be considered for probational admission. In such cases evidence of superior capability in business, economics and mathematics or statistics will be considered.

Provisional admission may be granted to applicants who have subject matter deficiencies in undergraduate preparation. Normally these deficiencies will be made up by enrolling in courses for undergraduate credit.

All applicants must take the Admissions Test for Graduate Study in Business (ATGSB). This test is a required part of the application, and the applicant should have the testing service report the test scores to the director of Graduate Program, College of Business Administration. Requests for applications and all questions concerning the test, including time and place, should be addressed to: Educational Testing Service, Box 966, Princeton, New Jersey 08540.

Completed applications should be on file at least 60 days prior to requested enrollment date.

\section*{Master of Science in Business Administration}

The program leading to the degree master of science in Business Administration is designed to provide broad education in business management. Depth in a particular area is possible thjough the use of electives.

Admission Requirements: In addition to the general admission requirements set forth above, the applicant must have completed at least two courses in economics and one course in accounting, business finance, business law, management, marketing, statistics and calculus.

The Program of Study: Generally, each candidate must complete the following core courses, or their reasonable equivalent, and fulfill either Option A or Option B. Other programs must be arranged with the advice of the graudate committee.
\begin{tabular}{|c|c|c|}
\hline 800 & Behavioral Management Theory & 3 \\
\hline 820 & Decision Theory of the Firm & 3 \\
\hline 830 & Legal and Social Environment of Business & 3 \\
\hline 840 & Marketing Systems Analysis & 3 \\
\hline 850 & Research Methods in Business & 3 \\
\hline 851 & Business Operations Analysis & 3 \\
\hline 860 & Accounting Controls for Business & 3 \\
\hline 861 & Financial Controls for Business & 3 \\
\hline & Tolal required core & 24 \\
\hline
\end{tabular}
Option A
Required core
Elective area
Written comprehensive exams required

Hours required for graduation
Elective areas include, but are not necessarily limited to, the following computer science; economics; finance; industrial relations; management marketing; operations research (industrial engineering); political science psychology; sociology; statistics.

\section*{Option B}

Required core
Master's thesis
Oral defense of thesis required
Hours required for graduation

\section*{Master of Science in Accounting}

The program leading to the degree master of science in Accounting is designed to prepare graduate students for careers in public, industrial or governmental accounting.

Admission Requirements. In addition to the general admission requirements set forth above, the student must have completed 14 credit hours in accounting, 9 credit hours in economics and 3 credit hours in business finance, law, management, marketing, statistics and calculus.

The Program of Study: Generally, each candidate must complete one of the following options. Other programs must be arranged with the advice of the graduate committee.

\section*{Option A}


\section*{Courses in Business and Accounting}

\section*{UNDERGRADUATE CREDIT}

305 201. Fundamentals of 13usiness for Professional People. (2) I. The course covers business topics selected to acquaint students in professional curriculums with the business problems involved in establishing and maintaining a professional practice; topics include accounting, insurance, law, investments and finance. Not open to students in College of Business Administration. 30.5210 . Personal Finance. (2) I, II. Finance from the viewpoint of the individual; principles and practices of credit buying, borrowing, saving and investing; purchase of government bonds, insurance, real estate, and annuities; problems of taxation and wills. Not open to students in College of Business Administration. Pr.: Sophomore standing
305 2.30. Intermediate Typing. (3) I, II, S. Emphasis on speed and accuracy in typing straight copy and in production of letters, manuscripts, and tabulated reports. Pr.: One unit of high school typing.
305 231. Production Typing. (3) I, II. Develop increased speed and accuracy in production typing - legal forms, statistical materials and letters - within acceptable time limits. Pr.: 305230.
305 233. Shorthand. (4) I, II. Beginning course in fundamentals of Gregg Shorthand. Open only to students with no previous shorthand instruction. Pr.: 305231 or concurrent enrollment.
305 234. Intermediate Shorthand. (3) I, II. Emphasis on writing speed and the introduction of transcription. Pr.: 305231 and 305233 or one unit of high school shorthand. 305.236. Transcription I. (3) II. Advanced shorthand with speeds of 100 to 120 or higher. Setting up business letters in various styles - gaining speed in transcription of letters and manuscripts. Pr.: 305235.
305 237. Office Practice and Technique. (3) I. Training for the executive secretary. The course work covers dictation and transcription, secretarial functions and responsibilities, and the use of office machines. Pr.: 305236 and conc. enrollment in 305238.
305 238. Office Machines Laboratory. (0) I, II. Instruction and practice covering the various calculators and ten-key adding machines. One hour a week.

305 275. Fundamentals of Accounting. (4) I, II, S. The preparation and use of accounting records for individual, partnership and corporate business organizations. Pr.: Sophomore standing.
305 301. Office Management. (3) I. An examination of the theory and practice of office management. The scope of the course is defined by the five functions of the office manager - organizing, staffing, directing, planning, and controlling.
305 305. Managerial Accounting. (3) I, II, S. Development and use of accounting information as an instrument of management control. Coverage includes analysis of financial statements, cost accounting applications, budgeting and accounting reports to management. Pr.: 305275.
305 310. Administrative Communications. (3) II. Preparation of business communications, reports and correspondence, and analysis of communication systems within an enterprise structure. Pr.: 229120 and 281106. 305 312. Insurance. (3) I. A study of life, property, casualty, and health insurance from the purchaser's point of view with additional emphasis on the operation and contributions of the insurance industry. Pr.: 225110. 305 343. Sales Communication. (3) I. Intensive investigation of the art of persuasive sales communication, with emphasis on selection, organization and effective oral presentation of marketing, sales and promotional information. Pr.: Junior standing or consent of instructor.
305 350. Small Business Operations. (3) Offered on sufficient demand. Opportunities in business ownership, principles governing the starting of a small enterprise; importance, status, problems, and management of small business. Pr.: 225 110. Not open to students in College of Business Administration.
305 361. Cost Accounting. (3) I, II. Allocation of production costs to determine unit costs of goods manufactured and sold and the utilization of such data by management. Pr.: 305275.
305 371. Intermediate Accounting I. (3) I, II. Application of accounting theory to the valuation of balance sheet accounts, with emphasis on cash, inventories and fixed assets. Pr.: 305275.
305 399. Honors Seminar in Business. (1) I, II. Readings and discussions on selected topics. A miximum of four hours credit may be obtained.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

305 400. Management Concepts. (3) I, II, S. Fundamental processes in managing the going concern. Provides a basic understanding of administrative problems through study of organization theory, quantitative, and behavioral aspects of decision making. Pr.: 245100 and junior standing.
305 405. Business Finance. (3) I, II, S. Emphasis on analyzing the timing, risk and return of the different forms of financing. Pr.: 225 120, 285320 and 305305 or 371.

305 425. Business Law I. (3) I, II, S. A study of law as it relates to business. Coverage includes contracts, agency and partnerships. Pr.: Junior standing.

305 426. Business Law II. (3) I. Study of the social forces which bring about changes in Civil Law as it affects commercial transactions. Coverage includes corporations, commercial paper and contractual rights. Pr.: 305425.
305 431. Personnel Administration. (3) I. Study of the personnel program and its operational processes of manpower planning, recruiting and developing. Analysis of the role of the personnel function in the organization with emphasis on problem solving. Pr.: Junior standing. 305 440. Marketing. (3) I, II, S. A general study of marketing from a social-economic point of view; a study of the institutional organization of the market and the functioning of marketing agencies in the distribution of goods. Pr.: 225110 and junior standing.
305 451. Production Management. (3) I. Production management as it relates to capital investment, inventory control, purchasing, plant layout and site location. Pr.: 225 120, 285320 and 305275.
305 461. Advanced Cost Accounting. (2) I, II. Budgetary control with standard costs; cost and profit analyses for decision-making purposes. Pr.: 305305 or 361.
305 471. Advanced Accounting. (3) II. Accounting for partnerships, installment sales, consignments, consolidated statements, and other special topics. Pr.: 305371.

305 472. Intermediate Accounting II. (3) I, II, S. Statement analysis and special problems peculiar to the corporate form of organization. Pr.: 305371.
305 481. Taxation I. (3) I, II, S. Fundamental concepts of income determination in federal and state income tax regulations; examination of the impact of tax regulations on business and personal financial planning and decision making. Pr.: Junior standing.
305 482. Taxation II. (3) II. Intensive examination of specific problems encountered in federal and state income tax regulations, with emphasis on research and preparation for the C.P.A. examination. Designed for those anticipating careers in accountancy. Pr.: 305481. 305 505. Investments. (3) I. A study of investment institutions, and principles and practices from the individual viewpoint. Corporate, civil, foreign, and real estate investment are compared as to risk, return, and intrinsic value. Pr.: 245340 or 220,285320 and 305405. 305 507. Financial Institutions. (3) II. The role of financial intermediaries in the flow of funds; emphasis on the financial management concepts that underlie these institutions and their impact on business and economic growth. Pr.: 305405.
305 512. Real Estate. (3) II. Principles and practices including legal, economic and social implications from the viewpoint of the real estate practitioner, investor and society. Pr.: Junior standing.
305 530. Labor Legislation. (3) II. Development of government regulations pertaining to legal rights and duties of employers, unions, and the public. Analysis of labor laws and their effect on labor-management relationships. Pr.: 305425.
305 540. Retailing. (3) II. An introduction to retailing from the management point of view; study of retail policies and organization; the operation of the buying and selling functions, merchandise control, store systems, personnel management, retail accounting, and expense control. Pr.: 305440.

305 542. Sales Management. (3) I. From the point of view of the manufacturer or wholesaler, a study of management problems relating to sales - including sales programs, product and distribution policies, price policy, management of sales force, sales promotion, and market research. Pr.: 305440.
305 545. Consumer Behavior. (3) I. Behavioral concepts and theories as they relate to marketing: motivation, learning, beliefs, attitudes, habits, taste, custom, fashion, social class, reference, group influences, value and utility theory. Pr.: 305440.
305 575. Accounting Internship. (3) II. Provides six weeks of practical deversified public accounting experience for accounting majors. The course objective is a broader educational experience for participating students. Pr.: 305 472, 481, 680, and consent of instructor.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

305 600. Business Policy. (3) I, II, S. Integration of the subject matter of required courses in business and economics through study of the problems of policy formulation and administration. Cases are used as the basis of class discussion and written reports. Business simulation is used as an additional pedagogical technique. Pr.: Open only to graduating seniors and graduate students; 305400,405 , and 440.
305 601. Advanced Management. (3) II. Emphasis on decision-making methodology, models and applications; the integrative nature of management systems and the decision-making process, structure, and appraisal. Pr.: 245340 or 220,285320 and 305400.
305 602. Business and Society. (3) I, II, S. The impact of changes in the non-market environment on business; the relationship of business to social, economic and political forces. Pr.: Senior or graduate standing plus nine hours of credit in the social sciences.
305 610. Business Measurements and Forecasting. (3) II. Methods of analysis of business data, with emphasis on the use of data for executive decisions. Topics include tables, charts, time series analysis, index numbers, current economic indicators, forecasting techniques, quality control, and sampling applications. Pr.: 285320 or consent of instructor.
305 615. Financial Management. (3) II. Analysis of problems in advanced financial planning and control. Pr.: 245340 or 220,285320 and 305405.
305 617. Controllership. (3) I. Emphasis on control of operation through cost analysis, internal and external reporting, and income determination concepts. Pr.: 305305 or 361 and 371.
305 630. Industrial Relations. (3) I. Study of strategies and procedures in industrial relations including prenegotiations and negotiations, grievance procedure, arbitration, labor law, conflict resolutions, behavioral aspects of union-management relations and current issues. Pr.: Junior standing.
305 631. Organizational Behavior and Administration. (3) I. An interdisciplinary study of organizational factors within the business firm; psychological, socialpsychological, and sociological variables crucial in understanding and predicting behavior in individuals and groups; emphasis on empirical research. Pr.: 305400 or 431 or consent of instructor.

305 632. Contemporary Issues in Labor Relations. (3) II. Research oriented course concentrating on current critical issues in the labor-management field. Pr.: 305630 or 225620.
305 640. Marketing Research. (3) II. Designed to acquaint the students with various marketing research concepts, methods, and techniques; and to develop their ability to evaluate, use, and present research findings. Pr.: 305440.
305 660. International Business. (3) II. Examination of business decision parameters and strategy in foreign environment. Emphasis on aspects differing from the domestic area as they relate to marketing, management and financial decisions. Pr.: Senior standing.
305 670. C.P.A. Problems. (3) I. A study of problems in various C.P.A. examinations. Pr.: 305472 and consent of instructor.
305 671. C.P.A. Review. (2) II. Study of theory of accounts and commercial law as given in C.P.A. examinations and review of current literature. Pr.: 305472 and consent of instructor
305 672. C.P.A. Law Review. (2) II. A review of the areas of law required to become a C.P.A. All applicable subjects will be covered. Pr.: 305425 and 426 or their equiv.
305 680. Auditing I. (3) I. Theory and procedure used in balance sheet audits. Pr.: 305472.
305 681. Auditing II. (3) II. Theory and procedure used in more complex balance sheet and detailed audits: a study of auditing questions as given in C.P.A. examinations, and review of current literature. Pr.: 305680 and consent of instructor.
305 798. Problems in Business Administration. Credit arranged. I, II, S. Pr.: Background of courses needed for the problem undertaken.
305 799. Problems in Accounting. Credit arranged. I, II, S. Pr.: Background of courses needed for the problem undertaken.

\section*{GRADUATE CREDIT}

305 800. Behavioral Management Concepts. (3) I. The development of the behavioral bases of individual and group functioning in business, governmental, educational and other organizations. Pr.: 305400 or consent of instructor.
305 820. Decision Theory of the Firm. (3) I. An integration of economic theory and operations research, with business decisions and application of these tools to management problems. Pr.: 225 120, 285320 and 305305. 305 830. Legal and Social Environment of Business. (3) II. Problems affecting business, government and society are used to develop insight into the existence of business problems calling for judgments involving human and social values. Pr.: Consent of instructor.
305 840. Marketing Systems Analysis. (3) II. A detailed analysis of the marketing operation of selected regional and national business firms. Analysis techniques will be stressed in providing deeper insight into present-day marketing systems. Pr.: 305440.
305 841. Seminar in Marketing. (3) On sufficient demand. Study of current literature, marketing theory, and intensive investigation of various problem areas. Pr.: 305440 or consent of instructor.

305 850. Research Methods in Business. (3) I. Statistical methods of analysis specifically applicable to graduate students in business. Experimental design, data collection and methods of analysis are covered. Pr.: 285320 and 305400.
305 851. Business Operations Analysis. (3) II. The use of quantitative decision models in business decisions; includes linear and dynamic programming, queuing, inventory control, simulation and multi-strategy game theory. Pr.: One course in calculus.
305 860. Accounting Controls for Business. (3) I. The reliability of accounting data for business decisions and the relevance of such data to particular desicisons are evaluated within the framework of changing economic conditions. Pr.: 225120 and 305305.
305 861. Financial Controls for Business. (3) II. The data necessary to judge economic flexibility and risk of in-
vestment proposals, cost of capital and capital structure are evaluated under static and dynamic assumption regarding money and capital markets. Pr.: 305405.
305 870. Accounting Theory I. (3) I. An intensive treatment of problems related to corporation accounting and reporting, with emphasis on income determination and balance sheet valuation. Pr.: Consent of instructor.
305 871. Accounting Theory II. (3) II. A critical examination of accounting literature, with emphasis upon accounting theory and intensive study of current issues in accounting theory. Pr.: Consent of instructor. 305 998. Research in Business Administration. Credit arranged. I, II, S. Pr.: Sufficient training to carry on the line of research undertaken.
305 999. Research in Accounting. Credit arranged. I, II, S. Pr.: Sufficient training to carry on the line of research undertaken.


\title{
THE COLLEGE OF EDUCATION
}

\author{
SAMUEL R. KEYS,' Dean \\ MARGARET C. BLOOMQUIST, Assistant to the Dean and Director of Student Personnel Services \\ ROY A BARTEL, Coordinator of Student Teaching
}

The College of Education is concerned with programs preparing individuals for a wide variety of educational positions in schools, colleges, industry, business, welfare, and governmental agencies.

Primary consideration is given to work and curricula in: 1) preparation of teachers for elementary and secondary schools, 2) preparation of personnel to serve in various levels of school and college administrative positions, 3) training of supervisory personnel for curricular development and instructional improvement, 4) programs to prepare persons for the wide variety of guidance and student personnel positions, 5) preparing teachers for junior colleges and four-year colleges, including professors for colleges of education, 6) providing programs to prepare teachers and other personnel in the area of
special education, 7) providing consultative services for the improvement of various aspects of educational programs including inservice training, and 8) providing graduate programs for positions in education at the graduate level.

The College of Education cooperates fully with all colleges and departments at Kansas State University. This cooperation is considered essential for a complete preparation of school personnel who require contact with personnel from all aspects of the academic community.

The Kansas State University Teacher Education Programs are accredited by the Kansas State Board of Education, North Central Association of Colleges and Secondary Schools, and National Council for Accreditation of Teacher Education.

\section*{Center for Extended Services and Studies o. KENNETH O'FALLON, Director}

The Center for Extended Services and Studies was established and is operated by the College of Education, Kansas State University, in response to the needs of schools in the State of Kansas and of education generally. The Center provides a structure within which the College of Education and Kansas State University can direct their resources toward working cooperatively with schools to develop and provide services and studies. The services and studies provided relate to the solution of educational problems and general improvement of education.

The Center is staffed and maintained through the assignment of faculty members within the College of Education, contracts with faculty from Kansas State University and other Kansas colleges and universities, and assignment of graduate students. The problem, service or study will, upon definition, determine the resources, human and other, that will be coordinated through agreement.

\section*{Undergraduate Study}

The curriculum in elementary education or secondary education at Kansas State University is a four-year program.

Students planning to transfer to Kansas State University after one or two years at a junior college are encouraged to plan their degree programs in a four-year sequence. The faculty of the College of Education is available to advise any student on his selection of courses which will meet Kansas State University degree requirements.

These students transferring to KSU as juniors will enroll in the College of Education and may complete requirements for admission to the Teacher Education Program during their first semester of residence.

\section*{Programs in Teacher Education}

The Teacher Education Programs are designed to develop competencies essential for teaching. The requirements of the Programs must be completed by everyone wishing to teach in elementary or secondary schools.
Students completing a Teacher Education Program which is part of requirements for a degree granted by another college at KSU,
are required to complete all requirements of the Teacher Education Program as outlined below.

The Teacher Education Programs consist of (1) General Education Studies (page 182 or 183), (2) Professional Studies (p. 183), and (3) Major Area.

Programs preparing junior college teachers are available: (1) Students may complete a Secondary Education Teacher Education Program and add to it requirements for junior college certification. (2) Students may have a program designed specifically for junior college certification.

\section*{Admission to the Teacher Education Programs}

Any student intending to teach in elementary or secondary schools must have the Application for Admission to the Teacher Education Programs filed and approved before the student may enroll in Educational Psychology II or any part of the Professional Semester. The Application for Admission to the Teacher Education Programs must be approved before pre-education majors may have a Change in Curriculum into the College of Education completed. The application forms are available in the Office of Student Personnel Services, College of Education, Holton Hall.

Dates: (1) Students must apply by October 15 or February 15 of the sophomore year, but not later than the semester in which they earn 53 semester hours. The Application for Admission to a Teacher Education Program must be filed two years prior to graduation. If this is not adhered to students may experience difficulties in meeting certification requirements.
(2) Transfer students from another institution should apply at the time of enrollment or pre-enrollment.

Students making a change in Teacher Education Programs should file an application for the new program.

Academic Standards Committee: The Academic Standards Committee of the College of Education must approve the Application for Admission to the Teacher Education Programs.

\footnotetext{
Requirements for Admission to the Teacher Education Programs: (The same
}
requirements apply to students applying for admission to the College of Education.)
1. a. Over-all grade-point average of 2.2 in all resident work attempted at Kansas State University.
b. The grade-point average requirements for students transferring to KSU will be based on all work attempted at previously-attended institutions when the application is filed at the time of enrollment.
2. A grade-point average of 2.5 in all resident work attempted at Kansas State University in the Teaching Field (as defined by the Certificate Handbook of the State of Kansas). This requirement does not apply to the Elementary Education majors. Transfer students will have the grade average based on all attempted work in the teaching field at previously-attended institutions when the application is filed at the time of enrollment.
3. Passing English Composition I and II with a grade of "C" or better in one of the courses. A student who fails to meet the requirement may substitute a satisfactory score on the Cooperative English Test - English Expression Form 1 C.
4. Grade of " C " or better in one of the following Speech courses: 105, 106, 109, 200.
5. Clearance by the Dean of Students.

Provisional admission may be granted to an applicant who meets all requirements and whose over-all gradepoint average is not below 2.0 and teaching field over-all grade-point average is not below 2.3.

\section*{The Professional Semester}

Teaching Participation is the culminating clinical experience of the Professional Semester. The Professional Semester is comprised of a series of prescribed courses which are accelerated so that one-half of the semester is allocated to the clinical experience (Teaching Participation). This semester occurs either in the fall or spring semester of the senior year.

Students desiring to be recommended for certification by KSU must earn credit for Teaching Participation in residence. Those students who have had secondary methods courses in another college or university will be required to audit the course at Kansas State University.

The Professional Semester for the various Teacher Education Programs is shown below:
ELEMENTARY PROFESSIONAL SEMESTER


The majority of secondary education majors enroll in the following courses in their Professional Semester.

SECONDARY PROFESSIONAL SEMESTER


Principles of Secondary Education (415 451)
Educational Sociology ( 405 616) .........................
Methods of Teaching in Secondary School (4is 476 )
(Art and English Majors have a major course included in this semester.)
The following are exceptions to the Secondary Professional Semester:


\section*{Application for Admission to the Professional Semester}

Applications for the Professional Semester must be filed before December 20th of the preceding year in which the student plans to enroll in the Professional Semester.

Failure to file the application by this date may cause a student to experience difficulties and delays in meeting certification and-or degree requirements.
Students must apply even though all admission requirements are not staisfied at the time of application. The application serves as a formal request from the student that the College of Education provide an opportunity for him to participate in the Professional Semester.
1. The Application. Obtain the form, Application for Admission to the Professional Semester, from the College of Education adviser and return the form to the same adviser.
2. Secondary students need signatures of both the teaching field adviser and the Education adviser.
- Other courses common to the secondary Professional Semester are taken prior to this Professional Semester sequence.
3. Elementary Education majors need only the signature of the Education adviser.
4. Return the form to the Education adviser.

\section*{Admission Requirements to the}

\section*{Professional Semester}
1. The application properly filed.
2. Full admission to a Teacher Education Program.
3. Educational Psychology I and II completed with a passing grade.
4. A minimum of ninety (90) hours of course work completed.
5. Over-all grade point average of 2.2 in all work attempted in residence at Kansas State University.
6. Students in all Secondary Education Programs must have a 2.5 over-all grade point average in the teaching field courses attempted in residence at Kansas State University.
7. Elementary Education majors must have completed the following four professional Courses:
Science for Elementary Schools, 415 470 .................................. 3
Science for Elementary Schools, \(415 \quad 470 \ldots \ldots\)
Language Arts for Elementary Schools, 415 . 471
\(\begin{array}{ll}\text { Language Arts for Elementary Schools, } \\ \text { Social Studies for Elementary Schools, } 415 & 472\end{array}\)
\(\begin{array}{ll}\text { Social Studies for Elementary Schools, } 415 & 472 \\ \text { Mathematics for Elementary Schools, } 415 & 473\end{array}\)
8. Students with degrees from other colleges and universities who wish to qualify for the Professional Semester at KSU must apply through the Coordinator of Student Teaching. Applicants must meet all requirements of the Teacher Education Program.
9. The Coordinator of Student Teaching will obtain clearance for students from the Dean of Students office.
10. Students will obtain clearance from Student Health through a physical examination the semester prior to the Professional Semester.
11. Courses common to the Secondary Professional Semester which are scheduled in some Teacher Education Programs prior to the Professional Semester must be completed satisfactorily.

The College of Education Adviser will indicate approval to the student's preenrollment or enrollment in the Professional Semester. When students pre-enroll in the Professional Semester and find at a later date that requirements for admission to the Professional Semester are not all satisfied, the student may request (through his College or Adviser) that his Application for Admission to the Professional Semester be postponed one semester. One postponement is all that is permitted. Approval for enrollment in the Professional Semester later than one postponement of the original application will require a new application.

\section*{Special Requirements Concerning the Professional Semester}
1. Students enrolled in the Professional Semester may take no courses which do not conform to the accelerated schedule. This means that during the Professional Semester no assignments or class attendance may be required during the clinical experience.
2. Students will receive credit or no-credit for Teaching Participation.
3. Students must be eligible for Admission to the Professional Semester to enroll in any of the professional education courses which are a part of the Professional Semester.

\section*{Curriculum in Elementary Education}

Bachelor of Science in Elementary Education. Hours required for graduation, men and women, 126.

Students preparing to teach in the elementary school are enrolled in a preelementary education curriculum in the College of Arts and Sciences for the freshman and sophomore years. Freshmen and sophomores are advised by a College of Education pre-education adviser in Room 110 Holton Hall. The adviser is available for advising and counseling students concerning the courses essential for entry into the Teacher Education Program. All sophomores must make application for admission to the Teacher Education Program. When the applications are approved, students are accepted into the Teacher Education Program and into the College of Education. Students are reassigned to advisers in the College of Education.

\section*{I. General Education Requirements}
(50 hours):
a. Communications: English Composition I and II, six (6) hours; Oral Communication, two (2) hours.
b. Social Sciences (must include General Psychology, 3 hours; additional 9 hours selected from economics, geography, political science, history, sociology, anthropology): Twelve (12) hours.
c. Literature or Language: Five (5) hours. (a combination of the two is not acceptable)
d. Natural Science: Sixteen (16) hours including eight (8) hours of biological science and eight (8) hours of physical science. Must include one laboratory course. No mathematics may be included.
e. Mathematics: Three (3) hours.
f. Physical Education: Two semesters required.
g. Electives.

\section*{II. Professional and Specialized Course Requirements}
(48 hours):
a. Professional Education: Thirty-six (36) hours.

\title{
1. Educational Psychology I, \(405 \quad 202\)
Educational Psychology 11, \(405 \quad 302\) \\ Educational Psychology 11, \(405 \quad 302\)
Principles of Elementary Education, \\ Principles of Elementary Education, 415300
Science for Elementary Schols, \\ Science for Elementary Schools, 415470 \\ Mathematics for Elementary Schools, 415 . 473. \\ Language Arts for Elementary Schools, 415471 \\ Social Studies for Elementary Schools, \(415 \quad 472\) \\ Elementary School Reading, 415474 \\ Educational Sociology, 405616 \\ Introduction to Instructional Media، 415316 \\ 2. Clinical Experiences \\ Teaching Participation in Elementary School ............. 8 hours \\ (Shall include the utilization of various instructional media.) \\ b. Additional Requirements: Twelve (12) hours.
}
\begin{tabular}{|c|c|c|}
\hline Music for Elementary Teachers, 257 & 205 & Hours \\
\hline Art for Elementary Schools, 209170 & & .. 3 \\
\hline Literature for Children, 229470 & & 3 \\
\hline Personal and Community Health, 261 & 356 & 3 \\
\hline
\end{tabular}

\section*{III. Area of Concentration}
(15 hours):
Fifteen (15) hours selected from the field of concentration. Courses excluding those taken to meet General Education requirements are to be taken from one of the following fields:

Biological Sciences
Home Economics
Music and Art
Social Science
English and Speech
Modern Foreign Language
Physical Science and Mathematics
Special Education:
Speech Pathology
Mental Retardation

\section*{IV. Electives}
(14 hours):
Remaining hours in the degree may be taken as additional hours in the major, related courses and free electives.

\section*{Curriculum in Secondary Education}

Bachelor of Science. Hours required for graduation, men and women, 126.
Students preparing to teach in the secondary school are enrolled in a pre-secondary education curriculum in the College of Arts and Sciences or the College of Business Administration for the freshman and sophomore years.

Dual advisement is provided during the entire four years for all prospective secondary teachers. For the first two years students are advised by a College of Education pre-education adviser in Room 110 Holton Hall or by an adviser in the College of Business Administration. In addition to the
pre-education adviser, students are assigned to advisers in their majors who assist in the selection of courses in their major and teaching fields.

All sophomores must make application for admission to the Teacher Education Program. When the applications are approved, students are accepted into the Teacher Education Program and into the College of Education. Students are reassigned to advisers in the College of Education, but retain their advisers in their major fields.
There are 22 subject fields applicable to teaching at the secondary level.

\section*{I. General Education Requirements:}
(50 hours):
a. Communications: English Composition I and II, six (6) hours; Oral Communication, two (2) hours.
b. Social Sciences (must include General Psychology, 3 hours; additional 9 hours selected from economics, geography, political science, history, sociology, anthropology): Twelve (12) hours.
c. Literature or Language (a combination of the two is not acceptable): Five (5) hours.
d. Natural Science: Sixteen (16) hours; including at least one course in biological science and one course in physical science. Must include one laboratory course. May not include more than four (4) hours of mathematics.
e. Physical Education: Two semesters required.
f. Electives.

\section*{II. Professional Education Requirements:}
(23-24 hours):
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a. Educational Psychology I, 405202
Educational Psychology II, 405302
Introduction to Instructional Media, 415316
Principles of Secondary Education. 415451
Educational Sociology, 405616
Methods of Teaching in the Secondary School, 415 476 . 2.3
b. Clinical Experiences
Teaching Participation in the Secondary School ..... 8 hours
(Shall include the utilization of various instructional media.)

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\section*{III. Major}
(Refer to section "Secondary Education Major Fields" below.)

\section*{IV. Electives}

Remaining hours in the degree may be taken in additional hours in the major, general education and related courses, and free electives.

\section*{Secondary Education Major Fields}

Agricultural Education: Students planning to be Agricultural Education Majors will be enrolled in and receive their degree from the College of Agriculture. See page 34.
Art Education (SED 420): Art 095, 096, 100, 190, 195, 196, \(200,205,210,222,224,230,235,246,265,270,290,496,600\), 787, an additional 6 hours in courses in one of the
specialized art subjects (oil, prints, ceremics, sculpture, art history, metalcrafts \& jewelry).
Biological Science (SED 427) : Biol. 198, 201, 450, 530, 535, An Husb. 400, 7 hours elected from Biol. 515, 646 or 660 , Agric. 211; Physics 112; Geol. 100; Chem. 210, 230, 250, 350 or \(110,190,191,200\).
Business Education (SED 421): B. A. 230, 231, 237, 238, \(275,301,305,315,400,425,426,440,234\) and 236 or 6 additional marketing hours or 6 additional accounting hours, 6 hours of Business Administration electives; Econ. 430 or B. A. 405 ; Pol. Sci. 325; Soc. 211; Econ. 110, 120 ; Math. 100.
Chemistry (SED 427): Chem. 210, 230, 271, 350, 351, 585, five hours of chemistry electives; Biol. 205 and 210 or 198 and 201 ; Math. 220, 221; Phys. 211 and 212 or 310 and 311; highly recommended are Math. 222, Chem. 799.
Earth Science (SED 427) : Biol. 198 and 201 or 205 and 210; Chem. 210, 230, 250; Math. 100, 150; Phys. 131, 135, 211, 212; Geog. 150; Geol. 100, 420, 430, 460.
Economics (SED 428): Econ. 110, 120, 410, 420; Pol. Sci. 110 or 444 ; Hist. 251, 252; Soc. 211; Soc. Sci. elective (recommended: Geog. 250 or 260 ); Bus. Admin. 275 ; Math. 100; Stat. 320 or 520 ; 12 hours electives in Economics, numbered 400 or above, selected with advice of Economics advisor.
English (SED 422); Three of the following four: Engl. \(380,381,385,386\); Engl. 350 or 651, 406, 451, 475, 599, 9 hours of literature electives, with 6 hours at 600 level and above.
Geography (SED 428) : Geog. 110, 150, 151, 250, 260, 350, 9 hours of additional courses numbered 500 or above in geography; Hist. 251, 252; Pol. Sci. 110 or 444; Soc. 211.
Home Economics Education: Students planning to be Home Economics Education Majors will be enrolled in and receive their degree from the College of Home Economics. See page 232.
History (SED 428): Hist. 101, 102, 251, 252, 597, 599, 12 hours of courses numbered 400 and above distributed in three of the five fields: (a) Ancient, Medieval and Early Modern Europe, (b) Modern Europe including Britain, (c) Non-Western History, (d) American (including Latin America), and (e) History of Science, History of Technology, Military History; Pol. Sci. 110 or 444 and three hours elective; Soc. 211; three hours elective in economics and Geography 110.
Journalism (SED 422) : Journ. 306, 316, 331, 21 hours electives from Journ. 235, 320, 331, 335, 358, 406, 455, 600, 606, 620, 652, 660.
Mathematics (SED 424): Math. 220, 221, 222, 240, 320 or 410,18 hours of courses numbered 400-799 in the department of mathematics for which the following courses are recommended: \(470,475,511,512,513,573,617,619,691\). It is recommended that a course in physics be included as part of general education and that a course in computer programming be included as an elective.
Modern Languages (SED 425): 30 hours in one language. A second teaching field is recommended.
Music Education: Students planning to be Music Education Majors will be enrolled in and receive their degree from the College of Arts and Sciences. See page 135.

Physical Education: Students planning to be Physical Education Majors will be enrolled in and receive their
degree from the College of Arts and Sciences. See page 141.

Physical Science (SED 427) : Chem. 210, 230, 250, 350, 351 ; Geol. 100, 430; Biol. 205 and 210 or 198 and 201; Phys. 310 and 311 or 211 and 212 and 407, 6 hours selected from Phys. 131, 135, 408, 560; Math 220, 221.
Physics (SED 427): Phys. 310, 311, 400, 432, 472, 502, 503, 740; Chem. 210, 230, 250; Math. 220, 221, 222, 240.
Political Science (SED 428): Pol. Sci. 110, 21 hours in political science; Hist. 101, 102, 251, 252; three hours in economics; Soc. 211; Geog. 110.
Psychology (SED 426) : Psych. 110, 420, 435, 440, 9 hours of psychology electives excluding Educational Psychology I and Educational Psychology II; Math. 100; Stat. 320 or 520 ; completion of a sécond teaching field (Specify field based on state certification requirements). Sociology (SED 428): Soc. 211, 410, 620, 710, two of the following four: 430, \(440,450,460,9\) hours of courses numbered 500 or above in the department of sociology; Pol. Sci. 110 or 444 ; Stat. 320 ; three hours in mathematics, logic or philosophy; three hours in economics; Geography 110; History 251, 252.
Speech (SED 429): Thirty hours in speech including 21 hours in the major area of interest and 9 hours in speech courses outside major area of interest. To satisfy requirements, choices may be made from the following speech courses: I. Public Speaking, Group Discussion \& Debate: \(176,200,608,616,618,655,765\); II. Theatre: 145 , \(253,255,350,433,436,472\); III. Oral Interpretation, Speech Correction, Voice \& Diction: 210, 213, 455, 526, 632, 637.

\section*{Teacher Certification}

The College of Education has the responsibility to serve as the recommending agent for ALL Kansas State University graduates who wish to qualify for certification as a preschool, elementary, secondary, or junior college teacher. The degrees earned in the College of Education will fulfill certification requirements. Students enrolled in and earning degrees in colleges other than the and earning degrees in colleges other than the College of Education must complete ALL requirements of the Teacher Education Program.
Students may qualify for the Three-Year Degree Elementary Certificate, the ThreeYear Degree Secondary Certificate, or the Three-Year Degree Elementary and Secondary Certificate, as established by the State Board of Education.
Applications for certification are processed by the Office of Student Personnel Services of the College of Education, Room 111, Holton Hall.
Kansas State University may become the recommending agent for recertification or
initial certification of individuals presenting degrees from other accredited institutions.
1. Persons seeking renewal may do so upon completion of a minimum of eight (8) hours in residence, a portion of which must be earned in the College of Education.
2. Persons seeking initial certification must meet all requirements of the Teacher Education Program. (page 180)

\section*{Graduate Study}

The College of Education offers work leading to the Master of Science degree and the Doctor of Philosophy in Education degree. Admission to the Graduate School is required of all students enrolling for graduate credit. The general requirements for advanced degrees are set forth in the Graduate School section of the catalog.

Master of Science Degree. Major work leading to the degree Master of Science is offered in the following fields:

Agricultural Education
Home Economics Education
Education-Specialization in: Adult Education, Educational Administration, Guidance and Counseling, Secondary Education, Elementary Education, Curriculum and Supervision, Special Education
Requirements: Candidates for graduate work shall meet the following requirements:
1. Graduation from an accredited institution whose requirements for the Bachelor's degree are substantially equivalent to those of Kansas State University.
2. Undergraduate grade average of 3.0 or better in the junior and senior years.
3. Graduate Record Examination, Aptitude Test score only.
4. Undergraduate preparation substantially equivalent to that given by Kansas State University in the specific subject-matter field in which the applicant expects to do graduate work.
5. Undergraduate preparation in closely related or supporting subjects adequate to support advanced work in the field of the applicant's choice.
6. Undergraduate professional education necessary to satisfy the requirements of the graduate program the student expects to pursue.

Students lacking preparation in certain areas may be required to do additional work. All students expecting to work for a Master's Degree shall make available to the Student Personnel Office of the College of Education two copies of the Graduate School Application, two official copies of transcripts
from each and every institution attended, a copy of verbal and quantitative scores of the Aptitude Test of the Graduate Record Examination, three letters of recommendation, a statement of academic objectives for graduate study, and international students whose native language is not English must make available the results of the Test of English as a Foreign Language TOEFL.

Additional requirements for the M.S. degree include:
1. A minimum of 30 semester hours, approximately one-half of which shall be in the major field (one option provides for 12 hours).
2. Included in all programs must be a minimum of two courses selected from the following list: Philosophy of Education, Curriculum Development, Advanced Educational Psychology, Principles and Practices of Guidance, Basic Principles of Measurement, and Research Methods and Treatment of Data. Students should confer with advisers concerning specific departmental course requirements.
3. Thesis, Report, Non-Report Options: Departments shall have the option of using one or more of the three plans below:
a. A thesis of six to eight semester hours
b.A written report of two semester hours either of research or of problem work on a topic in the major field.
c. Ccurse work only, but including evidence of scholarly effort such as term papers, production of art, music, designs, etc., as determined by his supervisory committee.
4. A final oral examination or a comprehensive written examination or both shall be required of the student. These may include a defense of the thesis or report, an interpretation of other scholarly products, or a testing of the student's understanding of his fields of study. Choice of examination procedures shall be a departmental option.

A brochure, "Guidelines for Initial Enrollment, Application, and Admission to Graduate Study in Education for Master's Degree and as Special Student," may be obtained on request from the Director of Student Personnel Services of the College of Education. Information on special requirements for an advanced degree may be obtained by writing to the department head.

Doctor of Philosophy Degree in Education. Major work is available in three broad areas of specialization: (1) Educational Administration, (2) Educational Psychology, (3) Adult and Occupational Education, and (4) Curriculum and Instruction. Joint programs involving selected departments in other

Colleges at Kansas State University will prepare individuals for teaching positions in junior and four-year colleges.

Requirements: Applicants for the Ph.D. degree in Education shall make available to the Office of Student Personnel Services two copies of the Graduate School Application, two official copies of transcripts of undergraduate and graduate transcripts, a copy of verbal and quantitative scores of the aptitude test of the Graduate Record Examination, a report of the Miller Analogies Test score, four letters of recommendation, an autobiography indicating educational experience and aspirations, a statement of health from the applicant's family physician, and evidence of writing ability such as a thesis or any published articles. In addition, the applicant will be asked to present himself for an interview at a designated time and place.
Additional requirements for the Ph.D. degree include a minimum of 90 semester hours of graduate study beyond the bachelor's and must include:
1. A minimum of 24 hours of course work above the Master's degree or equivalent, and 20-30 hours of research at Kansas State University after admission to the doctoral program.
2. A minimum of 20 hours in the area of specialization, 12 hours in an integrated supporting area, and 9 hours in the prescribed research core. The prescribed research core consists of the following: (a) a first course in statistics, (b) Administration \& Foundations (A\&F) 800, and (c) A\&F 904. A foreign language is not required.
3. A minimum of two regular semesters of fulltime residency after admission to the doctoral program. Full time residency means the student may be employed up to half time and must be enrolled for at least nine hours credit each semester.
4. Written preliminary and oral examinations that meet the requirements of the Graduate School and the College of Education.

Beyond the courses specified in the research core, adaptations can be made in the light of the student's particular interests. These adaptations will be approved by the adviser and the student's committee. Each student's pattern of studies is individualized. All doctoral candidates are expected to reflect an interest in and a concomitant aptitude for research.

The degree may be earned by students who show evidence of unusual competency in
scholarly study. It is not conferred for mere conformity to matriculation, residence, or course requirements. The degree also requires power of independent, original, and scientific investigation, evidence of which the candidate is expected to show in a dissertation.

Information on special requirements for an advanced degree may be obtained by writing to a department head.

\section*{Administration and Foundations}

JOHN T. ROSCOE*, Head of Department
Professors Danskin*, DeMand*, Flanagan*, Hoyt*, McCain*, Moggie*, O'Fallon*, Roscoe*; Associate Professors Harlow, Kaiser*, Kasper*, Laughery*, Nordin, and Sarthory* ; Assistant Professors Holen, Kittleson*, Litz, McIlvaine, and Steffen; Instructors Gillund, Hudson, and Schroeder. Emeritus Professors Baker, Green, and Olson.

The focus of the department is threefold: (1) Foundations of Education at both the undergraduate and graduate levels, (2) Graduate studies in Educational Administration, and (3) Graduate studies in Educational Psychology, Guidance and Counseling.

The Foundations of Education include such topics as educational psychology, educational sociology, plus history and philosophy of education. The intent is to bring to bear upon the problems of contemporary education the contributions of the humanities and the behavioral sciences at both the undergraduate and graduate levels.

Studies in Special Education are within the framework of Educational Psychology and are intended to accommodate students who wish to specialize in teaching children and youth with certain exceptionalities. Students must complete an undergraduate teacher education program leading to certification for either elementary or secondary school teaching. Early planning will permit completion of coursework required for provisional certification in Special Education at the undergraduate level. Permanent certification requires the completion of additional work at the graduate level. The focus of the program is on the preparation of teachers of the mentally retarded at both the elementary and secondary levels with the major emphasis upon the former. In addition, a close working relationship is maintained with the Department of Speech in the preparation of sup-
porting personnel in the area of Speech Pathology and Hearing Conservation.

Graduate studies in Educational Psychology, Guidance and Counseling prepare teachers, researchers, counselors and guidance personnel for schools, colleges and universities. Students may choose coursework emphasizing such dimensions as learning and human development, statistics and measurement, guidance and counseling, student personnel work, and the education of the mentally and emotionally handicapped.

The program in the Educational Administration Area is designed to prepare individuals for positions of leadership at all levels of education and in professional organization and educational agencies. The program provides sufficient breadth and depth to give candidates for advanced degrees ample opportunity to develop essential competencies. A close working relationship is maintained with the Environmental Laboratory, the Center for Community Planning Services, the Computer Center and the College of Architecture in the development of joint programs. Explorations are being made in other areas in which cooperative activities may occur.

\section*{UNDERGRADUATE CREDIT}

405 110. Group Life Seminar. (1) I. Introduction to organized group experience through participation in weekly small group meetings. Study of such questions as effective communication, the function of groups, and human growth through social interaction. Open to selected freshmen and other new students, with consent of instructor.
405 202. Educational Psychology I. (3) I, II, S. Physical, intellectual, emotional, social, and personality development from conception to adulthood; understanding of these phases of development and their importance for education essential as background for those desiring to enter the teaching profession. Pr.: Psych. 110 and sophomore standing.
405 210. Leadership Training Seminar. (2) I. General principles of leadership as applied to small groups. Study of the role of the leader, group processes and interaction, defining group goals, and techniques of observation. Workshop and supervision in small group leadership. Pr.: Sophomore standing and consent of instructor
405 302. Educational Psychology II. (3) I, II, S. The learning process, with special emphasis on abilities and teaching-learning processes, and measurement and evaluation of school learning. Pr.: A \& F 202, junior standing, and admission to Teacher Education.

405 400. Independent Study in Education. (1-3). Selected topics in professional education. Maximum of 3 hrs. applicable toward degree requirements. Pr.: Consent of Department Head.

405 415. Art for Exceptional Children. (Same as Art 415).

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

405 601. Principles and Practices of Guidance. (3) I, II, S. Need and nature of guidance functions; personnel, their duties and relations; programs and evaluation of results. Pr. : C \& I 475 or 477, or consent of instructor.

405 603. Junior High School. (2 or 3) I, alternate S. Origin, objectives, program, and administration of the junior high school, and relations with lower and higher education units. Pr.: Teaching experience.
405 607. Mental Hygiene in the School Community. (3) On sufficient demand. Dynamics creating different personalities and deviant behavior. The educative process as it affects personality integrity. Pr.: Psych. 415 or A \& F 202.
405 608. Education of Exceptional Children. (3) On sufficient demand. A general study of the field of special education, with emphasis on the development and organization of instructional materials; parent education; and coordination of the services of physicians, health departments, welfare agencies, and the school. Included in the study of administration of special services at the national, state, and local levels. Pr.: A \& F 202 and C \& I 300 or 450.
405 609. Psychology of Exceptional Children. (3) (See Psych. 425.) I, II, S. Psychological aspects of the superior, the subnormal, the emotionally disturbed and the physically handicapped child, with attention to early identification and treatment. Pr.: Psych. 415 or A \& F 202.

405 610. Practicum in Education of Exceptional Children. (3-5) On sufficient demand. Observation and participation in teaching exceptional children under the supervision of selected teachers in special education programs. Pr.: Admission to student teaching and senior standing.
405 611. Occupational Information. (2) I, S. A study of the competencies and skills and demands on persons in various occupations, with attention to the collection, evaluation, filing, and use of occupational information. Pr.: Senior standing and consent of instructor.
405 616. Educational Sociology. (3) I, II, S. A study to gain an understanding of the ways in which the school can effectively utilize the social process in developing and educating the individual and to show the interrelationships of such institutions as the family, the church, the playgrounds, and the various youth-serving agencies with the school. Pr.: Senior standing.
405 620. The Junior College. (3) I, II, S. This course is designed to give the student an overview of one of the most rapidly growing units in the American educational system. Emphasis on philosophy, purposes, curriculum, organization, professional staff, student-personnel programs, and the role of the comprehensive community junior college in higher education. Pr.: A \& F 302 and consent of instructor.
405 625. Principles of Measurement. (3) I, II, S. Principles of constructing, administering and evaluating tests used in schools. Pr.: Teaching certificate or senior standing.
405 627. Curriculum Development for the Mentally Retarded. (3) On sufficient demand. Curriculum content,
methods, and organization of work in the education of mentally retarded children using experience units. Pr.: A\&F 608.
405 630. Education of the Disadvantaged. (3) On sufficient demand. Consideration of the life-space of the disadvantaged learner and its relationship to curriculum organization and inter-personal relationships in the schools. The development of realistic, relevant goals for the teacher of the disadvantaged. Pr.: A\&F 616 or consent of instructor. (See A. \& O. 630, and C. \& I. 630.)

405 681. Field Experiences in Special Education. (1-3) On sufficient demand. Observation and supervised activities in schools, camps, clinics, or institutions as related to student's area of special interest or preparation. Pr.: A\&F 608 or A\&F 609.
405 712. Individual Appraisal. (3) I, S. Intensive study of standardized tests and their use. Emphasis given to values and problems of testing, selection and evaluation of measuring instruments, testing programs and interpretation of test results. Pr. : A\&F 601 and A\&F 625.

405 795. Problems in Administration and Foundations. Credit arranged. I, II, S. Selected students are permitted to secure specialized training appropriate to the needs of the individual. The student's project may involve intensive library investigation in a special field or the collection and analysis of data pertinent to a given problem. All work is done independently under the direction of a faculty member. As many conferences are held as necessary to assure successful completion of a project. Pr.: Background of courses necessary for the problem undertaken and consent of instructor.

\section*{GRADUATE CREDIT}

405 800. Statistical Methods in Education. (3) I, S. An introductory yet comprehensive survey of common statistical analyses encountered in educational research. Computer oriented. Pr.: A first course in college mathematics plus either Stat. 520 or A\&F 625.
405 802. Research Methods and Treatment of Data. (3) I, II, S. Principles of research in education; nature, organization, and presentation of research data; basic statistical computations and interpretations; selection of research problems. Pr.: Nine hours of education or consent of instructor.
405 806. Philosophy of Education. (3) I, II, S. A critical analysis of major educational philosophies with discussion of their impact on the problem of education for democracy. Pr.: Twelve hours of education and consent of instructor.
405 807. General School Administration. (3) I, S. A panoramic view of the problems and tasks of schoolsystem administration centered on the administrative process and substantiative problems of leadership, personnel, business and finance, curriculum, facilities, and school-community relations. Pr.: One year of teaching experience.
405 808. School Business and Finance. (3) II, alternate S. Professional preparation primarily for school administrators and persons planning to enter that work including problems of finance, administration, and support of schools at local, state, and federal levels. Pr.: At least one year of teaching experience.

405 812. The School Plant. (3) I, alternate S. Determination and provision of building and other plant needs by the local public school district, including planning, financing, construction, and utilization. Pr.: At least one year of teaching experience.
405 813. School-Public Relations. (2 or 3) I. Interrelationships that exist between the school and the community and the role of the teacher and administrator in such relationships. Pr.: A \& F 807 for graduate students in educational administration. One year of teaching experience for all others.
405 814. Secondary School Administration. (3) I, II, S. Aims and functions of junior and senior high schools and junior colleges; problems in the progress of studies, extra-class activities, pupil accounting, community relations, and articulation with other schools. Pr.: At least one year of teaching experience.
405 817. Organization and Administration of the Guidance Services Program. (2 or 3) I, II, S. Staff, facilities, tools, and techniques of the school and community in an organized guidance program. Pr.: Twelve semester hours in courses required to meet standard counselor qualifications; consent of instructor.
405 818. Practicum in School Administration. (3 to 6) I, II, S. Supervised on-the-job experience in school administration. Pr.: Kansas School Administrator's Certificate or consent of instructor.
405 819. Advanced Education Psychology: Learning. (3) On sufficient demand. The learning process, with special emphasis on human abilities and early and contemporary learning theories, with applications to selected recent developments in teaching and persistent problems and issues in education. Pr.: A \& F 302 or its equivalent.
405 820. Public School Law. (1 or 3) II. The nature of legal responsibilities faced by the public school administrator; resources available to him for solution of legal problems. Designed to develop understanding of the legal base upon which public education is built and controlled. Pr.: A \& F 807 or consent of instructor.
405 821. Guidance in the Elementary School. (3) On sufficient demand. The nature and philosophy of guidance in the elementary school; the function of specialized child appraisal and counseling techniques in the unique interrelationships of the specialist and the teacher in the team approach to elementary school guidance. Pr.: C \& I 475, A \& F 601, and consent of instructor.
405 827. Individual Intelligence Testing. (3) On sufficient demand. Theory of the appraisal of individual intelligence with an emphasis on techniques of administration, interpretation, and application in the school setting; supervised practice and developed proficiency in the use of WAIS, WISC and Binet. Pr.: A \& F 601, Psych. 420 , and consent of instructor.
405 832. Counseling Theory. (3) II, S. Theories, methods, and problems in counseling, relating the counseling process to dynamics of human behavior. Pr.: A \& F 712 or Psych 420 or equivalent and conc. enrollment.
405 833. Group Guidance. (3) II. Designed to acquaint students with group procedures as basic tools in counseling, guidance, and other education services. Pr.: A \& F 832 and Psych. 550.

405 839. Guidance Services Practicum. (2 or 3) I, II, S. Supervised experience in guidance services in secondary schools; preparation and use of pupil personal records, tests, provision, and use of occupational and educational information, counseling, placement and follow-up, and use of school and community personnel and resources. Pr.: or conc.: A \& F 832 and consent of instructor.
405 841. Principles of Student Personnel Administration. (2) On sufficient demand. Principles, administrative organization, procedures, and problems of student personnel work in higher education; a nalysis of policy formation, staff relationships, finance and controls, and physical plant needs; an introduction to the personnel services: health, housing, food, union, placement, counseling, and activities program. Pr.: Graduate standing and consent of instructor.

Seminars in Education. Credit arranged. On suffıcient demand. These seminars will consider research in the several fields of education represented in terms of the special interests of the students. Pr.: Consent of instructor.
405 853. Educational Administration.
405 855. Guidance Services.
405 857. Social Foundations.
405 858. Special Education.
405 863. Practicum in Counseling. (3) I, II. Supervised practical experience in counseling. Pr.: A\&F 832 and consent of instructor. (Same as Psych. 860 and FCD 860).
405 864. Seminar in Student Personnel Work. (1-4) On sufficient demand. Credit arranged. Intensive discussion of a problem of current professional interest based on study of pertinent original literature. May be repeated with consent of supervisory committee. Pr.: Consent of instructor.
405 866. History and Philosophy of Higher Education. (3) I. History and development of higher education with a study of the philosophy, objectives and functions of various types of institutions. Pr.: Consent of instructor. 405 868. International Education. (3) On sufficient demand. Developing, administering, conducting, and evaluating educational programs from a world perspective. Pr.: Teaching experience or consent of instructor.
405 870. Mental Retardation. (3) On sufficient demand. Etiological, psychological, sociological, and educational aspects of mental retardation. Pr. : A \& F 608.
405 877. Social Psychology of Higher Education. (3) I. Considers literature and applications of social psychological studies of the college student, campus cultures, institutional characteristics, and organizational change. Pr.: Consent of instructor.
405 880. Theory of Measurement. (3) II. A course especially useful for graduate students in education planning to use or develop mental measuring instruments in their thesis. Students will learn to design reliable and valid instruments. Pr.: A \& F 625.
405 881. Theory in Educational Administration. (3) II. Organizational and administrative theory are applied to the school and the functions of the school administrator. The process of theory development in educational administration is also considered. Pr.: A \& F 807.

405 882. Strategies for Educational Change. (3) I. This course is designed to provide educators with conceptual knowledge concerning the problems and processes of educational change. Case studies of change are analyzed in the attempt to develop models of educational change. Pr.: A \& F 807 or 817 , or C \& I 809.
405 883. Educational Systems Analysis. (3) I. A study of systems analysis techniques applicable to education including PERT, CPM and PPBS. Intended for administrators, business managers and educational researchers. Pr.: A\&F 807 or consent of instructor.

405 886. Advanced Educational Psychology: Development. (3) II. Advanced studies in physical, intellectual, emotional, social and personality development with the focus on the importance of these factors to the educational process. Pr.: A\&F 302.
405 887. The Principalship. (3) I, alternate summers. Analysis of the principal's role as he interacts with his various referent groups. Applicable to both elementary and secondary administration. Pr.: One year of teaching experience.
405 898. Higher Education Administration. (3) On sufficient demand. Administration theory applied to the organization and administration of colleges and universities; special reference to structure, governing boards, administrative roles, decision making, and analysis of selected problems. Pr.: A\&F 866.

405 904. Experimental Design in Educational Research. (3) II. Philosophy, planning and evaluation or research in education. Experimental designs appropriate for educational research with special emphasis on multivariable procedures. Computer oriented. Pr.: A \& F 800 .
405 910. Counseling Supervision Practicum. (3) On sufficient demand. An advanced course in the theory, techniques and problems of supervising persons being trained as counselors. Course emphasis is on actual supervisory experiences with beginning counselors. Open to advanced doctoral students only with consent of instructor.
405 911. Advanced Counseling Theory and Practice. (36) I, II. Designed to help the student integrate advanced theory, research and practice in counseling and student personnel work. Pr.: Knowledge of personality theory, theories of learning and motivation, A \& F 832 and consent of instructor.

Internship in Education. Credit arranged. On sufficient demand. Studies of and field experiences in the development of programs in cooperating schools and educational or related agencies under the supervision of College of Education graduate faculty members. A maximum of six credit hours may be chosen from the areas listed. Pr.: Consent of instructor.
405 950. Education Administration.
405 951. Student Personnel Services.
Advanced Seminars in Education. (2-3) On sufficient demand. These seminars will critically consider recent research in the designated fields. The emphasis will be upon individual studies and small group interaction. Enrollment is restricted to those students who have
been admitted to the doctoral program in education and who have completed substantial amounts of graduate study in the designated fields. Pr.: Consent of instructor.

405 960. Educational Administration
405 961. Educational Psychology
405 999. Research in Administration and Foundations. Credit arranged. I, II, S. Individual investigation in the field of a student's specialization. Pr.: Sufficient training to carry on the line of research undertaken.

\section*{Adult and Occupational Education}

\section*{robert meisner,* Head of Department}

Professors Agan, * Alford, * Apel* Johnson,* and Prawl;* Associate Professors Albracht,* Bradley,* Griffith, Meisner, and Scott;" Assistant Professor Campbell;* Instructors Erpelding, Rumbaugh, and Wissman; Emeritus: Professor Rust;* Associate Professor Hall. \({ }^{*}\)

The programs in the Adult and Occupational Education area are designed for selected individuals who wish to prepare themselves as professional educators in public and private institutions and agencies.

Programs in the Department of Adult and Occupational Education are designed to: (1) prepare students for teaching and allied positions in Adult Education, Vocational Education in Agriculture and Home Economics, Occupations Education, and related fields, (2) serve those employed in public and private Adult and Occupational Education Programs, and (3) provide graduate courses for those seeking advanced degrees.

\section*{Courses in Adult and Occupational Education}

\section*{UNDERGRADUATE CREDIT}

410 319. Agricultural Education Colloquium. Credit arranged. On sufficient demand. Discussion, assigned readings, and lectures over the selected trends, developments, and problems which are peculiar to the overall field of agricultural education in Kansas. Developments in new legislation, techniques, and philosophies are discussed and applied. Students are encouraged to engage in self study concerning their place in the profession of Agricultural Education.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

410 401. Independent Study in Education. (1-3). Selected topics in professional education. Maximum of 3 hrs. applicable toward degree requirements. Pr.: Consent of Department Head.
410 485. Practicum in Extension. (5) S. Two months' experience. Application for Admission: Cooperative Extension Service, during Spring Semester. Pr.: Junior standing and consent of instructor.

410 500. Methods of Teaching Agriculture. (3) I, II. Lesson plans; organization of materials and direction of class, laboratory and field instruction work in vocational agriculture; individual farming programs and class and group activities; coordination of farm mechanics work; administration, organization, and coordination of the Future Farmers of America organization with the program of instruction in vocational agriculture. Pr.: A \& F 302.
410 550. Methods of Teaching Home Economics. (2) I, II. Selection of techniques: organization, preparation, and presentation of materials for teaching secondary programs. One hour rec. and two hours lab. a week. Pr. Junior standing; C \& I 450 ór conc. enrollment; taken semester prior to C \& I 477.
410 551. Methods of Teaching for Dietetic Students. (3) I. Principles of teaching applied to selection, organization, and development of subject matter for individuals and courses taught by dietitians. Pr.: Senior standing in Institutional Management and Dietetics.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

410 605. Organization and Programs in Adult Education. (3) I, S. Development and objectives of University Adult Education programs; namely Cooperative Extension, Academic and Industrial Extension and Continuing Education with emphasis on programs and procedures. Pr.: Senior standing or consent of instructor.
410 630. Education of the Disadvantaged. On sufficient demand. Consideration of the life-space of the disadvantaged learner and its relationship to curriculum, organization and inter-personal relationships in schools. The development of realistic, relevant goals for the teacher of the disadvantaged. Pr.: 405616 or consent of instructor. (See A. \& F. 630, and C. \& I. 630).
410 700. Seminar in Agricultural Education. Credit arranged. On sufficient demand. Seminars will consist of problems in the several fields of agricultural education represented in terms of special interests of the students. Designed to serve undergraduate as well as graduate needs. Pr.: Consent of instructor.
410 701. Administration and Supervision of Vocational Education. (2) Offered on sufficient demand. Objectives, curriculum organization and content, administrative and supervisory problems from the viewpoint of the city superintendent; leadership needs which must be met in a school system which offers vocational education. Problem basis of treatment is used. Pr. : C \& I 450 and one year of teaching experience.
410 702. Vocational Education. (3) I, II, S. Provision for vocational education in Kansas and other states and countries; principles underlying such education; relation of vocational education to the community, county, state, and nation. Pr.: A \& F 302.
410 703. Teaching Adult Classes in Agriculture. (2 or 3) Offered on sufficient demand. Organization and preparation of materials, and methods used in teaching adult classes in vocational education in agriculture for young farmers and adults. Departments are visited for evaluation of programs and results. Pr.: A \& O 702.
410 705. Organization Problems in Teaching Farm Mechanics. (2) Offered on sufficient demand. Analysis of the farm mechanics course of study; needs and interests
of boys; learning difficulties; skills and technical knowledge required; correlation with agriculture; application of laws of learning to the teaching process; determination of objectives. Pr.: C \& I 477.
410 706. Field Experience in Agricultural Education. (1 or 2) Offered on sufficient demand. A course designed for prospective teachers to help bridge the gap between classroom theory and student teaching. Emphasis will be placed on observation of and participation in school and community organizations and programs. Pr.: A \& 0702 and consent of instructor.
410 711. Consumer Education. (2 or 3) S. Evaluate syllabi and approaches to teaching consumer education. Relate consumer education to consumer economics and consumer affairs. Pr.: A \& O 550 or A \& O 752 and F. Ec. 300 or consent of instructor. (See F. Ec. 711).
410 750. Curriculum in Home Economics. (3) I, II, S. Philosophy and principles of home economics education; development of guides for teaching and evaluating reimbursable secondary programs. Pr.: C \& I 450.
410 751. Methods in Adult Homemaking Classes. (1 to 3) S. Principles of teaching applied to adult classes; a demonstration class in one or more phases of homemaking. Pr.: A \& O 550 or equiv.
410 752. Methods of Adult Teaching. (3) II, S. Recommended methods of adult teaching; application to various adult education programs. Pr.: senior standing, juniors by consent of instructor.
410 753. Introduction to Occupational Education. (3) I, II, S. Overview of occupational education at all levels and its role in society. Designed for administrators, counselors, and vocational educators who perform a leadership function involving occupational education programs. Pr.: Teaching experience or consent of instructor.
410 754. Adult Basic Education. (3) I, II, S. Evolving adult basic and high school equivalency education concepts will be examined. Program implementation, supervision, methods and materials are emphasized. Pr.: Adult teaching experience or consent of instructor.
410 791. Occupations Education. (2-3) I, II, S. Emphasis on providing for prevocational experiences including orientation and exploratory and applied experiences in school and nonschool situations. Pr.: Teaching experience or consent of instructor.
410 792. Hospital and Industry Adult Education. (3) Offered on sufficient demand. An introduction to principles, roles, organization, procedures and problems of adult education in hospitals, industry and related agencies. Pr.: Consent of instructor.
410 795. Problems in Adult and Occupational Education. Credit arranged. I, II, S. Independent study of specific problems in the areas of adult or occupational education. Pr.: Consent of instructor.

\section*{GRADUATE CREDIT}

410 805. Program Planning in Adult Education. (2-3) II, S. An examination of the basic situations in which adult education occurs and fundamental steps by which learning is made more effective in those situations. Pr.: Graduate standing.
410 816. Adult Education. (2-3). Offered on sufficient demand. A study of Adult Education historical perspectives, contemporary institutions and programs,
teaching-learning process, administrative practices, and conceptual roles. Pr.: One year of field experience or approval of instructor.
410 822. Young Farmer and Adult Farmer Education in Agriculture. (2 or 3) I, II, S. Organization, objectives, and procedures of conducting Young Farmer and Adult Farmer classes. Designed for teachers in service. Pr.: Experience in teaching vocational agriculture.
410 823. Agricultural Education for Beginning Teachers. (1 to 3) S. Securing and organizing information and planning teaching activities which will help the beginning vocational agriculture teacher. Pr.: Graduation from the Curriculum in Agricultural Education.
410 824. Curriculum in Agriculture I. (2 or 3) S. Curriculum problems; planning local programs in agriculture; developing facilities and plans for meeting current and advanced problems in the teaching of agriculture. Pr.: One year of teaching in agriculture.
410 825. Curriculum in Agriculture II. (2 or 3) S. Cont. of A \& O 824. Pr.: A \& O 824 or consent of instructor.
410 829. Supervision in Occupational Education. (2-3). I, S. Philosophy and principles of effective supervision related to occupational education programs; application of principles to problems met by student teacher supervisors. Pr.: Teaching experience or consent of instructor.
410 830. Trends in Home Economics Teaching. Credit arranged. I, II, S. Advanced study of evolving trends and materials for secondary programs; application to teaching and curriculum. Pr.: A \& O 750 and teaching experience.
410 836. Field Studies in Agricultural Education. (2 or 3) On sufficient demand. Planning, organizing, and coordinating the various phases of the local program of vocational education in agriculture. Pr.: Experience in teaching agriculture or consent of instructor.
410 837. Seminar in Home Economics Education. Credit arranged. II, S. Critical analysis of selected issues in home economics education. May be taken more than one semester with consent of advisory committee. Pr.: Teaching experience.
410 838. Research in Organization and Presentation of Home Economics. Credit arranged. I, II, S. Individual research problems in phases of organization and administration of home economics. May be chosen as the basis for thesis for the master's degree. The nature of the problem will depend upon the student's major interest. 410 840. Occupational Home Economics Education. Credit arranged. I, II, S. Development of curriculums and teaching materials pertinent to the programs for job training in home and community service occupation. Pr.: Teaching experience.

Seminars in Education. Credit arranged. On sufficient demand. These seminars will consider research in the several fields of education represented in terms of the special interests of the students. Pr.: Consent of instructor.
410 851. Agricultural Education.
410 859. Adult Education.
410 871. Occupational Experience Supervision. (3) II, S. Analysis of objectives and scope of occupational experience programs. Emphasis is placed on the
organization, administration, related instructional procedures, coordination techniques, and evaluation of occupational experience programs. Pr.: Teaching experience, or consent of instructor.
410 878. Technical Education. (3) I, S. An analysis of the evolving role of technical education and other postsecondary occupational education with emphasis upon principles underlying organization and practice unique to technical education. Pr.: Graduate standing.
410 879. Manpower Surveys. (3) II, S. A critical study of methods and procedures involved in planning, organizing, conducting, and analyzing community and regional manpower surveys. Application to particular fields of occupational education will be stressed. Pr.: Graduate standing.
410 890. Organization and Administration of Adult Education. (2-3) I, S. A critical study of organizational procedures and administrative practices as related to the implementation and maintenance of an effective program in adult education. Pr.: Graduate standing.
410 891. Organization and Administration of Occupational Education. (2-3) I, S. An overview of the organization of occupational education programs in agriculture, business, distributive education, health, home economics, trade and industry, technical and related fields and their administration. Emphasis on federal-state-local relationships. Pr.: A \& O 753 or consent of instructor.
Internship in Education. Credit arranged. On sufficient demand. Studies of and field experiences in the development of programs in cooperating schools and educational or related agencies under the supervision of College of Education graduate faculty members. A maximum of six credit hours may be chosen from the areas listed. Pr.: Consent of instructor.
410 952. Adult Education.
410 953. Occupational Education.
Advanced Seminars in Education. (2-3). On sufficient demand. These seminars will critically consider recent research in the designated fields. The emphasis will be upon individual studies and small group interaction. Enrollment is restricted to those students who have been admitted to the doctoral program in education and who have completed substantial amounts of graduate study in the designated fields. Pr.: Consent of instructor.
410 962. Adult Education
410963 . Occupational Education
410 999. Research in Adult and Occupational Education. Credit arranged. I, II, S. Pr.: Sufficient training to carry on the line of research undertaken and consent of instructor.

\section*{Curriculum and Instruction}

ARNOLD J. MOORE, Head of Department
Professors Dixon,* Keys,* and Littrell;* Associate Professors Bartel," Boyer, Hause," Kurtz*, McAnarney," Owens," Price," Schell,* Trennepohl,* and Utsey;* Assistant Professors Byars* Caine,* Craig, Dickinson, James," King," Loeb," Paul, and Smethers; Instructors Clore, Driss, Hazlett, Kaupp, Replogle, and Sullivan; Emeritus: Professor Strickland.

An important responsibility of this department is the undergraduate teacher education programs at Kansas State. The course offerings in the professional studies components of both the elementary and secondary teacher preparation programs are under the jurisdiction of the Curriculum and Instruction Department. However, the educational psychology and social foundation courses are listed in the Administration and Foundations Department. The specific dimensions of these curricula are delineated under the section, Programs in Teacher Education.
Graduate study in this department includes courses designed to improve the instructional competence of teachers in elementary and secondary schools, and in colleges. Generally, students working on a Master's Degree concentrate on courses designed to increase their effectiveness as classroom teachers. Doctoral programs in this area are aimed at the preparation of instructional leaders, supervisory personnel, curriculum specialists, generalists for elementary and secondary schools, and teacher education personnel in colleges and universities. Another very important function of this area will be to provide joint programs involving selected departments in other colleges at Kansas State University. These joint programs will prepare individuals for teaching positions in junior and four-year colleges. Examples of cooperative programs are those currently being offered with the mathematics and physics departments.

\section*{UNDERGRADUATE CREDIT}

415 050. Developmental Reading Laboratory. (3) I, II. Designed to improve the college student's reading skills, rates of comprehension, vocabulary, and study skills. Pr.: Consent of instructor.
415 300. Principles of Elementary Education. (3) I, II, S. An over-all view of the elementary school: organization, management, purpose, curriculum trends, and pupil characteristics. Pr.: Junior standing.

415 316. Introduction to Instructional Media. (1) I, II, S. Experiences in the choice, production, evaluation, and utilization of instructional materials. Operation and simple maintenance of basic types of instructional equipment. Pr.: Admission to teacher education or consent of instructor.
415 325. Safety. (3) I, II, S. Fundamentals of accident analysis and prevention, maintenance, human factors, safety standards, treatment of special hazards. Three hours rec. a week. Pr.: Junior standing.
415 326. Problem in Safety Education. (1) Pr.: Consent of instructor.
415 328. Driver and Traffic Safety Education I. (3) I, S. Critical analysis of traffic accidents, attitude factors, essential knowledge of automobile operation, traffic laws and regulations. Includes laboratory experience in the use of psychophysical testing and in the teaching of driving skills. Two hours rec. and three hours lab. a week. Pr.: Psychology 110, A \& F 202, C \& I 325, a valid driver's license, and good driving record.
415 329. Problem in Driver Education. (1) Pr.: Consent of instructor.
415 330. Driver and Traffic Safety Education II. (3) II, S. This course deals with professional preparation for secondary school instruction in this field. Primary areas of study include classroom and in-car teaching techniques. A study of organization and administration of driver education: emphasis on competence in transforming knowledge and skills, as well as inspiring satisfactory attitude in students. Two hours rec. and three hours lab. a week. Pr.: C \& I 328, 21 years of age, and senior standing.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

415 402. Independent Study in Education. (1-3). Selected topics in professional education. Maximum of 3 hrs. applicable toward degree requirements. Pr.: Consent of Department Head.
415 415. Art for Exceptional Children. (Same as Art 415).

415 417. Teaching Participation in Elementary Music. (4) I, II. Observation in teaching under the direction of selected teachers in elementary music school programs. Pr.: Music 412 and admission to Student Teaching.
415 418. Teaching Participation in Secondary Music. (4) I, II. Observation in teaching under the direction of selected music teachers in junior and senior high schools. Pr.: Music 413 and admission to Student Teaching.
415 450. Principles of Secondary Education. (3) I, II, S. Junior and senior high school organization and objectives, their genesis and curriculum trends, characteristics of student population, and legal status and practices. Pr.: A \& F 302.
415 451. Principles of Secondary Education. (3) I, II (Professional Semester). For description see C \& I 405.
415 461. School Music I. (3) I, II, S. (See Music 412).
415 462. School Music II. (3) I, II, S. (See Music 413).
415 470. Science for Elementary Schools. (3) I, II, S. The relationships among nature, environment and elementary science in their role in childhood education resources and activities suitable to the elementary school. Pr.: Admission to Teacher Education or consent of instructor.

415 471. Language Arts for Elementary Schools. (3) I, II, S Modern trends in the teaching of reading, oral language, composition, and spelling. Pr.: Admission in Teacher Education or consent of instructor.
415 472. Social Studies for Elementary Schools. (3) I, II, S. Course of study content as a basis for consideration for modern classroom procedure; objectives and problems in the teaching of social studies. Pr.: Admission to Teacher Education or consent of instructor.
415 473. Mathematics for Elementary Schools. (3) I, II, \(S\). The teaching of mathematics in the elementary schools, including the nature of mathematical processes, curriculum, methods of instruction, instructional materials, and the evaluation of outcomes. Pr.: Admission to Teacher Education or consent of instructor. 415 474. Elementary School Reading. (3) I, II, S. An introductory course in the content, methods, and materials of the total reading program in the elementary school. Pr.: Admission to Teacher Education or consent of instructor.
415 475. Teaching Participation in the Elementary School. Credit arranged. I, II. Observation and teaching participation under the direction of selected elementary teachers. Pr.: C \& I 300, 470, 471, 472, 473, and admission to Student Teaching.
415 476. Methods of Teaching in the Secondary School. (2 or 3) I, II. General principles of teaching applied to secondary school instruction; motivation, organization of subject matter; lesson planning; evaluation and reporting; challenging the levels of ability; organization and management of the classroom; attention given to both methodology and materials of the secondary schools. Pr.: Admission to Student Teaching.
415 477. Teaching Participation in the Secondary School. Credit arranged. I, II. Observation and teaching participation under direction of selected teachers in junior and senior high schools. Pr.: Admission to Student Teaching.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

415 602. Audio-Visual Instruction. (2 or 3) I, II, S. Principles and techniques in the use of visual and audiovisual materials; operation and maintenance of equipment and sources of supply. Pr.: Completion of student teaching or graduate standing.
415 604. Extra-Class Activities. (3) II, S. Organization, sponsorship, and objectives of clubs, publications, athletics, dramatics, musical organizations, assemblies, home room, and student council in junior and senior schools. Pr.: C \& I 450, senior standing, or consent of instructor.
415 615. Reading in the Secondary School Subjects. Information concerning the reading process. Techniques for helping students develop reading and study skills needed for studying materials used in the secondary school subjects. Course is designed for classroom teachers. Pr.: Senior standing and consent of instructor. 415 621. Junior College Curriculum. (3) I, II, S. Evaluation of Junior College curricula, reasons for revision, aims and objectives. Designed to familiarize students with the entire curricular offerings of the comprehensive community junior college. Pr.: 405620 and-or consent of instructor.

415 630. Education of the Disadvantaged. On sufficient demand. Consideration of the life-space of the disadvantaged learner and its relationship to curriculum, organization and inter-personal relationships in schools. The development of realistic, relevant goals for the teacher of the disadvantaged. Pr.: 405616 or consent of instructor. (See A. \& F. 630, and A. \& O. 630.)
415 662. Instructional Television. (3) On sufficient demand. The principles of instructional television: its development, pregramming, techniques, and application. Pr.: Junior standing and consent of instructor. (See Speech 662).
415 680. Kindergarten Education. (3) S. A specialized study of the kindergarten in the American school: methods and materials for working with the kindergarten child, including communication and explanation skills and readiness for reading. Pr.: A \& F 202, C \& I 300 and junior standing.
415 735. Improving Elementary Science Teaching. (3) I, II. Evaluation and implementation of psychological and philosophical foundations will be stressed in improving elementary science teaching. Recent materials will be compared and their unique and common elements examined. Pr.: Teaching experience and-or consent of instructor.
415 795. Problems in Curriculum and Instruction. Credit arranged. I, II, S. Independent study of a specific problem in curriculum or instruction. Pr.: Consent of instructor.

\section*{GRADUATE CREDIT}

415 803. Curriculum Development. (3) I, II, S. An overall view of the entire school curriculum, patterns of organization, outlining of instructional fields, and specific helps in curriculum development for administrators and classroom teachers. Pr.: Twelve hours of education or consent of instructor.
415 804. Curriculum Construction for Secondary Schools. (2 or 3) On sufficient demand. Procedures for organizing and conducting programs for curriculum improvement in the secondary schools; techniques for the development and evaluation of curriculum materials. Opportunity is provided for work on individual curriculum problems. Pr.: C \& I 803 and teaching experience.
415 809. Supervision and Improvement of Instruction. (3) S. A course designed for administrators, supervisors, and classroom teachers who wish to help themselves and others isolate and analyze teaching problems. Pr.: One year of teaching experience.
415 811. Curriculum Construction for Elementary Schools. (2 or 3) On sufficient demand. Procedures for organizing and conducting programs for curriculum improvement in the elementary schools; techniques for the development and evaluation of curriculum materials. Opportunity is provided for work on individual curricular problems. Pr.: C \& I 803 and teaching experience.
415 815. Educational Media Programs. (3) On sufficient demand. Organization, administration, and evaluation of educational media service programs, with emphasis on the provision of services, materials, equipment, facilities, staff and financial resources essential in support of modern instructional programs. Includes studies of programs in varying sizes and types of
educational institutions. Pr.: C \& I 602 or consent of instructor.
415 835. Supervision of Student Teaching. (3) On sufficient demand. Organization and functions of student teaching programs; orienting, supervising, and evaluating student teachers in elementary and secondary schools. Pr.: Teaching experience and consent of instructor.
415 842. Directed Professional Development. (5) I, II. Research and teaching under supervision in the secondary school. Open only to outstanding liberal arts graduates enrolled in the special program for the professional preparation of such graduates for teaching in critical areas in secondary schools. Pr.: Registration in Graduate School and consent of instructor.
415 843. Principles of College Teaching. (2) I, II. Overview of principles of learning, learning theory, educational objectives, methods and techniques, college students and evaluation in the classroom. Emphasis upon pre-service and in-service help in improving instruction at the college level. Pr.: Consent of instructor.
415 844. Current Issues in College Teaching. (2) II. Attention given to objectives, problems and evaluation of college instruction, purpose of the university, creative teaching, student involvement and unrest, and current issues. Individual study of special interest topics. Pr.: 415 843 and consent of instructor.
415 845. Advanced Elementary School Reading. (3) On sufficient demand. A study and evaluation of selected theories, programs, practices, and materials, K-6, emphasizing current trends, issues, and problems. Pr.: C \& I 474 or consent of instructor.
415 846. Diagnosis and Treatment of Reading Disabilities. (3 or 4) I, S. A systematic study of the causes of reading problems, the use and interpretation of diagnostic instruments and procedures, and special materials and methods of remedial instruction. Includes diagnosis of a child with a reading problem. Pr.: C \& I 615 or 485 and teaching experience or consent of instructor. 415 847. Clinical Practices in Reading. (3) II, S. Supervised experience in diagnosing and teaching children with reading problems. Pr.: C \& I 846 (Diagnosis and Correction of Reading Disabilities).
415 848. Organization and Administration of Reading Programs. (2) II, S. An investigation of several topics of special interest to educators responsible for developing a total reading program, K-12, with special attention to the remedial reading program. Pr.: C \& I 615 or 845 or consent of instructor.
415 850. Individualized Instructional Programs. (3) On sufficient demand. A study of the rationale, procedures, techniques, and materials which are appropriate and necessary to individualizing instructional programs. Particular emphasis given to organizational structure, curriculum, and administration of non-graded, multigraded, and multi-tracked programs. Pr.: Teaching experience or consent of instructor.

Seminars in Education. Credit arranged. On sufficient demand. These seminars will consider research in the several fields of education represented in terms of the special interests of the students. Pr.: Consent of instructor.
415 852. Curriculum and Improvement of Instruction.
415 854. Elementary Education.
415 856. Secondary Education.

415 860. Trends in Elementary School Language Arts. (3) On sufficient demand. An analysis of current methods, issues, and trends in teaching, speaking, listening, and writing through the study of significant literature and research findings. Pr.: Teaching experience or consent of instructor.
415 861. Contemporary Mathematics Education in the Elementary School. (3) On sufficient demand. Advanced study of selected topics in elementary school mathematics emphasizing new programs, trends, controversial topics, and new recommendations for persistent problems; findings of recent research stressed. Pr.: Teaching experience or consent of instructor.
415 862. Creativity in Education. (3) II, S. Clarification of creativity in education, discovery of creative talent, methods of encouraging creative talent; emphasis on learning models and research in creativity as compared with or contrasted with conformity; emphasis on divergent and convergent thinking and its role in creative teaching with major consideration given to the student's involvement in creative study and-or teaching. Pr.: Teaching experience or consent of instructor.
415 865. Planning and Developing Instructional Materials. (3) On sufficient demand. The principles and processes involved in planning and producing instructional materials, ranging from the preparation of simple graphic and photographic materials to computerassisted programmed instruction. Pr.: C \& I 602 or consent of instructor.
415 867. Trends in Elementary School Social Studies. (3) On sufficient demand. Current methods, materials, issues, and trends in developing social consciousness among elementary school children. Social science strategies usable by children. Pr.: Teaching experience or consent of instructor.
415 869. Internship in College Teaching. (2-6). On sufficient demand. An experiential course for graduate students devoted to improving instruction. Supervised teaching of college classes and seminars in conjunction with cooperating departments. Pr.: Master's degree, C \& I 844, and consent of department head.
415 872. Advanced Study of the Reading Process. (3) Survey of selected theories of the reading process. Investigation of the interrelationships of the reading act: cognitive processes; language; social-emotional factors and experience. Emphasis upon recent developments in the field. Pr.: C \& I 845, C \& I 615, or consent of instructor.
415 873. The Science Curriculum. (3) On sufficient demand. National curriculum programs and projects at both elementary and secondary levels. Evaluation of appropriateness of content as it relates to a philosophy of science education. Modes for investigating scientific phenomena and their subsequent use in teaching the processes of the scientists. Pr.: C \& I 803 and consent of instructor.

415 874. The Mathematics Curriculum. (3) On sufficient demand. Trends in the teaching and supervision of mathematics. Analysis of literature and research relating to content, methods, and materials of mathematics education. Pr.: C \& I 803, experience teaching mathematics, and consent of instructor.
415 875. The English Curriculum. (3) On sufficient demand. The changing scene in the teaching of English: trends, materials, and ideas in literature, composition and grammar that have emerged from recent research and discovery. Pr.: C \& I 803 and consent of instructor. 415 876. The Social Studies Curriculum in the Secondary School. (3) On sufficient demand. New trends, materials, and ideas in teaching the social sciences, based on recent research and experimental programs. Pr. : C \& I 803 and-or consent of the instructor.
415 884. Computer Applications in Education. (3) On sufficient demand. The effects of information retrieval systems, data processing, and computer assisted instruction on the curriculum, instruction, and administration of educational institutions. Pr.: Educational experience and the consent of the instructor.
415 907. Curriculum Theory. (3) On sufficient demand. Theoretical concepts underlying significant curriculum developments. A systematic critique of current curricular theory. Consideration of model generation. Pr. : C \& I 804 or 811 and consent of instructor.

415 908. Instructional Theory. (3) On sufficient demand. Comprehensive analysis of research on the teaching process. Theoretical models for understanding teacher-pupil interaction. The design of studies on factors affecting teacher behavior and classroom learning. Pr.: C \& I 809, A \& F 819, and consent of instructor.
415 919. Seminar in Curriculum Development. Credit arranged. On sufficient demand. Designed for curriculum specialists. Current research and curricular innovations. Evaluation of instructional materials and curricular organization for classroom implementation. Experiences in using selected materials and the development of teaching strategies. Pr.: C \& I 804 and 811 and consent of instructor.
Internship in Education. Credit arranged. On sufficient demand. Studies of and field experiences in the development of programs in cooperating schools and educational or related agencies under the supervision of College of Education graduate faculty members. A maximum of six credit hours may be chosen from the areas listed. Pr.: Consent of instructor.
415 954. Curriculum Development.
415 955. Improvement of Instruction.
415 999. Research in Curriculum and Instruction. Credit arranged. I, II, S. Pr.: A \& F 800 and-or consent of instructor.


\title{
THE COLLEGE OF ENGINEERING
}

\author{
RALPH G. NEVINS, Dean
}

CECIL H. BEST, Associate Dean
KENNETH K. GOWDY, Assistant Dean

A course of study leading to a degree in the College of Engineering provides a wellrounded university education designed to develop the general qualities of leadership and human understanding inherent to an educated person.

In addition it equips the student with a broad theoretical background to meet the new and demanding problems of our rapidly expanding technology. To assure the continued economic and technologic development of this nation, an increasing number of high school students should select careers in this challenging profession.

In the College of Engineering at KSU an outstanding faculty combines with excellent physical facilities to provide a stimulating environment in which to prepare for a professional career.

The College of Engineering offers the Bachelor of Science degree in each of the following curriculums:

> Agricultural Engineering - curriculum on page 199. Chemical Engineering - curriculum on page 199.
> Civil Engineering - curriculum on page 200.
> Electrical Engineering - curriculum on page 200 .
> Industrial Engineering - curriculum on page 201 .
> Mechanical Engineering - curriculum on page 202 .
> Nuclear Engineering - curriculum on page 202.

A general description of each of these curriculums, including a list of the faculty and departmental course offerings, is presented on pages 204 through 225 . Also included in this section is a summary of the graduate program of each department. The

Master of Science degree is granted by the Applied Mechanics Department and in each of the preceding areas listed for the Bachelor of Science degree.

To round out the graduate program in the College of Engineering, the Doctor of Philosophy degree is offered in six departments: Applied Mechanics, Chemical Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering and Nuclear Engineering. Additional information on the graduate program is included in the section on the Graduate School, page 257.

\section*{Undesignated Major}

Entering freshmen who are undecided as to a major in engineering may enroll in General Engineering for one year. They will take the following program of study which is completely applicable to all engineering programs.
\begin{tabular}{|c|c|c|c|c|}
\hline Fall Semester & & & Course & Sem. Hrs. \\
\hline English & 229 & 100 & English Composition I & \\
\hline Chemistry & 221 & 210 & Chemistry I ..... & \\
\hline Mathematics & 245 & 220 & Anal. Geometry \& Calc & lus 1 \\
\hline General Engineering & 500 & 160 & Engineering Concepts Hum. or Soc. Sci. Elect &  \\
\hline Physical Education & & & Basic Physical Educat & \\
\hline General Engineering & 500 & 110 & Engineering Lectures & \[
0
\] \\
\hline Spring Semester & & & & \\
\hline & & & Course & em.Hrs. \\
\hline English & 229 & 120 & English Composition II & \\
\hline Chemistry & 221 & 230 & Chemistry 11 & \\
\hline Mathematics & 245 & 221 & Anal. Geometry \& Calc & lus 11 \\
\hline Economics & 225 & 110 & Economics I ......... & \\
\hline & & & Hum. or Soc. Sci. Elect & \\
\hline Physical Education & & & Basic Physical Educatio & \\
\hline General Engineering & 500 & 115 & Engineering Assembly & . . . . . 0 \\
\hline
\end{tabular}

\section*{Engineering Honors Program}

The Honors Program in the College of Engineering offers the interested student an intellectual challenge consistent with his ability and interests. Entering engineering freshmen with high school averages or entrance examination scores within the top five percent will be invited to join the program. Transfer students with superior academic records also are eligible and will be invited to join the Honors Program. Sophomores and other upperclassmen enrolled in engineering who have not previously qualified for the Honors Program may, with the endorsement of a member of the engineering faculty and the approval of the Engineering College Honors Committee, join the program.

The Engineering College has approved the implementation of an experimental program encouraging the development of individual programs for students qualifying for the Honors Program. Such programs will be developed between an individual student and a faculty member of that student's department. Engineering faculty will be encouraged to seek out honor students and with them develop programs of study that will meet the student's academic and professional interests. The academic programs developed must be approved only by the student's department chairman and the Engineering Dean's Office.

Participation in the Honors Program will not shorten the time required for graduation for most students, but should be a stimulating experience. In addition to enrolling in Honors sections in much of his coursework, the student may enroll in a variety of seminars, colloquia and research problems designed to enrich and challenge the interested student. The Honors Program in Engineering is closely integrated with the Honors Program of the other Colleges at KSU and provides an excellent opportunity for interdisciplinary study. A student in the Honors Program may elect to withdraw from the program at anytime at his option.

\section*{Cooperative Education Program}

The College of Engineering, through its Cooperative Education Program, offers students in engineering an opportunity to obtain practical industrial experience as an
integral part of their formal education. The future engineers participate in pairs, alternating semesters in work and study. While one student is a full-time employee in industry, the other studies in his chosen professional engineering field. Participants are selected from students who are progressing satisfactorily toward a degree and have completed at least one semester in their chosen curriculum.

\section*{Summer School}

Many of the courses appearing in the engineering curriculums, not only those which are offered in the College of Engineering but also in the College of Arts and Sciences, may be taken during the summer term.
High school seniors, who have had insufficient mathematics to enroll in Analytic Geometry and Calculus I, are urged to investigate the possibility of summer school to remove this mathematics deficiency. College Algebra and Plane Trigonometry are offered during the summer sessions and provide an excellent transition from high school mathematics into the engineering curriculum.

Information concerning the courses offered is contained in the Summer School Catalog, which may be obtained from the Director of Admissions of the University.

\section*{Center for Effective Teaching}

The College of Engineering Center for Effective Teaching is organized to further the college's goal of excellence in teaching. The center sponsors several programs to enhance teaching, including specialized training for young engineering educators, seminars in educational methods and techniques for all engineering faculty, student evaluation of undergraduate teaching and monetary awards for excellence in teaching. The center is funded by private endowment and also helps in the financing of specialized teaching aids, teaching reference materials and educational research.
The center's activities are coordinated by an advisory committee of students and faculty from the College of Engineering.

\section*{Curriculum in Agricultural Engineering}
B.S. in Agricultural Engineering

\section*{FRESHMAN \\ Fall Semester}

English
Chemistry
Mathematics
Mech. E
Ag. E
Physical Education
General E .

\section*{Spring Semester \\ English \\ Chemistry \\ Mathematics \\ Economics \\ Physical Education \\ SOPHOMORE \\ Fall Semester \\ Mathematics
Physics
Biology
Applied Mech.}
\begin{tabular}{ll}
245 & 222 \\
265 & 310 \\
215 & 198 \\
510 & 305
\end{tabular}
\begin{tabular}{|c|c|}
\hline urse & ester Hour \\
\hline \multicolumn{2}{|l|}{\multirow[t]{4}{*}{\begin{tabular}{l}
Anal. Geometry \& Calculus III Engineering Physics I \\
Principles of Biology
\end{tabular}}} \\
\hline & \\
\hline & \\
\hline & \\
\hline
\end{tabular}


JUNIOR
Fall Semester
Ag. E .
Mech. E.
E.E.

Speech
Applied Mech


\section*{Fall Semester}


Number of hours required for graduation \(131^{\ldots-}\)
-Humanities and Social Science Electives are to be selected from the list on page 203 and need not be taken in the order listed in the curriculum.
"To be chosen with the advice and approval of the faculty adviser and department head
... Any male student is allowed to apply at least four (4) hours of Basic ROTC credit toward his degree without being required to take more credits ROT Credit toward his degree

\section*{Curriculum in Chemical Engineering}
B.S. in Chemical Engineering
Fall semester
\begin{tabular}{|c|c|c|c|c|}
\hline & & & Course & Sem. Hrs. \\
\hline English & 229 & 100 & English Composition I & 3 \\
\hline Chemistry & 221 & 210 & Chemistry I & 5 \\
\hline Mathematics & 245 & 220 & Anal. Geometry \& Calc & lus \(1 . .4\) \\
\hline Economics & 225 & 110 & Economics & ..... 3 \\
\hline Speech & 281 & 105 & Oral Communication I & 2 \\
\hline Physical Education & & & Basic Physical Educat & n .... 0 \\
\hline General Engineering & 500 & 110 & Engineering Lectures & 0 \\
\hline & & & & 17 \\
\hline Spring Semester & & & & \\
\hline & & & Course & Sem.Hrs. \\
\hline English & 229 & 120 & English Composition II & 3 \\
\hline Chemistry & 221 & 230 & Chemistry II & 3 \\
\hline Chemistry & 221 & 271 & Chemical Analysis & 4 \\
\hline Mathematics & 245 & 221 & Anal. Geometry \& Calculu & lus 11. 4 \\
\hline & & & Elective* & 3 \\
\hline Physical Education & & & Basic Physical Education & n ..... 0 \\
\hline Ch. E. & 520 & 115 & Engineering Assembly & - 0 \\
\hline
\end{tabular}
SOPHOMORE
Fall Semester
\begin{tabular}{|c|c|c|c|}
\hline & & & Course Sem. Hrs. \\
\hline Mathematics & 245 & 222 & Anal. Geometry \& Calculus III 4 \\
\hline Physics & 265 & 310 & Engineering Physics I ........ 5 \\
\hline Chemistry & 221 & 431 & Organic Chemistry I .......... 3 \\
\hline Chemistry & 221 & 432 & Organic Chemistry I Lab. ..... \(\quad 2\)
Elective \\
\hline Ch E. & 520 & 115 & Engineering Assembly ....... 0 \\
\hline
\end{tabular}

JUNIOR

\begin{tabular}{|c|c|c|c|c|}
\hline \multirow[t]{2}{*}{Spring Semester} & \multicolumn{2}{|r|}{\multirow[t]{2}{*}{-}} & & \\
\hline & & & Course & Sem.Hrs. \\
\hline Chemistry & 221 & 595 & Physical Chemistry II & 3 \\
\hline Ch. E. & 520 & 430 & Transport Phenomena & 5 \\
\hline Ch. E & 520 & 422 & Chem. Engg. Lab. I ... & 2 \\
\hline Ap. Mech. & 510 & 412 & Dynamics & 3 \\
\hline & & & Elective* & 3 \\
\hline Ch. E & 520 & 115 & Engineering Assembly & 0 \\
\hline & & & & 16 \\
\hline
\end{tabular}
Fall Semester
\begin{tabular}{|c|c|c|c|c|}
\hline rer & & & Course & Sem. Hrs. \\
\hline Ch E & 520 & 432 & Chem. Engg. Lab. II & 2 \\
\hline Ch. E & 520 & 520 & Process Anal. \& Design & 5 \\
\hline Ch. E. & 520 & 530 & Process Optimization & 3 \\
\hline & & & Elective* & 6 \\
\hline Ch. E & 520 & 115 & Engineering Assembly & 0 \\
\hline & & & & \\
\hline Spring Semester & & & & \\
\hline & & & Course & Sem. Hrs. \\
\hline Ch E & 520 & 442 & Chem. Engg. Lab. III & 2 \\
\hline Ch. E & 520 & 540 & Ch. E. Systems Design Elective* & 5
9 \\
\hline Ch. E. & 520 & 115 & Engineering Assembly & 0 \\
\hline & & & & 16 \\
\hline
\end{tabular}

Number of hours required for graduation \(131^{* *}\)

\footnotetext{
Fifteen hours of electives must be selected from the list of Humanities and Social Science electives on page 203. The remaining nine hours are technical electives of which at least six must be Engineering Sciences other than Chemical Engineering and including one Electrical Engineering course. All electives must be chosen with the advice and approval of the head of the department and the dean.

Any male student is allowed to apply at least four (4) hours of basic ROTC credit toward his degree without being required to take more credits than his non-ROTC colleagues
}

Curriculum in Civil Engineering
B.S. in Civil Engineering
\begin{tabular}{|c|c|c|}
\hline \multicolumn{3}{|l|}{FRESHMAN} \\
\hline \multicolumn{3}{|l|}{Fall Semester} \\
\hline Mathematics & 245 & 220 \\
\hline Chemistry & 221 & 210 \\
\hline English & 229 & 100 \\
\hline Architecture & 104 & 207 \\
\hline Physical Education & & \\
\hline General E. & 500 & 110 \\
\hline
\end{tabular}
 \(\overline{16}\)

\begin{tabular}{lll} 
Spring Semester \\
& & \\
Mathematics & 245 & 240 \\
Physics & 265 & 311 \\
Applied Mechanics & 510 & 415 \\
Chemistry & 221 & 250 \\
Civil E. & 525 & 214 \\
Civil E. & 525 & 115
\end{tabular}

JUNIOR
Fall Semester
Civil E.
Applied Mech.
Mech. E.
Geology
Applied Mech
Civil E.
\begin{tabular}{ll}
525 & 431 \\
510 & 412 \\
560 & 413 \\
234 & 100 \\
& \\
510 & 418 \\
525 & 115
\end{tabular}


Spring Semester

> Civil E.

Applied Mech
Civil E.
Civil \(E\).
Civil E.
\begin{tabular}{ll}
525 & 432 \\
510 & 471 \\
525 & 463 \\
525 & 422 \\
525 & 115
\end{tabular}

Course Semester Hours
Analysis of Statically
Indeterminate Structures ... 3
Fluid Mechanics .......
Sanitary Engg. Fund.
Sanitary Engg. Fu
Soil Mechanics I
Engineering Science Elective
Engineering Assembly...

\section*{SENIOR}

Fall Semester
\begin{tabular}{|c|c|c|c|}
\hline \multirow[b]{3}{*}{Civil E. Civil E.} & & & Course Semester Hour \\
\hline & 525 & 443 & Structural Engg. in Metals \\
\hline & 525 & 465 & Sanitary Engg. Design \\
\hline & & & Senior Design Elective \\
\hline Civil E. & 525 & 451 & Hydrology \\
\hline & & & Humanities or Soc. Sci. Elect. \\
\hline Civil E. & 525 & 115 & Engineering Assembly \\
\hline
\end{tabular}

Spring Semester
Civil E.:
Civil E.
Civil E.
Civil E.

Civil E.

525444

Course Semester Hours
Structural Engg. in Concrete
Transportation Engineering
Foundation Engineering
Humanities or Soc. Sci. Elect.
Engineering Assembly ....... 0
'Humanities and Social Science Electives are to be selected from list on page 203 and need not be taken in the order listed in the curriculum.
"Eight credit hours of engineering science electives are required. One course in computer programming or equivalent programming experience is required. The remaining hours of engineering science elective are to be selected from an approved list of science and engineering science courses Other science or engineering science courses may be substituted on a recommendation of the faculty advisor and approval of the department head and the dean
""Any male student is allowed to apply at least four (4) hours of Basic ROTC credit toward his degree without being required to take more credits than his non.ROTC colleagues.

\section*{Curriculum in Electrical Engineering}

\section*{B.S. in Electrical Engineering}

\section*{FRESHMAN}

Fall Semester

\begin{tabular}{lllll} 
Spring Semester & & & \\
Course & Semester Hours
\end{tabular}

\section*{SOPHOMORE}

Fall Semester

Physics
Mathematics
Applied Mech
E.E.

Economics
\begin{tabular}{|c|c|c|}
\hline & & Course Semester Hours \\
\hline 265 & 310 & Engineering Physics I ........ 5 \\
\hline 245 & 222 & Anal. Geometry \& Calculus III \\
\hline 510 & 305 & Statics \\
\hline 530 & 355 & Intro. to Computer Engg. . ... 3 \\
\hline 225 & 110 & Economics I .................. 3 \\
\hline
\end{tabular}

\begin{tabular}{|c|c|c|c|}
\hline \multicolumn{4}{|l|}{SENIOR} \\
\hline \multicolumn{4}{|l|}{Fall Semester} \\
\hline & & & Course Semester Hours \\
\hline Mech. E. & 560 & 413 & Ther modynamics I \\
\hline E.E. & 530 & 510 & Control Systems Design ....... 3 \\
\hline & & & Option Elective + .............. 3 \\
\hline & & & Complementary Elective** \\
\hline & & & Humanities or Soc. Sci. Elect.* \\
\hline
\end{tabular}
\begin{tabular}{|c|c|c|c|}
\hline \multicolumn{4}{|l|}{Spring Semester} \\
\hline \multirow{5}{*}{E. E.} & & & Course Semester Hours \\
\hline & 530 & 530 & E. E. Seminar ................. 1 \\
\hline & & & Option Elective + .............. 6 \\
\hline & & & Complementary Elective \({ }^{* *}\).... 5 \\
\hline & & & Humanities or Soc. Sci. Elect.* \\
\hline
\end{tabular}

Number of hours required for graduation \(132++\)

\footnotetext{
Humanities and Social Science Electives are to be selected from the list on page 203 and need not be taken in the order, listed in the curriculum.

14 semester hours of Complementary Electives and M.E. 212 or 16 emester hours of Complementary Electives and a minimum of one selected from an approved list of science and engineering courses upon consultation with the student's faculty adviser.
+12 semester hours of Option Electives must be selected from Electrical Engineering courses upon consultation with adviser.
+ + Any male student is allowed to apply at least four (4) hours of Basic ROTC credit toward his degree without being required to take more credits than his non-RO7C colleagues.
}

\section*{General Option}

In the general option a set of specializations is possible. The student is expected to select a set of interrelated courses which will enable him to concentrate in one area. Examples of such areas are Communications Systems, Digital Systems, Electromagnetic Theory and Applications, Energy Conversion and Power Systems, Linear System Theory, and Microelectronics.

\section*{Bioengineering Option}

A student pursuing the option of Bioengineering within the Electrical Engineering Department can fulfill the requirements for a B.S. in Electrical Engineering by following the outlined core curriculum listed for Electrical Engineering. A suggested set of life science courses which should be included in the Bioengineering option follows:
\begin{tabular}{|c|c|c|c|}
\hline Organic Chemistry & 221 & 350 & General Organic Chemistry \\
\hline Organic Chemistry & 221 & 351 & General Organic Chem. Lab. \\
\hline Biochemistry & 020 & 421 & General Biochemistry \\
\hline Biology & 215 & 205 & General Zoology \\
\hline Biology & 215 & 405 & Comp. Anat. of Vertebrates OR \\
\hline Physiology & 740 & 625 & Special Anatomy ........ Cr. OR \\
\hline Physiology & 740 & 431 & Anatomy and Physiology \\
\hline
\end{tabular}

The above courses will be substituted for the Complementary Electives listed in the Electrical Engineering Curriculum. Upon consultation with his academic adviser the student must select from the list of Option Electives those which would complement a strong Electrical Engineering core curriculum and the Bioengineering Option.

\section*{Computer Engineering Option}

A student pursuing the option of Computer Engineering within the Electrical Engineering Department can fulfill the requirements for a B.S. in Electrical Engineering by following the outlined core curriculum listed for Electrical Engineering. The following courses will be required as Complementary and Option Electives.
Computer Science
E. E.
E. E.
E. E.
E. E.
\begin{tabular}{ll}
286 & 425 \\
530 & 540 \\
530 & 544 \\
530 & 651 \\
530 & 620
\end{tabular}
Computer Org. \& Prog. .....
Computer Logic Design .....
Digital Circuits Lab. ......
Design of Digital Systems I
Analog Computer ........... 3
3
2
3
3

Upon consultation with his academic adviser, the student should select the remaining semester hours of Complementary and Option Electives from the Departments of Electrical Engineering, Mathematics, Computer Science and Statistics with at least one course from Electrical Engineering.

\section*{Curriculum in Industrial Engineering}



JUNIOR
Fall Semeste
Fall Semester
Mech. E.
Statistics
Ind \(E\).
Ind \(E\).
Ind..
Applied Mech
Ind \(E\).
\begin{tabular}{llll} 
& & Course & \multicolumn{1}{c}{ Semester Hours } \\
560 & 413 & Thermodynamics I & 3 \\
285 & 410 & Intro. Prob. \& Stat. I & 3 \\
550 & 350 & Engineering Materials & 2 \\
550 & 351 & Engineering Materials Lab. & 1 \\
550 & 451 & Work Measurement & 3 \\
510 & 412 & Dynamics & 3 \\
550 & 115 & Engineering Assembly & 0 \\
& & & 15
\end{tabular}


\section*{SENIOR}

Fall Semester
\begin{tabular}{lll} 
Ind.. & 550 & 553 \\
Ind.. & 550 & 575 \\
Ind. & 550 & 571 \\
Ind.. & 550 & 502 \\
& & \\
Ind. \(E\). & 550 & 115
\end{tabular}

Course Semester Hours
Prod. Plan. \& Invent. Control
Quant. Tech. in Ind Engg .
intro. to Operations Re
Soc. Sci. or Humanities Elect
Engineering Assembly.

\section*{Spring Semester}
\begin{tabular}{lll} 
Ind. E. & 550 & 625 \\
Ind. E. & 550 & 554 \\
Ind. E. & 550 & 572 \\
Ind. E. & 550 & 573 \\
& & \\
Ind. E. & 550 & 115
\end{tabular}

Course Semester Hours
Man-Environment Systems
Ind. Facilities Layout \& Des.
Intro. to Oper Research II
Industrial Simulation
Soc. Sci. or Humanities Elect.
Engineering Assembly

Curriculum in Mechanical Engineering
B.S. in Mechanical Engineering

\section*{FRESHMAN}



SOPHOMORE
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|r|}{Course Sem. Hrs} \\
\hline Physics & 265 & 310 & Engineering Physics I & \\
\hline Mathematics & 245 & 222 & Anal. Geometry \& Caluc & clus 111 \\
\hline Economics & 225 & 110 & Economics 1 & \\
\hline Mech E. & 560 & 217 & Graph Comm. Anal. \& D & Des. II \\
\hline Ind E & 550 & 341 & Production Process & \\
\hline Mech. E. & 560 & 115 & Engineering Assembly & \\
\hline \multicolumn{5}{|l|}{Spring Semester} \\
\hline & & & \multicolumn{2}{|l|}{Course Sem. Hrs.} \\
\hline Physics & 265 & 311
240 & Engineering Physics in & \\
\hline Ap. Mech. & 510 & 305 & Statics & \\
\hline Ind E & 550 & 350 & Engg. Materials & \\
\hline & & & Hum. or Soc. Sci. El.* & \\
\hline Mech. E. & 560 & 115 & Engineering Assembly & \\
\hline
\end{tabular}

\section*{JUNIOR}

Fall Semester
Mech. E
E.E.
nd. E.
Ap. Mech
Mech E.
\begin{tabular}{ll}
560 & 413 \\
530 & 391 \\
550 & 351 \\
510 & 412 \\
510 & 415 \\
& \\
560 & 115
\end{tabular}
\begin{tabular}{|c|c|}
\hline Course & Sem. Hrs \\
\hline Thermodynamics I & \\
\hline Circuit Theory I & \\
\hline Engg. Materials Lab & \\
\hline Dynamics & \\
\hline Mech. of Materials & \\
\hline Hum. or Soc. Sci. El & \\
\hline Engineering Assem & \\
\hline
\end{tabular}
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|l|}{Spring Semester} \\
\hline & & & Course & Sem. Hrs. \\
\hline Mech. E. & 560 & 513 & Thermodynamics II & 3 \\
\hline E. E. & 530 & 415 & Electronics I ... & 3 \\
\hline Ind. E & 550 & 372 & Comp. and Data Proc. & 2 \\
\hline Ap Mech. & 510 & 471 & Fluid Mechanics & 3 \\
\hline Physics & 265 & 400 & Atomic Physics or & \\
\hline N E. & 580 & 410 & Intro. To Nuclear Engg. & 3 \\
\hline & & & Hum. or Soc. Sci. El. & 3 \\
\hline Mech. E. & 560 & 115 & Engineering Assembly & 0 \\
\hline
\end{tabular}

\section*{SENIOR}

\section*{Fall Semester}

Mech E
Mech. E
Mech. E
Mech. E.
\begin{tabular}{|c|c|c|c|c|}
\hline & & & Course & Sem.Hrs. \\
\hline Mech. E. & 560 & 453 & Mech. Engg. Des Lab. & 2 \\
\hline Mech. E & 560 & 551 & Machine Desing II & ...... 3 \\
\hline Mech. E. & 560 & 583 & Mech. Engg. Lab. II & 2 \\
\hline Mech. E & 560 & 656 & Mach. Vibration I or & \\
\hline Mech. E . & 560 & 622 & Environmental Engg. Hum. or Soc. Sci. El.: & 3 \\
\hline & & & Technical Elective \({ }^{-}\) & \\
\hline Mech. E. & 560 & 115 & Engineering Assembly & 0 \\
\hline
\end{tabular}

\footnotetext{
Number of hours required for graduation \(132^{m}\)
}

Humanities and Social Science Electives are to be selected from the list on page 203 and need not be taken in the order listed in the curriculum

To be chosen with the advice and approval of the faculty adviser and department head
. Any male student is allowed to apply at least four (4) hours of Basic ROTC credit toward his degree without being required to take more credits than his non.ROTC colleagues.

\section*{Curriculum in Nuclear Engineering}
B.S. in Nuclear Engineering

\section*{FRESHMAN}

Fall Semester
N. E.
Engisih

Economics
Chemistry
Mathematics
Physical Education
\begin{tabular}{ll}
580 & 110 \\
229 & 110 \\
225 & 110 \\
221 & 210 \\
245 & 220
\end{tabular}


Spring Semester
\begin{tabular}{|c|c|c|c|c|}
\hline & & & Course & Sem. Hrs. \\
\hline N.E. & 580 & 116 & N. E. Seminar & \\
\hline English & 229 & 120 & English Compo & 3 \\
\hline Chemistry & 221 & 230 & Chemistry II & 3 \\
\hline Chemistry & 221 & 250 & Chemistry II La & 2 \\
\hline Physics & 256 & 310 & Engineering Pr & ....... 5 \\
\hline Mathematics & 245 & 221 & Anal. Geometr & lus II. \({ }^{4}\) \\
\hline Physical Education & & & Basic Physical & n ..... 0 \\
\hline
\end{tabular}

SOPHOMORE


JUNIOR
Fall Semester
N.E.
N.E.
Mech.
E.E.

Spring Semester
\begin{tabular}{lll} 
N.E. & 580 & 60 \\
N. E. & 580 & 55. \\
Ap Mech. & 510 & 47
\end{tabular}
N.

SENIOR
Fall Semester

Spring Semester
\begin{tabular}{l} 
N. E \\
N. \\
\hline
\end{tabular}

Course Sem. Hrs.
\begin{tabular}{|c|c|}
\hline Course & Sem. Hrs. \\
\hline Ap. N. E. Anal. & \\
\hline Rad. Appl. Engg. & \\
\hline Thermodynamics I & \\
\hline Electronics 1 : & \\
\hline Tech. Elect.** & \\
\hline Soc. Sci. or Hum. El & \\
\hline
\end{tabular} \(510 \quad 47\) Nuc React Fund Fluid Mech. Tech. Elect.* Soc. Sci. or Hum. El:

(......... \(\frac{3}{18}\)
\begin{tabular}{|c|c|}
\hline Course & Sem. Hrs. \\
\hline App. React. Theory & ....... 3 \\
\hline Neut. \& Part. Inter. & - 3 \\
\hline Nuc. Fuel Proc. & 3 \\
\hline Tech. Elect.** & 3 \\
\hline Soc. Sci. or Hum. El & 3 \\
\hline & \\
\hline & 15 \\
\hline
\end{tabular}

Course
Nuc. React. Tech.
Nuc. React. Tech. Lä
Tech. Elect.
Soc. Sci. or Hum. El.
3
-15

Number of Hours Required for Graduation is \(130^{*}\)

Humanities and Social Science Electives are to be selected from the list on page 203 and need not be taken in the order listed in the curriculum

A Technical Elective program of study is chosen in consultation with the sfudent's adviser and presented for approval to the departmental faculty no later than the second semester of the sophomore year.

Any male student is allowed to apply at least four (4) hours of Basic ROTC credit toward his degree without being required to take more credits than his non-ROTC colleagues.

\section*{Dual Degree Programs}

An engineering student may earn two B.S. degrees by pursuing a dual degree program. There are many interesting possibilities for a second major including business administration, mathematics, chemistry, geology, political science, etc. In general, the second degree can be obtained with an additional year of study (a minimum of 30 additional hours is required). Two programs of interest are listed below:

\section*{Engineering and Business Administration}

Ordinarily the program must be commenced during the student's junior year and the following courses are required for the B.S. in Business Administration.
\begin{tabular}{|c|c|c|c|c|}
\hline Bus. Ad & 305 & 275 & Course Fund. of Accounting & Sem.Hrs. \\
\hline & & & & \\
\hline Bus. Ad & 305 & 305 & Managerial Accounting & - \({ }^{3}\) \\
\hline Economics & 225 & 110 & Economics I & 3 \\
\hline Economics & 225 & 120 & Economics II & \\
\hline Bus. Ad & 305 & 425 & Business Law 1 & -1 \({ }^{3}\) \\
\hline Com Science & 286 & 315 & Fund of Comp. Prog. & 3 \\
\hline Bus Ad. & 305 & 400 & Management Concepts & \\
\hline Bus. Ad. & 305 & 405 & Business Finance & 3 \\
\hline Bus Ad. & 305 & 440 & Marketing & 3 \\
\hline Bus. Ad. & 305 & 600 & Business Policy & \\
\hline \multirow[t]{3}{*}{Bus. Ad.} & 305 & 602 & Business and Society & 3 \\
\hline & & & Field of Bus. Specializa & 12 \\
\hline & & & Business electives & - 3 \\
\hline
\end{tabular}

Total hours required 49

\section*{Civil Engineering and Geology}

Students interested in a career in Foundation Engineering are advised to complete the B.S. degree requirements in Civil Engineering plus the requirements listed below to qualify for the B.S. degree in Geology.
I. General requirements for B.S. degree in Arts and Sciences'. (see page 81 ).
II. Complete the following courses in Geology.
\begin{tabular}{|c|c|c|c|}
\hline & & Course & Sem. Hrs. \\
\hline 234 & 430 & Historical Geology & ....... 4 \\
\hline 234 & 460 & Mineralogy 1 & .... 4 \\
\hline 234 & 461 & Mineralogy 11 & - 4 \\
\hline 234 & 420 & Geomorphology & \(\cdots{ }^{4}\) \\
\hline 234 & 530 & Structural Geology & . \({ }^{4}\) \\
\hline 234 & 603 & Stratigraphic Geology & 4 \\
\hline 234 & 640 & Field Geology & 6 \\
\hline
\end{tabular}

\section*{Humanities and Social Science Electives for College of Engineering Students}

To add breadth to his education and to help prepare him for a more effective role in society each engineering student is required to take several courses in the social sciences and humanities. The following list of electives has been approved by the faculty.

Art - Any course
Economics - Any course above those required
English - Any course above those required Geography - Any course in Geography
History - Any course
Philosophy - Any course except Philosophy 171
Modern Languages - Five hours
Music - Any course
Political Science - Any course
Psychology - Any course
Sociology and Anthropology - Any course Speech - Any course in "Theater and Interpretation" Architecture and Design - Any course in history or appreciation of architecture

From the areas listed above at least two courses must be taken at the 400 level or above; however, not more than three credit hours may be taken in applied music and-or applied art.

\section*{Information for Pre-Engineering Students Transferring to Kansas State}

Many of the fundamental courses required for a degree in engineering may be obtained through pre-engineering programs at other four-year institutions or junior colleges. In general, two years of coursework will be transferrable. However, there are small differences among the curricula so students electing this route should work closely with their advisers and KSU to ensure a proper selection of courses. Questions should be referred to The Dean's Office, College of Engineering.

\footnotetext{
BASIC SUBJECTS COMMON TO ALL CURRICULA
Subiect Credif HoursatKSU
Chemi
Mathematics - (Anal. Geom. \& Calc., Diff. Equa.)
Physics
Statics
English Composition
Economics
ocial Science \& Humanities Electives (courses in economics, psychology. history, literature, etc.) psychology, 15
}

HER PRE CURRICULUM
\begin{tabular}{lccccccr} 
& AgE ChE & CE & EE & IE & ME & NE \\
Speech & 2 & 2 & 2 & 2 & & 2 & \\
Graphics & 2 & \(* *\) & 2 & 2 & 2 & 5 & \\
Qualitative Analysis & & 4 & 2 & & & & 2 \\
Computer Programming & 2 & \(* *\) & 2 & 3 & 2 & 2 & \\
Organic Chemistry & \(*\) & 8 & & & & \\
Geology \\
Biology & 4 & & 4 & & & \\
Accounting & \(*\) & & & & 4 &
\end{tabular}
-These requirements are satisfied upon completion of the B.S degree in Civil Engineering with judicious attention to the selection of Humanities and Civil Engineering with iud
Social Science electives
*'Technical Elective in the curriculum

Summer Session-Students transferring at the junior level may find it advantageous to attend the summer session preceding their fall enrollment. Engineering subjects that normally are offered include:

\author{
Applied Mechanics - Statics, Dynamics \\ Chemical Engineering - Introduction to Process Analysis \\ Electrical Engineering - Circuit Theory I \\ Industrial Engineering - Computers \& Data Processing, Industrial Management I \\ Mechanical Engineering - Thermodynamics I
}

\section*{Agricultural Engineering}

WILLIAM H. JOHNSON,* Head of Department
Professors Fairbanks," Hodges,* Larson,* and Johnson;' Associate Professors Chung,* Clark," Lipper,* Manges,' and Stevenson;* Assistant Professors Baugher and Spillman;' Instructors Anderson, McMillan, Murphy, and TenEyck; Emeritus: Professor Fenton.

Agricultural Engineering is the profession that applies the science of engineering principles to the agricultural industry. Basic training enables the student to develop new ideas and methods as well as to further the application of engineering fundamentals in such areas as production mechanization; soil, water, and air resources; power and energy sources; plant and animal environment; feed and waste handling, processing, and storage.
The curriculum includes all basic courses such as mathematics, physics, chemistry, and mechanics common to engineering curriculums, as well as specific courses in the field of agricultural engineering, some of which permit specialization in a particular area through technical electives available in the department.
Students completing this curriculum are prepared to do design, research, testing, sales promotion, teaching and extension work as applied to agriculture.
Federal and state agencies, colleges and universities, equipment manufacturers, rural electric power suppliers and many enterprises involving agriculture desire and need the services of the agricultural engineer.

\section*{GRADUATE STUDY}

Major work leading to the degree Master of Science in agricultural engineering is offered in the fields of farm power and machinery, farm structures, soil and water conservation, rural electrification and processing.

Prerequisite to major work in these fields requires the completion of an undergraduate curriculum in agricultural engineering substantially equivalent to that required of undergraduate students at this University.

Work leading to the degree Master of Science is also offered in the field of agricultural mechanization to those students who have completed a bachelor's degree in agriculture with the equivalent of a major in agricultural mechanization.

\section*{Courses in Agricultural Engineering UNDERGRADUATE CREDIT}

505 160. Engineering Concepts. (2) II. An introduction to agricultural engineering and engineering design. Problems involving the basic concepts of engineering science are considered. Two 2-hour labs. a week.
505 312. Biological Materials and Machine Functions in Agriculture. (3) II. Physical properties of biological materials. Functional requirements of agricultural machines. Two hours rec. and three hours lab. a week. Pr.: Phys. 310.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

505 410. Environmental Analysis for Plant and Animal Systems. (3) I. The fundamental concepts and practical considerations required for the synthesis and design of open and enclosed environmental systems for agricultural production. Pr.: Phys. 311, Pr. or conc.: M.E. 413.

505 420. Energy Use and Control in Agricultural Systems I. (3) II. Theory and application of energy conversion devices; measurement methods and instrumentation; fundamental concepts of hydraulic, electronic, and pneumatic control systems. Two hours of recitation and three hours lab. a week. Pr.: M.E. 413, E.E. 401.
505 430. Soil and Water Engineering. (3) I. RainfallRunoff relationships, principles of soil erosion control, design of water handling structures for land drainage, flood protection and irrigation, agricultural surveying. Two hours recitation and three hours lab. a week. Pr.: Ap. M. 471, Ag. E. 410, C. E. 422 or Agro. 660.
505 436. Design of Agricultural Machinery. (3) I. Analysis and design of agricultural machines. Two hours rec. and three hours lab. a week. Pr.: Phys. 311; Pr. or conc.: Ap. M. 415, Ag. E. 311.
505 466. A nalysis of Agricultural Structures. (3) II. Estimation of loads on agricultural structures; allowable unit stresses; structural systems in agricultural buildings. Three hours rec. a week. Pr.: Ap. M. 415, Ag. E. 440 .

505 505. Energy Use and Control in Agricultural Systems II. (3) II. Application of energy to condition and process biological materials important to agriculture; to modify their environments; and to measure, modify, or induce certain characteristics. 2 hrs . rec., 3 hr . lab. per week. Pr.: Phys. 311 and Ag. E. 420.

505 550. Agricultural Systems Engineering. (2) II. Development of plans and specifications for buildings, equipment and controls for selected systems of agricultural production. Six hours lab. a week. Pr.: Ag. E. \(436,466,500\).

505 580. Measurement Systems. (3) I. Theory and application of measurement systems with emphasis on environments and processes related to soils, plants and animals. Two hours rec. and three hours lab. a week. Pr.: E. E. 403 or equiv.

505 581. Professional Practice in Agricultural Engineering. (1) II. Professional attitudes and ethics. Post-degree career planning and social responsibilities. One hours rec. a week. Pr.: Senior standing.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

505 605. Irrigation and Drainage. (3) I, II. Design and operative problems involved in irrigation or drainage of agricultural land. Two hours rec. and three hours lab. a week. Pr.: C. E. 422, Ap. M. 471, Ag. E. 375.
505 620. Problems in Agricultural Engineering. Credit arranged. I, II, S. Problems in the design, construction, or application of machinery or power in agriculture, structures, modern conveniences, and rural electrification. Pr.: Approval of instructor.
505 700. Agricultural Process Engineering. (3) I, II. Theory, equipment, and design techniques in processing agricultural products. Two hours rec. and three hours lab. a week. Pr.: Ap. M. 471, M. E. 413.
505 710. Advanced Farm Power and Machinery. (3) I, II. Analytical study of design, construction and operating characteristics of tractors and selected farm machines. Two hours rec. and three hours lab. a week. Pr.: Ag. E. 436, 446.

\section*{GRADUATE CREDIT}

505 810. Research in Agricultural Engineering. Credit arranged. I, II, S. The laboratories of the University are available for research in all areas of agricultural engineering. The results of such investigation may be incorporated in bulletins of the Agricultural Experiment Station and-or furnish material for the master's thesis. Pr.: Approval of department head.
505 815. Graduate Seminar in Agricultural Engineering. (1) I, II. Presentation and discussion of research philosophies, procedures and results. One hour rec. a week. Required of all graduate students in Agricultural Engineering. Pr.: Graduate standing.

\section*{Courses for Students in Agriculture}

\section*{UNDERGRADUATE CREDIT}

506 151. Agricultural Mechanics Practices. (2) I, II. Introduction to mechanics practices and techniques basic to the repair, maintenance and construction of agricultural facilities and equipment, including oxyacetylene and arc welding, tool conditioning, soldering, power tool operation such as drill press and metal lathe. Six hours lab. a week.
506 251. Farm Power. (3) I, II. A study of the internal combustion engine and the farm tractor; ignition, injection, carburetion, fuels, lubricants, power transmission, control systems, and tune-up maintenance. One hour rec. and six hours lab. a week. Pr.: Math. 100.

506 300. Engineering in Agriculture. (4) I, II. Engineering principles as applied to farm power and machinery, soil and water conservation, irrigation, farm electrification, farm structures and the farmstead. Three hours rec. and three hours lab. a week. Pr.: Math. 100. 506 310. Farm Electrification and Soil Conservation. (2) I, II. For students pursuing the curriculum in Agricultural Education. Introduction to methods of planning for efficient utilization of electric energy for farm production and to farm surveying including checking of conservation practices applied to soil and water. Six hours lab. a week.
506 330. Agricultural Machinery Management. (3) I. Selection, adjustment, operation, servicing, economics, and application of agricultural machines. Two hours rec. and three hours lab. a week. Pr.: Phys. 211.
506 351. Agricultural Machinery Operation and Maintenance. (2) I, II. Emphasis upon shop skills as applied to machine operation, adjustment, and maintenance; principles of power transmission, draft, alignment, timing and calibration of tillage, harvesting, planting, and spraying equipment. Six hours lab. a week. Pr.: Ag. E. 151 or equiv.

506 352. Agricultural Machinery Construction. (2) II. Advanced shop processes and techniques for constructing and maintaining agricultural machinery; advanced welding, hardsurfacing and metallurgy; selection of materials of construction. Six hours lab. a week. Pr. : Ag. E 151 or equiv. and junior standing.
506 353. Farmstead Utilities. (3) I. Utilization of energy for light, heat, and power on the farmstead; planning for distribution of electric power and water; motors and controls. Two hours rec. and three hours lab. a week. Pr.: Math. 100, 150; Phys. 212.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

506 451. Planning and Management of Agricultural Buildings. (3) II. Farmstead planning; requirements of livestock production systems; environment control; waste management. Three hours rec. Pr.: Phys. 112 or 211 and Math. 100.
506 452. Farm Building Construction. (2) I, II. Construction practices related to buildings and materials used in agriculture; application of procedures for design of concrete mixtures, framing and fastener requirements, material selection; and cost estimation. Six hours lab. a week. Pr.: Math. 100.
506 455. Dairy Mechanics. (3) Upon sufficient demand. Installation, adjustment and operation of dairy plant equipment; boilers, engines, motors, pumps, refrigeration machinery, water supply and waste disposal. Two hours rec. and three hours lab. a week. Pr.: Junior standing.
506 458. Conservation Surveying and Planning. (3) II. Agricultural surveying; layout and checking waterways, terraces and farm ponds; conservation planning from aerial photograph. One hour rec. and five hours lab. a week. Pr.: Math. 100.
506 459. Agricultural Mechanic Methods. (3) I, II. Methods of teaching agricultural mechanics in high school including the organization and equipment for school shop; preparation of instruction sheets, organization and presentation of demonstrations. One
hour rec. and six hours lab. a week. Pr.: Conc. enrollment in student teaching.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

506 600. Advanced Farm Mechanics. (3) S. For teachers of vocational agriculture and those concerned with teaching agricultural mechanics in high school; advanced shop techniques, with special emphasis on welding, machine tool, mechanical drawing, and farm carpentry. One hour rec. and six hours lab. a week. Pr.: Ag. E. 151, 459 or equiv., plus one year's teaching experience or approval of instructor.
506 603. Advanced Farm Power. (3) S. For teachers of vocational agriculture concerned with teaching agricultural mechanics in high school; problems concerning power units and tractor operation, service, repair and maintenance. Teaching aids and programs will be developed. One hour rec. and six hours lab. a week. Pr.: Ag. E. 251 or equiv.
506 615. Problems in Agricultural Mechanization. Credit arranged. I, II, S. Problems in the application of technical principles to agricultural mechanization. Pr.: Approval of instructor.
506 651. Mechanized Feed Handling and Storage. (3) I. Planning mechanical systems for preparation and handling of feeds on farms; conditioning and preservation of grains, forages, and feeds. Two hours rec. and three hours lab. a week. Pr.: Ag. E. 451 and 353.
506 652. Soil and Water Conservation Practices. (3) II. The hydrological cycle; rainfall-runoff relationships; structural conservation practices for conserving water and controlling erosion; drainage of agricultural lands. Two hours rec. and three hours lab. a week. Pr.: Agron. \(270, \mathrm{Ag} . \mathrm{E} .300\) or 458.
506 653. Irrigation Practices. (3) I. Principles and practices of irrigation involved in the setup and operation of various irrigation systems on the farm. Two hours rec. and three hours lab. a week. Pr.: Agron. 270, Ag. E. 300 or 458.

506 654. Agricultural Facilities and Machinery Management. (2) II. Analytic study of functional and economic feasibility when matching farm production operations and labor-saving facilities and equipment; special emphasis on selection of equipment. Six hours lab. a week. Pr.: Ag. Ec. 100 and Ag. E. 651.

\section*{Applied Mechanics}

PIILLIP G. KIRMSER; Head of Department
Professors Best, \({ }^{*}\) Calcote, \({ }^{*}\) Haft, \({ }^{*}\) Kirmser, \({ }^{*}\) and McCormick;" Associate Professors Huang,* Kipp,* and Lindly;' Assistant Professors Crary, Hu,* and Knostman; Instructor McDonald; Emeritus: Professor Taylor and Associate Professor Munger.

The Department of Applied Mechanics functions as a service department at the undergraduate level and does not administer a curriculum leading to a bachelor's degree. The undergraduate courses offered are concerned with fundamental subject matter of an interdisciplinary nature. Some of these
courses are common to all undergraduate curriculums.

\section*{GRADUATE STUDY}

Major work leading to the degrees Master of Science and Doctor of Philosophy is offered in this department.
The completion of an undergraduate curriculum in engineering substantially equivalent to one of those offered at this University is prerequisite to advanced study. Students, at the doctorate level particularly, are expected to develop strength in the physical sciences and to this end are expected to augment their major studies by course work in mathematics, theoretical physics, and sometimes chemistry.
The facilities for advanced study are excellent in both theoretical and experimental fields. These include large-scale digital and analog computers for theoretical studies and data analysis, modern equipment for vibration and experimental stress analysis, and a well-equipped laboratory for materials testing.

\section*{Courses in Applied Mechanics}

\section*{UNDERGRADUA TE CREDIT}

510 205. Applied Mechanics A. (3) I, II, S. Composition and resolution of forces equilibrium of force systems; application of the principles of statics to problems, including force analyses of simple structures. Centroids; moments of inertia. Three hours rec. a week. Pr.: Phys. 211, Math. 220.
510 220. Strength of Materials A. (3) I, II, S. Behavior of materials subjected to tension, compression, shear, and bending; design of beams and columns. Three hours rec. a week. Pr.: Ap. M. 205.
510 224. Strength of Materials A Laboratory. (1) I, II. Tests to determine the physical properties of various structural materials, including steel, aluminum, wood, and concrete. Analysis and interpretation of test data. Three hours lab. a week. Pr. or conc.: Ap. M. 220.
510 305. Statics. (3) I, II, S. Composition and resolution of forces; equilibrium of force systems; application of general laws of statics to engineering problems, including use of vector algebra, friction and force analyses of simple structures, cables, and machine elements; centers of gravity; moments of inertia. Three hours rec. a week. Pr. or conc.: Math. 221.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

510 412. Dynamics. (3) I, II, S. Vector treatment of kinematics, Newton's Laws, work and energy, impulse and momentum, with applications to problems of particle and rigid body motion. Three hours rec. a week. Pr.: Ap. M. 305, Math. 222.

510 415. Mechanics of Materials. (3) I, II, S. Elementary theories of stress and strain, behavior of materials, and applications of these theories and their generalizations to the study of stress distribution, deformation, and instability in the simple structural forms which occur most frequently in engineering practice. Three hours rec. a week. Pr.: Ap. M. 305; Pr. or conc.: Math. 222.
510 418. Mechanics of Materials Laboratory. (1) I, II, S. Determination of selected mechanical properties of several engineering materials, including iron-carbon alloys, aluminum alloys, concrete, wood, and plastics; relationship between structure and mechanical properties of these materials; elementary problems in experimental stress analysis and structural behavior; test procedures, instrumentation, and interpretation of results. One hour lab. instruction and two hours lab. a week. Pr. or conc.: Ap. M. 415.
510 471. Fluid Mechanics. (3) I, II, S. Physical properties; fluid statics; dynamics of ideal and real fluids (for incompressible and compressible flow); impulse and momentum; laws of similitude; dimensional analysis; flow in pipes; flow in open channels; flow about immersed objects. Three hours rec. a week. Pr.: Ap. M. 412; Pr. or conc.: M. E. 413.
510 491. Airplane Stress Analysis. (3) I. Analysis of stress and stability problems in the structural elements of airplanes. Three hours rec. a week. Pr.: Ap. M. 415, Math. 240 or equiv.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

510 601. Advanced Mechanics of Materials. (3) I, II. Introduction to advanced problems in the elastic regime. Biaxial stress and strain, theories of failure, flexure, torsion, membrane theory of shells, beams on elastic foundations, thick cylinders and rotating disks, energy methods and buckling. Three hours rec. a week. Pr.: Ap. M. 415, Math. 240 or equiv.

510 610. Experimental Stress Analysis. (3) I. Experimental methods of investigating stress distribution. Photoelastic models, photoelastic coatings, brittle coatings, and resistance strain gages applied to static and dynamic problems. Two hours rec. and three hours lab. a week. Pr. or conc.: Ap. 601 or approval of instructor.

510 612. Experimental Techniques in Mechanics. (1-3) I, II. Techniques and instrumentation for the experimental analysis of selected problems in vibrations, dynamics, fluid mechanics or engineering materials. Pr.: Senior standing in engineering and consent of instructor
510 615. Intermediate Dynamics. (3) II. General vector principles of the dynamics of particles and rigid bodies; applications to orbital calculations, gyrodynamics and rocket performance; introduction to the energy methods of advanced dynamics. Three hours rec. a week. Pr. : Ap. M. 412 , Math. 240 or equiv.

510 618. Introduction to the Theory of Continuous Media (3) I. Analysis of strain, motion and stress; fundamental laws; constitutive equations; applications to fluid, elastic, and plastic media. Three hours rec. a week. Pr.: Ap. M. 412, Math. 240 or equiv.
510 620. Intermediate Fluid Mechanics. (3) I. An introduction to the general analytical relations of fluid
flow, viscous flow, turbulence, boundary layer theory; applications. Three hours rec. a week. Pr.: Ap. M. 471, Math. 240 or equiv.
510 701. Energy Methods in Engineering Mechanics. (3) II. The principle of virtual work, minimum potential energy; theorem of complementary energy; Castigliano's theorems; application of statically determinate and indeterminate beams, curved beams, and frames; extension of energy principles of statics to dynamic problems. Three hours rec. a week. Pr. : Ap. M. 415.

510 710. Elastic Stability. (3) I. Bending of prismatic bars under simultaneous action of axial and lateral loads; buckling of centrally compressed bars; buckling of compressed rings and curved bars; lateral buckling of beams. Three hours rec. a week. Pr.: Ap. M. 415, Math. 240 or equiv.
510 714. Applied Elasticity. (3) II. Analysis of stress and strain at a point in an elastic medium; twodimensional problems in rectangular and polar coordinates; torsion of bars; energy principles; numerical methods. Three hours rec. a week. Pr.: Ap. M. 601
510 716. Applied Linear Analysis. (3) I. The application of linear analysis to engineering problems, including derivations of equations, exact and approximate solutions for systems representable by matrix algebraic, difference, differential, and integral equations. Concepts of characteristic, impedance, transfer and influence functions. Three hours rec. a week. Pr.: Math. 240.
510 720. Finite Element and Other Approximate Methods in Mechanics. (3) II. The theory and application of finite element and other techniques and computer programs to continuum mechanics, stress and strain of elastic bodies, plates, shells, heat conduction, flow, and vibration problems of mechanics. Three hours rec. a week. Pr.: Ap. M. 714 or 716 or equiv.
510 721. Applied Nonlinear Analysis. (3) II. Study of mechanical or electrical systems governed by nonlinear equations, elliptic integrals, geometry of integral curves, the phase plane, Lienard's graphical construction, Poincare's classification of singular points, stability and instability. Three hours rec. a week. Pr.: Math. 240 or equiv.
510 750. Engineering Acoustics. (3) II. A study of the generation, propagation, and reproduction of sound, with applications to the transmission and reduction of sound in materials and structures, and the design of acoustic enclosures and filters. Three hours rec. a week. Pr.: M. E. 756 ; or Ap. M. 618,714 , or 716 ; or consent of instructor.

\section*{GRADUATE CREDIT}

510 806. Topics in Theoretical and Applied Mechanics. Credit arranged. I, II, S. Advanced study of special problems in the fields of mechanics. Each spring semester a course based on a previously announced, different, modern, technically advanced book concerning topics applicable to engineering problems will be offered under this course number. Pr.: Approval of instructor. 510 810. Research in Applied Mechanics. Credit arranged. I, II, S. Experimental and-or analytical investigations in the fields of materials of construction, mechanics of materials, fluid mechanics, soil mechanics, dynamics, and vibrations. The results of such investigations may furnish material for graduate theses or reports. Pr.: Approval of instructor.

510 822. Theory of Elasticity. (3) I. Stress, strain, equations of equilibrium and compatibility, straindisplacement relations for general coordinates; problems in plane stress and plane strain; applications to three-dimensional problems; propagation of elastic waves; complex variables and variational methods. Three hours rec, a week. Pr.: Ap. M. 618.
510 830. Thermoelasticity. (3) I. Theory and analysis of thermal stresses in elastic and inelastic systems. Pr.: Ap. M. 714 or 822 or consent of instructor.
510 842. Theory of Plates and Shells. (3) II. Equations for bending of thin plates, symmetrical bending of circular plates, simply supported rectangular plates; rectangular plates with various edge conditions, plates of various shapes. Introduction to analysis of bending of shells. Three hours rec. a week. Pr. : Ap. M. 601.
510 850. Vibration of Elastic Bodies. (3) I. Longitudinal, torsional, and lateral vibration of bars; testing of samples of materials by dynamic methods; the Ritz method; vibration of membranes and plates; waves in isotropic elastic mediums; vibration of pavement slabs. Three hours rec. a week. Pr.: M. E. 656; Pr. or conc.: Ap. M. 714 or 822.
510 862. Plasticity. (3) I in odd years. Elastic-plastic and fully plastic problems of trusses, beams, and bars in torsion; unrestricted and contained plane strain; limit analysis. Three hours rec. a week. Pr.: Ap. M. 601.
510 870. Transform Calculus Applied to Engineering Problems. (3) II. The Laplace, sine, cosine, Hankel, Legendre, Fourier, and Jacobi transforms applied to the solution of initial and boundary value problems in the ordinary and partial differential equations arising in engineering. Three hours rec. a week. Pr.: Math. 550 or equiv.
510 880. Advanced Fluid Mechanics. (3) II. Potential flow in three dimensions, vortex motion, the equations of viscous flow, hydrodynamic stability, turbulence. Three hours rec. a week. Pr.: Ap. M. 618 or 620, Math. 551.

\section*{Chemical Engineering}

DR. L. T. FAN," Head of Department
Professors Bates,' Honstead, \({ }^{*}\) and Kyle;* Associate Professors Akins, \({ }^{*}\) Erickson,* and Matthews;* Assistant Professors Hall,* Heymach, Kao, Retzloff,* and Walawender.
Chemical engineers have the responsibility for the development of new processes and plants for the chemical and allied industries.
This involves a knowledge of chemistry, physics, mathematics, and chemical engineering science. Chemical engineers must know how chemical reactors are designed, how automatic controls are used to operate processes, how materials can be separated and purified by distillation, extraction, or other diffusional operations. They must know how to use computers, how to make material and energy balances, how to make valid engineering judgments based on economic considerations, and how to move
liquids, gases and solids from one place to another.
The Chemical Engineering Curriculum is designed to give students the necessary breadth of knowledge and the necessary scientific tools to perform these functions.
The first two years are devoted to basic chemistry, physics and mathematics, and the essential communication skills.
The last two years are spent in learning the applications of these sciences through the study of transport processes, separation techniques, thermodynamics, kinetics, process dynamics and design. Technical and non-technical electives are provided to allow for broad educational desires.
The Chemical Engineering Curriculum is best suited to highly motivated, intelligent students with strong interests in chemistry, physics, and mathematics. Graduates are well trained for responsible positions in industry or for continuing their education through M.S. or Ph.D. degrees.

\section*{GRADUATE STUDY}

The Master of Science and Doctor of Philosophy degrees are offered: Research in transport phenomena, diffusional processes, thermodynamics, process dynamics, optimization techniques, and process development is regularly under way, and new fields of research are being developed. Support for this research comes from federal, state, and industrial sources. Laboratory space, equipment and instruments are available for this research. The department has shop facilities in which unusual equipment is built and repaired. A glass blower is available on the campus, and the College of Engineering and the University computing centers are used extensively by graduate students.

\section*{INTEGRATED MASTERS DEGREE PROGRAM}

A five year integrated program leading to a B.S. in Chemical Engineering at the end of four years and a Master of Science in Chemical Engineering at the end of five years is available for promising undergraduate students. Students who have completed the sophomore year and have outstanding scholastic records are invited to join the program. Each student in consultation with a
faculty adviser will plan an individualized program of study which meets requirements for the B.S. and M.S. degrees. Features of the program include integrated planning, participation in research as an undergraduate and enrollment in graduate level courses in the senior year. Students participating in the program will be considered for financial assistance in the form of scholarships, fellowships, research assistantships, and part-time work.

\section*{Courses in Chemical Engineering}

\section*{UNDERGRADUATE CREDIT}

520 115. Engineering Assembly.
520 214. Introduction to Process Analysis. (3) I, II, S. An introduction to the basic concepts of Chemical Engineering. Three hours rec. a week. Pr.: Chem. 230; Pr. or conc. Math. 222 and Phys. 311.
520 216. Chemical Engineering Computational Techniques. (1) I, II, S. Application of digital and analog computers, graphical methods, and statistics to chemical engineering problems. Three hours lab. a week. Pr. or conc.: Ch. E. 214 and Math. 240.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

520 415. Chemical Engineering Thermodynamics. (5) I, II, S. Development and application of the principles of thermodynamics as applied to chemical engineering problems. Four hours rec. and three hours lab. a week. Pr.: Ch. E. 214.
520 422. Chemical Engineering Laboratory I. (2) I, II. Principles and techniques of physical measurements such as temperature, pressure and concentration; basic principles of momentum transfer, heat transfer, and mass transfer; experiments in classical unit operations, e. g., distillation, evaporation, drying, fluidization, and in chemical kinetics, thermodynamics and process dynamics. Six hours lab. a week. Pr.: Ch. E. 415; Pr. or conc.: Ch. E. 430.
520 430. Transport Phenomena. (5) II. Introduction to the basic principles of viscous flow, heat conduction, convection, radiation and diffusion in which the transport media are considered to be continuous. Four hours rec. and three hours lab. a week. Pr.: Ch. E. 214.
520 432. Chemical Engineering Laboratory II. (2) I, II. Cont. of Chemical Engineering Laboratory I. Six hours lab. a week. Pr.: Ch. E. 422.
520 442. Chemical Engineering Laboratory III. (2) I, II. Cont. of Chemical Engineering Laboratory II. Six hours lab. a week. Pr.: Ch. E. 432.
520 480. Problems in Chemical Engineering. Credit arranged. I, II, S. An introduction to chemical engineering research. Pr.: Approval of department head.
520 520. Process Analysis and Design. (5) I. The analysis and design of chemical process components, including chemical reactors and separation systems. Four hours rec. and three hours lab. a week. Pr.: Ch. E. 415, 430.

520 530. Process Optimization. (3) I. The economic optimization of chemical processes, with emphasis on optimization methods and process economics and their application in design. Three hours rec. a week. Pr. or conc.: Ch. E. 520.
520 540. Chemical Engineering Systems Design. (5) II. The synthesis and design of process systems for chemical and allied industries. Emphasis will be placed on the design process and the development of optimal designs. Three hours rec. and six hours lab. a week. Pr.: Ch. E. 530.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

520 615. Biochemical Engineering. (3) I. The analysis and design of biochemical processing systems with emphasis on fermentation kinetics, continuous fermentations, aeration, agitation, scale up, sterilization, and control. Three hours rec. a week. Pr. or conc.: Ch. E. 520.

520 625. Biotransport Phenomena. (3) I, II. Principles of transport phenomena applied to biological and physiological processes. Membrane transport processes, circulatory system transport phenomena, transport and distribution of drugs. Pr.: Biology 425 or equivalent and Ch. E. 430.
520 635. Chemical Engineering Analysis I. (3) I, II, S. The mathematical formulation of problems in chemical engineering using partial differential equations, vector and tensor notation. Solution of these problems by graphical, numerical, and transform methods. Three hours rec. a week. Pr.: Ch. E. 430.
520 645. Analysis of Physiological Processes. (3) II. Principles of process and systems analysis applied to problems in biology and medicine. Analysis of mixing in flow systems, principles and applications of tracer analysis, analysis of kinetic and adsorption processes. Pr. : Biology 425 or equivalent and Ch. E. 520.
520 715. Selected Topics in Biochemical Engineering. (3) II, S. Subjects of current interest in the broadest sense of biochemical engineering. These involve not only chemical engineering problems which contain biochemical, biological or medical elements but also applications of chemical engineering principles and methodologies to biochemical, biological, medical and ecological problems. Pr.: Ch. E. 615.

\section*{GRADUATE CREDIT}

520 810. Research in Chemical Engineering. Credit arranged. I, II, S. Original investigations in transport phenomena, unit operations, thermodynamics, process dynamics, applied chemical kinetics and process development. The results of these investigations may be used for the master's thesis or the doctoral dissertation. 520 815. Advanced Chemical Engineering Thermodynamics. (3) I, II, S. Advanced topics in thermodynamics, with emphasis on chemical and physical equilibria and the estimation of thermodynamic properties. Three hours rec. a week. Pr.: Graduate standing in chemical engineering.
520 822. Advanced Chemical Reaction Engineering. (3) I, II, S. Theory of kinetics and catalysis in homogeneous and heterogeneous systems, with applications in chemical reactor design and process development. Three hours rec. a week. Pr.: Ch. E. 540.

520 826. Advanced Unit Operations I. (3) I, II, S. Advanced study of mass transfer operations. Three hours rec. a week. Pr.: Ch. E. 540.
520 832. Advanced Unit Operations I. (3) I, II, S. Advanced study of the operations involving mechanical separation of materials. Three hours rec. a week. Pr.: Ch. E. 540.

520 850. Advanced Chemical Process Dynamics. (3) I, II, S. The dynamical behavior of chemical reaction systems and process equipment used in chemical plants. Control mechanisms for these systems. Three hours rec. a week. Pr.: Graduate standing in chemical engineering.
520 855. Chemical Engineering Analysis II. (3) I, II, S. Cont. of Ch. E. 635. Mathematical and statistical methods applied to chemical engineering problems. Three hours rec. a week. Pr.: Ch. E. 635.

520 862. Advanced Transport Phenomena I. (3) I, II, S. Advanced treatment of momentum, energy and mass transport, with emphasis on momentum transport in chemical engineering applications. Three hours rec. a week. Pr.: Ch. E. 635.

520 867. Advanced Transport Phenomena II. (3) I, II, S. Advanced treatment of momentum, energy and mass transport, with emphasis on energy and mass transport in chemical engineering applications. Three hours rec. a week. Pr.: Ch. E. 862.
520 871. Advanced Process Design and Optimization. (3) I, II, S. Advanced problems in the optimal design and economic evaluation of plant equipment and processes for the chemical and allied industries. Three hours rec. a week. Pr.: Ch. E. 540, 635.
520 875. Graduate Seminar in Chemical Engineering. (1) I, II. Discussion of current advances and research in chemical engineering and related fields.
520 901. Selected Topics in Reaction Engineering. (3) I, II, S. Advanced study in this field of such topics as complex reactions, catalysis, dispersion effects, fast reactions, reactions in fluidized beds. Three hours rec. a week. Pr.: Ch. E. 822 and one course in chemical engineering numbered 851 or higher
520 910. Selected Topics in Transport Phenomena. (3) I, II, S. Subjects of current interest such as surface phenomena, turbulent transport, droplet mechanics, multi-component systems. Three hours rec. a week. Pr.: Ch. E. 867.

520 915. Selected Topics in Process Dynamics. (3) I, II, S. Study of the most recent methods for analysis of the dynamic behavior and control of complex systems and industrial processes. The use of Lyupanov theorems and the maximum principle are examples of the methods to be studied. Three hours rec. a week. Pr.: Ch. E. 850 and one graduate course in chemical engineering numbered 851 or higher.
520 920. Selected Topics in Unit Operations. (3) I, II, S. Study of such topics as zone melting, foam fractionation, membrane permeation, therinal diffusion, and unsteady state operations. Three hours rec. a week. Pr.: Ch. E. 826 or 832 and one course in chemical engineering numbered 851 or higher.
520 925. Selected Topics in Process Design and Optimization. (3) I, II, S. Study of advanced methods of process design and optimization, such as modern variational methods and dynamic programming. Applications to be chosen mainly from the chemical and
allied industries to include stochastic as well as deterministic problems. Three hours rec. a week. Pr.: Ch. E. 871.

520 930. Selected Topics in Thermodynamics. (3) I, II, S. Advanced study in this field of such topics as irreversible thermodynamics, solution theory, and surface phenomena. Three hours rec. a week. Pr.: Ch. E. 815 and one course in chemical engineering numbered 851 or higher.

\section*{Civil Engineering}

JACK B. BLACKBURN, Head of Department
Professors Blackburn,* Smith,* and Snell;* Associate Professors Cooper, \({ }^{*}\) Rosebraugh,* and Williams;* Assistant Professors Funk, \({ }^{*}\) Schmid, \({ }^{*}\) Swartz,* Wallace, \({ }^{*}\) and Zovne; Emeritus: Professors Crawford, Frazier, and Morse.

The civil engineer designs and builds: structures, including buildings, bridges, tunnels, towers, air frames and space vehicles; transportation facilities, including highways, airports, waterways, railways and pipelines; water supply facilities, including treatment plants and distribution systems; waste disposal facilities, including treatment plants and collector systems; water resource facilities, including dams, canals and reservoirs; flood control facilities, including levees, dikes, retention basins and bank protection. The objectives of the Curriculum in Civil Engineering are to prepare the student for participating in, and ultimately assuming responsibility for, the planning, analysis, location and design of the abovenamed types of civil engineering works.

\section*{GRADUATE STUDY}

The Master of Science degree is conferred on those who complete the degree requirements in: Structural Analysis and Design; Soil Mechanics and Foundations; Hydraulic Engineering, Sanitary Engineering, Highway and Traffic Engineering; Transportation Planning; and Surveying and Mapping. Laboratory facilities for advanced study and research are available in the areas of Structures, Soil Mechanics, Hydraulics, Sanitary Engineering, Transportation, Photogrammetry, Photo Interpretation, Surveying and Mapping.

\section*{Courses in Civil Engineering}

\section*{UNDERGRADUATE CREDIT}

525 115. Engineering Assembly. (0) I, II.
525 212. Elementary Surveying Engineering. (3) I, II Coordinates, directions, distances and elevation. Traverses. Boundary Surveys. Leveling. National rectangular coordinate systems. Property descriptions: public land subdivision and metes and bounds. Topographic surveys. Surveying planning and estimating. One hour lec. and six hours lab. a week. Pr.: Math. 150 or equiv.
525 214. Route Surveying. (3) I, II. Curves and earthwork; surveying pertaining to alignment of highways and railways. Two hours rec. and three hours lab. a week. Pr.: C. E. 212.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

525 411. Photogrammetry. (3) I, II. Principles of terrestrial and aerial photogrammetry; theory and use of stereoplotters; construction of mosaics, flight maps, and planimetric maps. Two hours rec. and three hours lab. a week. Pr.: C. E. 212; Pr. or conc.: C. E. 214.
525 422. Soil Mechanics. (3) I, II. Identification, classification, and engineering properties of soils; theory and application of consolidation, compressibility, and strength of soils; ground water retention and movement; slope stability and lateral earth pressures; stress distribution in soil. Two hours rec. and 3 hours lab. a week. Pr.: Ap. M. 415.
525 428. Foundation Engineering. (3) I, II. Prediction of soil variation; soil investigations; stress distribution and bearing capacity; dewatering analysis and procedures; retaining structures and lateral earth pressure; shallow foundations, pile foundations; underpinning and grouting. Two hours rec. and three hours lab. a week. Pr.: C. E. 422. Pr. or Conc.: C.E. 444
525 431. Analysis of Statically Determinate Structures.
(3) I, II. Analysis of statically determinate beams, frames, and trusses; calculation of influence lines and deflections. Two hours rec. and three hours lab. a week. Pr.: Ap. M. 415.
525 432. Analysis of Statically Indeterminate Structures. (3) I, II, S. Elastic analysis of statically indeterminate beams, frames, trusses; introduction to force and displacement methods using matrix algebra. Two hours rec. and three hours lab. a week. Pr.: C. E. 431.
525 443. Structural Engineering in Metals. (3) I, II, S Theoretical, experimental and practical bases for proportioning metal members and their connections; design of steel structures. Two hours rec. and three hours lab. a week. Pr.: C. E. 432.
525 444. Structural Engineering in Concrete. (3) I, II, S. A study of the theories of reinforced concrete and of its characteristics as a construction material; design of reinforced concrete structures. Two hours rec. and three hours lab. a week. Pr.: C. E. 432.
525 451. Hydrology. (2) I, II. A study of the sources of supply and movement of underground and surface waters. Two hours rec. a week. Pr.: Ap. M. 471.
525 452. Hydraulic Engineering. (3) I, II. Applications of the principles of fluid mechanics to control and utilization of water; reservoir, dam, and spillway design; enclosed
conduit and open channel design; hydraulic machinery and hydro-power development; principles of fluid measurement; laboratory - flow and velocity metering, hydraulic models, pipe losses, open channel flow. Two hours rec. and three hours lab. a week. Pr.: C. E. 451.
525 463. Sanitary Engineering Fundamentals. (3) I, II. Basic concepts from chemistry and microbiology and their applications to the determination and control of water quality and to the techniques employed in biological waste treatment. Two hours rec. and three hours lab. a week. Pr.: Chem. 250 or equiv.
525 465. Sanitary Engineering Design. (3) I, II. Design of water supply and waste treatment control facilities, including collection, storage, treatment, and distribution systems. Two hours rec. and three hours lab. a week. Pr.: C. E. 452 and 463.

525 471. Transportation Engineering. (3) I, II. The development, economic feasibility, method of financing, location, geometric design, and operational analysis of transportation systems. Two hours rec. and three hours lab. a week. Pr.: C. E. 422.
525 485. Civil Engg. Project. (1-3) I, II. A laboratory design or research problem selected by the student. Requires a review of the literature; the preparation of a proposal which describes the project; the completion of the design or research; and, the preparation of a report. Maximum cr. hrs.: 3. May be substituted for a required senior design course on recommendation of instructor and approval of the department head

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

525 618. Engineering Photo Interpretation. (3) I. Photo interpretation techniques, types of aerial photographic film and their uses; applications in land use studies, land surveying, site selection, rainfall runoff and stream flow, location of construction materials, and in the determination of soil properties; other applications. Two hours rec. and three hours lab. a week. Pr.: Senior standing and consent of instructor.
525 622. Soil Mechanics II. (3) I. Review of identification, classification, and engineering properties of soils; stress distribution in the soil; advanced study of strength and compressibility of soil, and of soil moisture and ground water movement. Three hours rec. a week. Pr.: C. E. 422. 525 624. Advanced Soil Testing for Engineering Purposes. (3) II. Physical characteristics and classification of soil materials; consolidation and compressibility tests; unconfined, direct, and triaxial shear tests. One hour rec. and six hours lab. a week. Pr.: C. E. 422.
525 628. Advanced Foundation Engineering. (3) II. Advanced studies of soil investigations; analysis and design of retaining structures, shallow foundations, pile foundations and dewatering systems; analysis and repair of failed structures; legal aspects of foundation engineering. Two hours rec. and three hours lab. a week. Pr.: C. E. 444 and C. E. 428.
525 632. Advanced Structural Analysis I. (3) I, II. Application of matrix methods of analysis to complex structures; selected topics in structural analysis. Three hours rec. a week. Pr.: C. E. 432.
525 633. Experimental Structural Analysis. (3) II. Application of Muller-Breslau's Principles and Betti's Law to structural models; principles of similitude. One hour rec. and six hours lab. a week. Pr. : C. E. 432.

525 641. Behavior of Structural Materials. (3) I. Studies of mechanical properties of structural engineering materials and their application to structural design. Effects of static and cyclic loadings and timetemperature variations. Aspects of statistical analysis of brittle fractures. Three hours rec. a week. Pr.: Ap. M. 418.

525 643. Advanced Reinforced Concrete Theory. (3) I. Advanced theories and methods of design and analysis of reinforced concrete structures. Three hours rec. a week. Pr.: C. E. 444
525 670. Geometric Design of Highways. (3) II. Criteria controlling geometric design of highways, vehicle requirements, speed volume, capacity safe grades, alignment, and cross-section; intersections and interchanges. Two hours rec. and three hours lab. a week. Pr.: C. E. 471.

525 675. Airport Design. (3) I. On demand. Problems encountered in planning, design, construction, and maintenance of large airports. Two hours rec. and three hours lab. a week. Pr.: C. E. 471.
525 751. Hydraulics of Open Channels I. (3) I. Properties of open-channel flow; types of open channels; conservation of mass, momentum, and energy; critical, uniform, and gradually varied flow; design of erodible channels; rapidly varied flow. Three hours rec. a week. Pr.: C. E. 452.
525 762. Water Supply and Quality Control. (3) I. An indepth study of the basic physical, chemical, and biological factors and their application in the design of water supply and water quality control systems. Three hours rec. a week. Pr.: C. E. 465 or equiv.
525 766. Waste Treatment Systems. (3) II. A study of waste treatment systems applied to domestic and industrial wastes. Emphasis is placed on the basic physical, chemical, and biological concepts applicable to the design of conventional and advanced waste treatment systems. Three hours rec. a week. Pr.: C. E. 465 or equiv.
525 771. Urban Transportation Analysis I. (3) I. Origindestination surveys, land-use inventories, parking and transit studies; arterial street standards and operating characteristics; coordination of city planning. Two hours rec. and three hours lab. a week. Pr.: C. E. 471 or consent of instructor.
525 774. Pavement Design. (3) II. On demand. Methods of evaluating the load-carrying capacity of soil subgrade, sub-base, and base courses; critical analysis of the methods of design for flexible and rigid pavements; methods of increasing the load-carrying capacity of highway and airport pavements. Two hours rec. and three hours lab. a week. Pr.: C. E. 422.
525 775. Traffic Engineering 1. (3) I. Driver, vehicle and roadway characteristics; speed and volume studies; congestion and accident studies; signs, signals, and pavement marking as traffic control devices; parking studies, screenline and corridor analyses; highway and intersection capacity. Two hours rec. and three hours lab. a week. Pr.: C. E. 471 or consent of instructor.
525 780. Economics of Design and Construction. (3) I. Selection of alternative engineering design and construction solutions through study of unit cost determination, cost estimating and financing procedures. Introduction to construction scheduling. Three hours rec. a week. Pr.: Senior standing in engineering or graduate standing for non-engineering majors.

525 786. Regional Planning Engineering (3) I. Engineering problems involved in regional planning; the design and location of streets and highways, water supply and sanitary facilities, drainage and public utilities; rights of way and easement. Two hours rec. and three hours lab. a week. For graduate students in regional planning other than civil engineers.
525 790. Problems in Civil Engineering. Credit arranged. I, II, S. Pr.: Approval of instructor.

\section*{GRADUATE CREDIT}

525 810. Research in Civil Engineering. Credit arranged. I, II, S. Original investigation or advanced study in some field related to the practice of civil engineering. Pr.: Approval of department head.
525 822. Soil Mechanics of Embankments. (3) I. Application of soil mechanics to cutting and filling operations for the construction of embankments; soil investigations; slope stability; stability and settlement of embankments; structures in embankments. Water control in and through embankments. Two hours rec. and three hours lab. a week. Pr. or conc.: C. E. 622.
525 823. Engineering Properties of Cohesive Soils. (3) I. Mineralogy and structures of clay minerals; fabric and bonding of the clay particles; compressibility and strength characteristics of clays; moisture effects, retention and movement through clay. Two hours rec. and three hours lab. a week. Pr. or conc. : C. E. 622.
525 826. Engineering Properties of Cohesionless and Mixed Soils. (3) II. Mineralogy and physical characteristics; fabric and bonding in mixed soils; compressibility and strength characteristics; moisture effects, retention, and movement. Two hours rec. and three hours lab. a week. Pr. or conc.: C. E. 624.
525 831. Advanced Structural Theory. (3) I. On demand. Current and developing topics in advanced structural theory. Three hours rec. a week. Pr.: Approval of instructor.
525 832. Advanced Structural Analysis II. (3) II. Influence lines for statically indeterminate structural systems such as continuous beams, trusses, arches, and continuous arches; introduction to the analysis of shell structures. Three hours rec. a week. Pr.: C. E. 632.
525 834. Numerical Solution of Advanced Structural Systems. (3) II. Numerical methods of calculating deflections, moments, and eigen-values; analysis of advanced structural systems by finite difference techniques. Three hours rec. a week. Pr.: C. E. 632, Math. 551 or 761.
525 835. Structural Dynamics. (3) I. Analysis of structures subjected to dynamic loading. Three hours rec. a week. Pr.: C. E. 632, 834.
525 843. Prestressed Concrete Design. (3) II. The study of prestressing methods and their application to the design of concrete structures. Three hours rec. a week. Pr.: C. E. 444.
525 844. Plastic Design of Steel Structures. (3) I. Fundamental principles of plastic design, methods of analysis of steel structures for ultimate load; influence of axial force and shear force on the plastic moment; stability problems in plastic design; design of the more common continuous structures. Three hours rec. a week. Pr.: C. E. 443.

525 845. Analysis and Design of Folded Plate Structures. (3) II. Theoretical foundation of folded plate analysis; bending theory for prismatic folded plate structures; matrix formulation; folded plates with nonsymmetric loading; continuous folded plate structures; prismatoidal and triangular plate structures. Three hours rec. a week. Pr. C. E. 632, Ap. M. 601.
525 848. Advanced Structural Design. (3) II. On demand. The design of complex steel and-or reinforced concrete structures; individual projects. Three hours rec. a week. Pr.: C. E. 632; minimum of nine hours graduate credit in structures and approval of instructor.
525 849. Design of Shell Structures. (3) I. The design of reinforced concrete shells of single and double curvature. Three hours rec. a week. Pr.: C. E. 832.
525 851. Hydraulics of Open Channels II. (3) II. Spatially varied flow; flow in channels of non-prismatic crosssection and nonlinear alignment (transitions); unsteady free-surface flow; flood routing; numerical simulation of unsteady open-channel flow. Three hours rec. a week. Pr.: C. E. 751.
525 854. Analysis of Groundwater Flow. (3) II. Darcy's law; general hydrodynamic equations of porous media flow; confined and unconfined flow, Dupuit's theory; conformal mapping techniques; flow under and through dams; seepage from canals and ditches; seepage toward wells and well hydraulics; problems of unsaturated or turbulent flow through porous media. Three hours rec. a week. Pr.: C. E. 422, 452, Math. 550 or equiv.
525 855. Analysis and Design of Large Dams. (3) II. Site selection and preliminary investigations; types of large dams and their uses; stability and stress analyses of gravity, arch, and buttress dams; problems related to earth dams. Three hours rec. a week. Pr.: C. E. 632, Ap. M. 601 .

525 863. Advanced Topics in Sanitary Engineering. (13) On Demand. For graduate students in Sanitary Engineering. The course provides a forum for the discussion of advanced topics in Sanitary Engineering. Research being conducted at this and other institutions is analyzed critically.
525 871. Urban Transportation Analysis II. (3) II. Trip forecasting, trip generation, trip distribution and trip assignment; accuracy checks; planning parking facilities; study of models used in transportation planning; transportation systems and plans evaluation. Two hours rec. and three hours lab. a week. Pr.: C. E. 771.
525 875. Traffic Engineering II. (3) II. Theory of traffic flow; design of traffic control devices and signal systems; application of statistical methods to traffic engineering problems. Two hours rec. and three hours lab. a week. Pr.: C. E. 775.

\section*{Electrical Engineering}

WELLINGTON W. KOEPSEL,* Head of Department
Professors Koepsel," Ward, Jr.," and Lucas;" Associate Professors Ahmed," Lenhert," Casey," Harris," and Wirtz;' Assistant Professors Bernotski, \({ }^{*}\) Calhoun, Cottom,* Gallagher,* Hummels, Johnson,* and Kaufman;* Instructors Alnema, Dollar, Hearn, Rosenkranz, Wakabayashi, and Walker; Emeritus: Professors Hunt, Jorgenson, Kerchner, Kloeffler, and Sitz.

The program of study in electrical engineering prepares a student for a career in research, development, design, operation and plant engineering, manufacturing, technical sales and application engineering in the profession of electrical engineering. Fields of employment are in such areas as microelectronics and integrated circuits, communication systems, automatic control, analog and digital computers, power systems, lasers, microwave devices and systems, bioengineering, and solid state devices. An individual upon completing his program of study will find employment opportunities with industrial organizations, the government, utilities, consulting firms and educational institutions. Opportunities also exist for baccalaureate degree holders to enter such fields as medicine, law and business administration.
The first two years of the curriculum are mathematics and physical sciences oriented while the third year emphasizes analysis and the fundamental concepts of electrical engineering. The fourth and final year broadens the student's understanding of engineering and introduces him to various aspects of electrical engineering design. Humanities and social science electives are available for the student as well as technical electives. The latter are usually chosen from such fields as communication systems, solid state engineering, integrated circuits, control systems, radar, power systems, energy conversion, computer systems, and microwaves.

\section*{GRADUATE STUDY}

The Department of Electrical Engineering offers programs of study leading to the Master of Science and Doctor of Philosophy degrees with areas of specialization in circuit theory, electromagnetic theory, bioengineering, information and communication systems, solid state engineering and integrated circuit technology, control
systems and computer technology. Wellequipped laboratory facilities are available for conducting original research in all of these areas.

Prerequisite to graduate study in the departruent is the completion of a program of study substantially equivalent to that required of undergraduate students in electrical engineering at this institution.
Special facilities available for graduate research include a 600 KeV Cockcroft-Walton Accelerator which the Department operates for research in ion implantation and ion beam technology, an Electromagnetics Research Laboratory for research in scattering in the frequency range of 8.2 GHz to 18.0 GHz , and a Solid State and Thin Film Technology Laboratory. The latter is equipped with a clean room, vacuum equipment, photographic reduction equipment, clean air benches, diffusion furnaces, and other specialized equipment for use in microelectronics. An analog and small digital computing facility is also available in the Department. The University Computing Center, housing a digital computer, is available generally for graduate instruction and research.

\section*{Courses in Electrical Engineering}

\section*{UNDERGRADUATE CREDIT}

530 355. Introduction to Computer Engineering. (3) I, II. Simple coding schemes, Boolean algebra fundamentals, elements of digital building blocks such as gates, flipflops, shift-registers, memories, etc., basic engineering aspects of computer architecture and elements of machine language. Three hours rec. a week. Pr.: Comp. Sci. 315 or equivalent.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

530 401. Circuit Theory I. (3) I, II, S. An introduction to linear circuit theory; analysis of linear circuits containing resistance, inductance and capacitance. Three hours rec. a week. Pr. or conc.: Math. 240 or equivalent, Phys. 311.
530 403. Elec tric Circuits and Control. (4) I, II. Principles of direct-current circuits and machines, alternatingcurrent circuits and machines, electronics, and application to instrumentation and control. Four hours rec. a week. Pr.: Phys. 311.
530 404. Circuit Theory II. (4) I, II, S. Steady-state and transient analysis of electric circuits using Laplace transforms. Three hours rec. a week and a three-hour calculation period each week. Pr.: Math. 240, E. E. 401. 530 405. Circuit Theory III. (3) I, II, S. One and two port network theory. Three hours rec. a week. Pr.: E. E. 404.

530 415. Electronics I. (3) I, II, S. Fundamentals of electronic devices. Three hours rec. a week. Pr.: E. E. 401.

530 416. Electronics II. (3) I, II, S. Analysis and design of electronic circuits. Three hours rec. a week. Pr.: E. E. 404, 415.
530 417. Electronics III. (3) I, II. Cont. of Electronics II. Three hours rec. a week. Pr.: E. E. 416.
530 431. Electrical Engineering Laboratory I. (2) I, II. Electrical engineering laboratory experiments on topics selected from and correlated with the concurrent or prerequisite courses. Three hours lab. a week. Pr. or conc.: E. E. 404, 415, 497.
530 432. Elec trical Engineering Laboratory II. (2) I, II, S. Cont. of Electrical Engineering Laboratory I. Three hours lab. a week. Pr.: E. E. 431; Pr. or conc.: E. E. 416, 501.

530 433. Electrical Engineering Laboratory III. (2) I, II. Cont. of Electrical Engineering Laboratory II. Three hours lab. a week. Pr.: E. E. 432; Pr. or conc.: E. E. 510. 530 434. Electrical Engineering Laboratory IV. (2) I, II, S. Cont. of Electrical Engineering Laboratory III. Three hours lab. a week. Pr.: E. E. 433.
530 497. Electromagnetic Theory I. (3) I, II. Vector analysis, electrostatics, magnetostatics, Maxwell's equations, and applications. Three hours rec. a week. Pr.: Phys. 311, Math. 240; Pr. or conc. : E. E. 401.
530 498. Electromagnetic Theory II. (3) I, II. Cont. of Electromagnetic Theory I. Three hours rec. a week. Pr.: E. E. 497.

530 501. Energy Conversion I. (3) I, II, S. Energy conversion principles and their application to electric energy converters operating in the static and the dynamic mode. Three hours rec. a week. Pr.: E. E. 404 and 497.
530 502. Energy Conversion II. (3) I, II, S. Cont. of Energy Conversion I. Three hours rec. a week. Pr.: E. E. 501.

530 510. Control Systems Design. (3) I, II. Modeling, analysis, and design of control systems. Three hours rec. a week. Pr.: Senior standing or consent of instructor.
530 530. Electrical Engineering Seminar. (1) I, II. Preparation and oral presentation of a written technical report. One hour rec. a week. Pr.: Senior standing in electrical engineering.
530 540. Computer Logic Design. (3) I. Simplification of logical algebra statements, study of digital logic hardware, basic design considerations of combinatorial, sequential and pulsed circuits, symmetric circuits, decoders, counters, adders and registers. Three hours rec. a week. Pr. : E. E. 355, Pr. or conc.: E. E. 416.
530 544. Digital Circuits Laboratory. (2) I, II. Practical aspects of digital system design including threshold voltage levels, propagation delay, clock requirements, interfacing problems associated with other logic systems and analog devices. Three hours lab. a week. Pr.: E. E. 540 and E. E. 432.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

530 608. Wave Guides, Antennas and Propagation. (3) I, II. Applications of Maxwell's equations to boundary value problems, guided transmission, cavities, radiation and propagation. Three hours rec. a week. Pr.: E. E. 498.

530 610. Problems in Electrical Engineering. Credit arranged. I, II, S.
530 620. Analog Computation. (3) II. Analog computer solution and simulation of engineering problems. Two hours rec. and three hours lab. a week. Pr.: Math. 240 or equiv.; Phys. 212 or 311, E. E. 416 or consent of instructor. 530 630. Transistor Circuitry. (3) I, II. Analysis and design of circuits using integrated and discrete circuit components. Three hours rec. a week. Pr.: E. E. 416.
530 645. Introduction to Communication Theory. (3) I, II. An introduction to communication systems including modulation, transmission, demodulation, random noise and information. Three hours rec. a week. Pr.: E. E. 416.
530 650. Operational Circuit Analysis. (3) I. Transformation methods applied to the solution of linear lumped and distributed parameter systems. Three hours rec. a week. Pr.: E. E. 404.
530 651. Design of Digital Systems I. (3) I. Design considerations of special purpose counters and registers, computer input-output devices, A-D and D-A conversion, magnetic memory devices and systems, digital arithmetic devices, clocks and clock control. Three hours rec. a week. Pr.: E. E. 540.
530 652. Design of Digital Systems II. (3) II. Hardware aspects pertaining to computer organization, data representation, data flow circuits, storage organization and searching, input-output processes. Three hours rec. a week. Pr.: E. E. 651.
530 660. Digital Network Theory. (3) I. Difference equation characterization of digital networks, transient and steady-state analysis of digital networks using the Ztransform, transfer function representation of digital filters, implementation of digital filters. Three hours rec. a week. Pr. : E. E. 404 or permission of instructor
530 665. Pulse Techniques. (3) II. A study of basic pulse circuits and their applications leading to an understanding of radar display circuits, computer components, and pulse modulation methods. Three hours rec. a week. Pr.: E. E. 417.
530 680. Power System Stability. (3) II. The analysis of power systems under transient and steady-state conditions. Three hours rec. a week. Pr.: E. E. 502.
530 685. Integrated Circuits Engineering. (3) I, II. An introduction to the major processes used in the design and fabrication of integrated circuits. Two hours rec. and three hours lab. a week. Pr.: Consent of instructor.
530 690. Solid-State Engineering. (3) I, II. Elastic, thermal, electric and magnetic properties of crystals and metals; conduction in metals and semiconductors; solid state devices. Three hours rec. a week. Pr.: E. E. 498; Phys. 400 or N. E. 410 or 450.
530 705. Control Theory Applied to Bioengineering. (3) I. Development of mathematical models used in the study and analysis of physiological control systems providing techniques for varying pertinent biological parameters.
Three hours rec. a week. Pr. or conc. : E. E. 510 or M. E. 612 or equivalent basic physiology and analog computer courses.
530 710. Theory and Techniques of Bioinstrumentation. (3) II. Theoretical aspects of biological signals, electrodes, transducers and processing equipment with special emphasis on the acquisition and recording of the responses to electrical potentials, pressure and flow
measurements. Laboratory work illustrating specific instrumentation and surgical procedures is included. Three hours rec. a week with time allowance for four or five laboratories during the semester. Pr.: E. E. 705 or consent of instructor.

\section*{GRADUATE CREDIT}

530 805. Advanced Feedback Control Systems. (3) II. A second course in the analysis and design of feedback control systems using both classical and modern control theory. Both linear and nonlinear systems are considered. Three hours rec. a week. Pr.: E. E. 520.
530 806. Sa mpled-data Control Systems. (3) On sufficient demand. Analysis and design of sampled-data control system using Z-transforms; study of digital computer controlled systems. Three hours rec. a week. Pr.: E. E. 520.

530 808. Optimal Control Systems. (3) On sufficient demand. A study of the methods of the optimization of feedback control systems, with particular emphasis placed on Pontryagin's maximum principles and Belman's functional analysis. Three hours rec. a week. Pr.: E. E. 805.
530 810. Research in Electrical Engineering. Credit arranged. I, II, S. Special research problems in electrical engineering. Pr.: E. E. 417.
530 815. Information Theory. (3) II. Information as a measure of uncertainty, zero-memory and Markov sources, coding of information sources, channels and mutual inf ormation, reliable transmission via unreliable channels, error correcting codes. Three hours rec. a week. Pl․: E. E. 645.
530 821. Noise Theory. (3) I. Study of noise phenomena and measurement; the representation of noise by statistical parameters, the noise factor of undesired noise sources, and the measurement applications of noise generators. Three hours rec. a week. Pr.: E. E. 645.
530 826. Signal Processing and Classification. (3) I, II. Theoretical considerations and applications of Fast Fourier Transform, Fast Hadamard Transform, Spectral analysis using Binary Fourier representation, digital filtering and fundamentals of pattern classification using learning machines. Three hours rec. a week. Pr.: E. E. 860 or equivalent and Stat. 610 or equivalent, or consent of instructor.
530 831. Modulation Theory. (3) II in alt. years. A study of the most widely used modulation systems, with particular emphasis on the evaluation of their performances in modern communication systems. Three hours rec. a week. Pr.: E. E. 821.
530 836. Network Synthesis I. (3) I. Basic properties of network functions. Passive synthesis of driving point impedances, transfer functions and transfer impedances. Three hours rec. a week. Pr.: E. E. 405 or consent of instructor.
530 837. Network Synthesis II. (3) II. Active synthesis of driving point impedances, transfer functions and transfer impedances using operational amplifiers, gyrators and negative immittance converters. Three hours rec. a week. Pr.: E. E. 836.
530 855. Advanced Electromagnetic Theory I. (3) I. Mathematical development of electromagnetic wave theory. Three hours rec. a week. Pr.: E. E. 608.

530 856. Advanced Electromagnetic Theory II. (3) II. Plane waves in unlimited isotropic media, cylindrical waves, spherical waves, radiation, and boundary value problems. Three hours rec. a week. Pr.: E. E. 855.
530 857. Microwave Theory. (3) On sufficient demand. Wave equation and its solution for rectangular and cylindrical wave guides, wave guide discontinuities and equivalent impedance representation, periodic structures, surface wave guides, microwave resonators, millimeter waves. Three hours rec. a week. Pr.: E. E. 855.

530 858. Antenna Theory. (3) On sufficient demand. Principles of radiation, directivity, and other characteristics of antenna systems; linear, short-wave beam and fire, omnidirectional, wide-band, slot, horn, and parabolic antennas; reflectors and lenses. Three hours rec. a week. Pr.: E. E. 855.
530 859. Radar Systems. (3) On sufficient demand. A study of radar systems including radar cross section, noise in target detection, doppler radar, scanning systems, propagation effects and error analysis; radar transmitters, receivers, antennas, and displays. Three hours rec. a week. Pr.: E. E. 855.
530 860. Matrix Methods Applied to Electrical Engineering. (3) I. Applications of matrices and linear vector spaces to electrical systems. Three hours rec. a week. Pr.: E. E. 405.
530 865. Advanced Information Theory Seminar. (3) II. Further theory of error correcting codes, study of recent developments in information theory as applied to analog and digital communication techniques, introduction to communication via satellite. Three hours rec. a week. Pr.: E. E. 815, 821.
530 880. Advanced Electrical Theory. Credit arranged. I, II. Pr.: E. E. 417.

\section*{General Engineering}

RALPH G. NEVINS, Dean

\section*{UNDERGRADUATE CREDIT}

500 110. Engineering Lectures. (0) I. Designed to acquaint freshman engineers with fundamental principles of their profession and to give a general survey of career opportunities in engineering. One hour of lecture a month. The dean, other members of the faculty, and visiting practicing engineers will present the lectures.
500 160. Engineéring Concepts. (2) I, II. An introduction to engineering and engineering design. Problems involving the basic concepts of engineering science are considered. Two class periods per week.
500 200. Kansas State Engineer Journalism. (1) I, II. Editorial and business staff work on the Kansas State Engineer. Pr.: Junior classification and consent of dean.
500 250. Impact of Engineering Technology on Society. (3) I, II. A study of social, economic and environmental problems as a function of technology. Study of various significant technological developments on present society and parallels with present developments. Study of current problems, detection of causes, and analysis of solutions. Implications for the future; governmental, industrial, and individual responsibility in detection of potential problems and methods of control or solution. Three hours rec. a week.

500 325. Cooperative Work Experience. (1) I, II, S. Industrial assignment on Engineering Work-Study Program. May not be taken for more than four sessions for credit. Pr.: Approval of program coordinator.
500 399. Honors Seminar in Engineering. (1) I, II. Selected topics of general interest. Open to sophomores in the Engineering Honors Program for two semesters.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

500 401. Seminar in Engineering. (1) I, II, S. Selected topics of general interest. Open to undergraduate students from all colleges.
500 402. Research in Engineering. Variable credit. I, II, S. Individual or group research problem selected with approval of faculty advisor.
500 499. Honors Colloquium in Engineering. (1) I, II. Selected topics of general interest. Open to juniors in the Engineering Honors Program for two semesters.
500 599. Honors Research in Engineering. (1) I, II. Individual research problem selected with. approval of faculty advisor. Open to seniors in the Engineering Honors Program for two semesters. Written report is presented at end of second semester.

\section*{Industrial Engineering}

FRANK A. Tillman,* Head of Department
Professors Bennett, Konz,* Lee," Smaltz,* and Tillman;" Associate Professors Ashour,* Bussey, L. Grosh,' Hwang," and Woodard;* Assistant Professors Byers, D. Grosh, Hansen, and Roth; Instructor Nelson; Emeritus Professors Clifton, Darby, Dietrich, and Hostetter.
The Curriculum in Industrial Engineering emphasizes the design, improvement, and installation of integrated systems of men, materials, and equipment. Studies in mathematical, physical, and social sciences are united with a modern approach to principles of engineering analysis and designed to specify, predict and evaluate the results of any industrial system. In addition, strong consideration is given to the economic and human factors involved in industrial operations.
Industrial engineers find opportunities in all types of businesses and industries and in many different activities. Graduates may be engaged in staff positions in work study, work flow design, safety engineering, economic analysis, process design, process control, cost control, operations research, and many other areas.
In addition, their unique background makes them unusually well-fitted for positions in manufacturing management. Managers need factual information arranged to define different alternatives and their consequences to
help recognize and solve existing problems. Industrial Engineering collects, analyzes and arranges this information in such a way as to fulfill this need, at the same time continuing to search for better ways to do the job at less financial and human cost.

The remarkable strides made by the industrial engineering profession during the past several years are reflected in the courses and curriculum. The use of newly developed techniques and fresh interpretations of more traditional approaches to industry's problems helps to keep the offerings current.

\section*{GRADUATE STUDY}

The Department of Industrial Engineering offers advanced work leading to the degrees Master of Science and Doctor of Philosophy with special emphasis on modern quantitative solution of industrial problems. Course work and research may be conducted in varied industrial areas including processing and control systems, and human factors engineering. Several strong minors are available in the College of Engineering and College of Liberal Arts.

Prerequisite to graduate work in these fields is the completion of an undergraduate curriculum in engineering or science which satisfies the major areas required in the undergraduate industrial engineering curriculum at Kansas State University.

Facilities and equipment for advanced study and research are extensive with majors in the department having access to both the College of Engineering and University computer centers.

\section*{Courses in Industrial Engineering}

\section*{UNDERGRADUATE CREDIT}

550 115. Engineering Assembly. (0) I, II. Presentation by students of abstracts and reviews of articles in the journals of their respective societies or in the technical press of their profession, and reports of engineering projects, industrial experiences, and original investigations conducted by the student branches of the professional engineering societies. Occasionally two or more of these individual groups unite for lectures by practicing engineers and by members of the engineering and university faculties. One hour of lecture a week, sophomore, junior, and senior years.
550 220. Introduction to Industrial Engineering. (2) I. Basic functions in industrial organization and their interrelationships; management consideration involving product, process, plant and personnel. Two hours rec. a week.

550 221. Industrial Production. (2) I, II. Technical aspects of modern industrial processes employed in the transformation of engineering materials; basic mechanics of metal machining and geometry of chip formation; flow and solidification of molten alloys; cold and hot forming processes; joining; welding and heat treatment. One hour rec. and three hours lab. a week.
550 341. Production Processes. (3) I, II. The study of modern industrial processes for production. Basic mechanics of metal machining and forming; flow and solidification of molten alloys; welding and heat treatment. Emphasis will be placed on actual production operations. One hour rec. and six hours lab. a week.
550 350. Engineering Materials. (2) I, II. Engineering requirements of materials; arrangements of atoms in materials; metallic and ceramic phases and their properties; polymers; multiphase equilibrium and nonequilibrium relationships; modification of properties through changes in microstructure; stability under service stresses, thermal behavior in service; corrosion; behavior in electromagnetic fields; effect of radiation on materials. Two hours rec. a week. Pr.: Chem 230; Pr. or conc.: Phys. 310.
550 351. Engineering Materiais Laboratory. (1) I, II. Laboratory experiments supplementing I. E. 350. Pr. or conc.: I. E. 350.
550 352. Tool Engineering. (3) II. Study of basic metal working processes and the new developments in metal cutting and forming. Design of jigs, fixtures, dies and other tooling for effective production. Two hours rec. and three hours lab. a week. Pr.: Ap. M. 415.
550 371. Computer Applications in Engineering. (1) I, II. Use of Fortran and scientific subroutines in the solution of engineering problems. Sample problems using application programs such as, ADAPT, AUTOSPOT, COGO, ECAP, LPS, PERT. Three hours lab. a week.
550 372. Computers and Data Processing. (2) I, II, S. The use of computers in the solution of engineering and management problems. One hour rec. and three hours lab. a week

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

550 401. Industrial Management. (3) I, II, S. Basic functions in an industrial organization and their interrelationships; management considerations involving product, process, plant and personnel. Three hours rec. a week. Pr.: Sophomore standing in engineering or consent of instructor.
550 425. Design Ergonomics. (2) I. Factors influencing the human use of architectural spaces especially work spaces. Objectives of design include health, performance, comfort and pleasantness, analysis of activities, workspace layout and environmental effects. Pr.: Junior standing and consent of instructor.
550 441. Engineering Reliability and Quality Assurance I. (3) I, II. Quantitative and qualitative controls required by manufacturing industries, with special emphasis on controlling process quality and costs. Three hours rec. a week. Pr.: Stat. 410.
550 451. Work Measurement. (3) I, II. Motion and time study; process analysis and charting; principles of motion economy affecting the design of products; processes or services; micro-motion analysis and an
introduction to standard data systems. Two hours rec. and three hours lab. a week. Pr.: I. E. 221.
550 481. Industrial Plant Studies. (0) II. Trip to industrial centers for study of facilities of special interest to industrial engineering students. Pr.: Junior standing in industrial engineering.
550 502. Industrial Management II. (2) I. Theory and practice of industrial management planning, execution and evaluation as a basis for coordination of the factors of an industrial system. Two hours rec. a week. Pr.: I. E. 401.

550 552. J ob Evalua tion and Wage Incentives. (2) I. Work measurement as a basis for industrial wage systems; a consideration of work factor analysis, job evaluation and wage incentives for production workers. Two hours rec. a week. Pr.: I. E. 451.
550 553. Production Planning and Inventory Control. (3)
I. Principles, techniques and applications of production planning and control, and inventory control. Two hours rec. a week. Pr.: I. E. 372 and Math 222.
550 554. Industrial Facilities Layout and Design. (3) II. Comprehensive design of an industrial production system; application of undergraduate industrial engineering sequence. Two hours rec. and three hours lab. a week. Pr.: I. E. 511.
550 571. Introduction to Operations Research I. (3) I, II, S. Objectives and methods for engineering research; operation analysis, evaluating alternatives in decision making; optimal allocations of resources. Three hours rec. a week. Pr.: Math. 222 or equivalent.
550 572. Introduction to Operations Research III. (3) II. More advanced treatment of topics covered in I. E. 571 as well as related topics not covered which include stochastic models. Three hours rec. a week. Pr.: I. E. 571, I. E. 575, and Stat. 410.
550 573. Industrial Simulation. (3) II. Introduction to modeling of industrial processes using digital simulations. The effect of simulation languages on modeling concepts will be stressed. Three hours rec. a week. Pr.: I. E. 372, I. E. 540.
550 575. Quantitative Techniques in Industrial Engineering. (3) I, II, S. Problem formulation and conceptual models; application of finite mathematics and other techniques to problems of industrial engineering and management. Three hours rec. a week. Pr.: Math. 222.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

550 603. Topics in Industrial Engineering. Credit arranged. I, II, S. Case studies of industrial firms and recent developments in the fields of industrial engineering and management. Pr.: I. E. 401, 571, or consent of instructor.
550 625. The Man-Environment Systems. (3) I, II. Basic structure and performance of the human; viewed as a component in information processing and control systems. Effect of environment. (Cross listed with M. E. 625). Pr.: Senior standing in engineering.

550 651. Standard Data Systems. (3) I. Microscopic and macroscopic standard data systems; commercial versions; company-developed plans; programmed standard data systems. Three hours rec. a week. Pr.: I. E. 372, 552.

550 655. Metal Casting. (3) II. An advanced course in the materials and metals used in modern metals casting processes. Application of metallurgical principles in the study of cast metals. Two hours rec. and three hours lab. a week. Pr.: I. E. 350 and I. E. 221.
550 660. Material Imperfections. (3) II. The nature of a crystal and the structures of materials; X-ray methods involved in the study of materials; preferred orientation and fiber textures; defects in crystals; phase transformation in the solid state; the effects of physical treatments on the crystal lattice of metals; defects in crystals. Two hours rec., three hours lab. a week. Pr.: Phys. 311, I. E. 350.
550 661. Industrial Metallurgy. (3) II. The physical behavior of metals while undergoing various industrial fabrication processes; responses involving plastic flow allotropic transformations, recrystallization, grain growth, diffusion, mechanical and crystallographic fibering, solid-state solution and precipitation. Two hours rec. and three hours lab. a week. Pr.: I. E. 221, I. E. 351.
550 663. Internal Structures of Metals. (2) I. Studies of internal structural phenomena of ferrous and non-ferrous alloys using metallographic and microphysical analyses. One hour rec. and three hours lab. a week. Pr.: I. E. 351. 550 664. Electrochemical Behavior of Metals. (3) I. The electro-chemical processes involved in corrosion of metals and the basic factors determining the nature and rate of attach; consideration of corrosion problems and methods of combatting corrosion. Two hours rec. and three hours lab. a week. Pr.: Chem 230, Phys. 310.
550 671. Structure of Engineering Materials. (2) I. The physical theories of the structure of solids; binding forces in molecular and crystalline materials; crystallography; thermodynamic stability of matter; equilibrium diagrams and The Phase Rule; rate theory and kinetics of solid-state transformations. Two hours rec. a week. Pr.: I. E. 351.
550 672. Mechanical Behavior of Engineering Materials. (2) II. The theoretical consideration of the mechanical behavior of solids; stress and strain; elastic and plastic deformation; dislocations; strength of solid materials; recovery, creep and flow; fracture mechanisms. Two hours rec. a week. Pr.: I. E. 671.
550 701. Engineering Administration. (3) I, S. Engineering project administration; organization dynamics; quantitative factors in decision making; application of computerized and non-computerized games. Two hours rec. and three hours lab. a week. Pr.: I. E. 502 or consent of instructor.

550 711. Advanced Production and Inventory Control. (3) II. Analytical and mathematical methods of making decisions on production, inventories, human resources, and shipping in modern industrial plants. Three hours rec. a week. Pr.: I. E. 511 or consent of instructor.
550 721. Numerical Control of Machine Tools. (3) II. Translation of information on engineering drawings through programming to tape preparation; application of computer programs to simplify control operations. Two hours rec. and three hours lab. a week. Pr.: I. E. 372, 522.

550 751. Applied Design Theory. (3) II. Bayes theorem, Bayesian estimators utility, loss function and risk, minimax strategies, elementary game theory and linear programming. Pr.: Stat. 411 or 610.

550 762. Advanced Metallurgy. Credit arranged. II. Studies in specialized phases and current concepts of metallurgy. Pr.: I. E. 351.
550 766. Powder Metallurgy. (3) II. Production of powders by mechanical and chemical methods; theoretical concepts associated with consolidation, heat treating and internal structural changes of parts produced from powder metals and cermets. Two hours rec. and three hours lab. a week. Pr.: I. E. 663.
550 775. Scheduling Theory. (3) I, II. Project scheduling, assembly line balancing, shop scheduling, basic structure, measures of performance, combinatorial and statistical aspects. Various approaches to the analysis of shop scheduling. Three hours rec. a week.
Pr.: Consent of instructor.

\section*{GRADUATE CREDIT}

550 801. Problems in Industrial Engineering. Cr. Arr. Pr.: Graduate standing in industrial engineering.
550 842. Engineering Reliability and Quality Assurance II. (3). Design and management of reliability programs and quality assurance systems; mathematics of reliability, case studies of reliability evaluation programs. Three hours rec. a week. Pr.: I. E. 441 or consent of instructor.
550 850. Human Engineering I. (3) I. Human factors affecting work; focus on man: energy requirements, lighting, noise, monotony and fatigue, learning, simultaneous vs. sequential tasks; experimental evaluation of concepts. Two hours rec. and three hours lab. a week. Pr. or conc.: Psych. 625 or consent of instructor.
550 852. Human Engineering II. (3) II. Focus on man in system: man-man and man-machine communication; design and arrangement of controls and displays; experimental evaluation of concepts. Two hours rec. and three hours lab. a week. Pr.: Psych. 625 or consent of instructor.
550 865. Simulation of Industrial and Management Systems. (3) II, S. This course is concerned with simulating industrial management systems on computers utilizing Monte Carlo techniques and simulation languages. Numerical methods related to simulation are to be covered. Three hours rec. a week. Pr. or conc.: Stat. 610 or consent of instructor.
550 871. Industrial Queueing Processes. (3) I or II. Introduction to the queueing process and theory of queues; analysis of single and multi-station queues; application to production, materials handling, inventory and maintenance systems. Three hours rec. a week. Pr.: Stat. 610 or equiv.
550 872. Industrial Forecasting Techniques and Applications. (3). The problems of model construction for industrial forecasting. The application of least squares, regression, exponential smoothing and adaptive fitting will be studied in solving industrial engineering problems. Three hours rec. a week. Pr.: Consent of instructor.

550 873. Industrial Systems Analysis. (3) II. Analysis and synthesis of automatic control systems with application to machines and processes and industrial management systems. A study of optimal control, stability, and sensibility of industrial management
systems. Three hours rec. a week. Pr. or conc. : I. E. 575 or equiv.
550 874. Operations Research I. (3) I. A study of the methods of operations research including formulation of models and derivation of solutions by various optimization techniques. Introduction to deterministic models and techniques, including optimization techniques, sequencing and replacement, linear programming, geometric programming and dynamic programming. Three hours rec. a week. Pr. or conc.: I. E. 575 or equiv.

550 875. Operations Research II. (3) II, S. A continuation of I. E. 874. Introduction to stochastic models and techniques including queueing theory, simulation, nonlinear programming, calculus of variations, maximum principle and forecasting. Three hours rec. a week. Pr.: I. E. 874, Stat. 610.
550 881. Linear Programming. (3) II. Development of the theory of linear programming and related topics including simplex method, duality theory, integer programming, transportation methods and stochastic linear programming. Application to industrial problems and the use of computer solutions are emphasized. Three hours rec. a week. Pr.: I. E. 575 or equiv.
550 882. Nonlinear Programming. (3) I or II. Study of nonlinear models and their solution. Topics covered are nonlinear programming including Kuhn-Tucker theory, quadratic programming, separable programming, geometric programming, gradient and search methods, quasi-linearization and invariant imbedding. Three hours rec. a week. Pr.: I. E. 875.
550 883. Dynamic Programming. (3) I or II. A study of the optimization of multistage decision processes based on the application of the principle of optimality. Stochastic and deterministic models are developed. Three hours rec. a week. Pr.: I. E. 874, Stat. 610.
550 885. The Application of the Maximum Principle to Industrial Systems. (3) I. A study of multistage systems optimization by the discrete maximum principle and a study of optimal decision and optimal control of continuous systems by the continuous maximum principle. Applications to production scheduling, inventory controls, transportation problems, economic systems and other industrial management problems. Three hours rec. a week. Pr. or conc.: I. E. 874.
550 890. Advanced Topics in Operations Research. (Var.) I, II, S. ( 6 hrs . maximum). Study of topics related to operations research not covered in other courses. Selected according to the interests and needs of graduate students. May be repeated. Pr.: Consent of instructor. 550 892. Graduate Seminar in Industrial Engineering. (1) I, II. Max. Total: three credit hours. Presentation and discussion of papers on industrial engineering subjects. One two-hour seminar a week.
550 896. Research in Industrial Engineering. Credit arranged. I, II, S. Investigations forming the basis for the master's thesis. Topics selected with approval of major professor and department head.

\section*{Mechanical Engineering}

Professors Appl', Crank*, Duncan*, Flinner*, Hobson*, McNall', Nevins", Rohles*, Tripp*, and Wood; Associate Professors Azer*, Gorton*, Gowdy*, Lindholm*, Miller*, Sprague', Swearingen*, Turnquist*, and Walker*; Assistant Professors Annis*, Ball, and Pauli; Instructors Bell and Nash; Emeritus: Dean Durland; Professors Brainard, Helander, Messenheimer, and Smutz.

Mechanical engineering graduates render professional services that vary from theoretical work in research and development to industrial applications such as design, production, management, sales and operation.
The fields in which these services are performed range from energy utilization and conversion to the design and development of machines and the manufacture of goods. Mechanical engineers are found in aircraft, missile, electronics, power, petroleum and atomic energy industries, to name but a few.
To provide the mechanical engineer with a broad fundamental base, the first half of the curriculum centers on the basic sciences of mathematics, physics, chemistry, and mechanics, which gives a thorough grounding in fundamentals and develops analytical thinking.
The later years include basic courses in thermodynamics, heat transfer, electricity and electronics, fluid mechanics and strength of materials. The principles developed in these courses are then applied to courses which introduce the student to the concepts of design, including the principles of economic design, and to advanced theories applicable to engineering analysis and design. Selected programs of advanced courses in the senior year provide a degree of specialization in the areas of aerospace, machine design, automatic controls, environmental engineering, vibrations, thermodynamics, heat transfer, etc.

\section*{GRADUATE STUDY}

The Department of Mechanical Engineering offers major work leading to the degrees Master of Science and Doctor of Philosophy. Prerequisite to major graduate work in the field of mechanical engineering is the completion of a four-year curriculum substantially equivalent to that required of undergraduates in mechanical engineering at Kansas State University. A student, particularly at the doctorate level, in addition to
his major studies is expected to develop strength in the physical sciences and mathematics by taking course work in those fields deemed appropriate by his supervisory committee.
Advanced work and research are offered in the areas of heat transfer, thermodynamics, air conditioning, energy conversion, automatic control, fluid and gas dynamics, aerodynamics, environmental engineering, biomedical engineering, propulsion systems, engineering design, kinematics and vibrations. Laboratory facilities and basic instrumentation are available for experimental work in these areas. Graduate students also have access to the college's digital and analog computers, and the various engineering laboratories and shops.

\section*{Courses in Mechanical Engineering}

\section*{UNDERGRADUATE CREDIT}

560 115. Mechanical Engineering Assembly. (0) I, II. The professional aspects of Mechanical Engineering. One hour rec. a month.
560 212. Graphical Communications, Analysis and Design I. (2) I, II, S. Technical sketching; study of basic principles of projective geometry; multi-view drawings; pictorials; reading and interpreting drawings; and creative or conceptual design. Three hours lab. and one hour rec. a week. Pr.: Plane Geometry.
560 217. Graphical Communications, Analysis and Design II. (3) I, II, S. Advanced study and application of projective geometry principles; functional design; detail and assembly layouts; design of charts and graphs; and conceptual design. Five hours lab. and one hour rec. a week. Pr.: M. E. 212.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

560 413. Thermodynamics I. (3) I, II, S. Properties of the pure substance. The first and second laws of thermodynamics. Three hours rec. a week. Pr.: Phys. 310; Math. 222.
560 440. Engineering Systems Analysis. (3) I, II. Application of physical laws, mathematical methods and computers to the development and interpretation of models for physical systems of engineering interest. Emphasis is on the methods of modeling rather than the systems modeled. Examples will be taken from all areas of engineering. Three hours rec. a week. Pr.: Phys. 311; Math. 240.
560 452. Machine Design I. (3) I, II. Displacement, velocity and acceleration analysis of machine elementscams, gears, and other mechanisms. A brief introduction to dynamics of machines. Three hours rec. a week. Pr.: Ap. M. 412.
560 453. Mechanical Engineering Design Laboratory. (2) I, II. Application of the principles of the design process in the solution of engineering industrialtype problems with direct involvement of industry. Six hours lab. a week. Pr. or conc.: M. E. 452, 521.

560 466. Patents and Inventions. (3) II. A brief consideration of the fundamental principles of U. S. patents and their relationship to the engineer; the inception and development of inventions. Three hours rec. a week. Pr.: Junior standing.
560 513. Thermodynamics II. (3) I, II, S. Continuation of Thermodynamics I. Gas mixtures, psychrometry, generalized thermodynamic relations and reactive systems. Three hours rec. a week. Pr. : M. E. 413.
560 521. Heat Transfer. (3) I, II. Fundamentals of conduction, convection and radiation; principles of heat exchanger design and dimensional analysis. Two hours rec. and three hours lab. a week. Pr.: Ap. M. 471, Math. 240 or equiv.
560 528. Aerodynamics I. (4) II. A general introduction to aerodynamics; operation of wind tunnel. Three hours rec. and three hours lab. a week. Pr.: Ap. M. 471, Math. 240 or equiv.
560 535. Mechanical Engineering Laboratory I. (3) I, II, S. Theory and application of mechanical engineering instrumentation and measurements. One hour rec. and six hours lab. a week. Pr.: M. E. 413, E. E. 401.
560 551. Machine Design II. (3) I, II. Design and analysis of machine elements, such as shafting, springs, screws, belts, brakes, clutches, gears, and bearings, with emphasis on strength, rigidity, and wear qualities. Three hours rec. a week. Pr.: Ap. M. 415, M. E. 452.
560 560. Engineering Economics. (3) I, II. Economic analysis of problems as applied in engineering. Three hours rec. a week. Pr.: Econ. 110, M. E. 413.
560 571. Petroleum Production. (3) I. Engineering problems in drilling and completion of wells; principles of drainage; production methods; and secondary recovery. Three hours rec. a week. Pr.: Senior standing in Department of Mechanical Engineering or approval of department head.
560 583. Mechanical Engineering Laboratory II. (2) I, II, S. Analysis of heat transfer and fluid flow processes, mechanical systems, automatic control; instrumentation, design of experiments. Six hours lab. a week. Pr.: M. E. 535 .
560 593. Thermodynamics III. (3) I, II, S. Direct energy conversion, compressible fluid flow, rotating and reciprocating machinery, thrust systems, cycle analysis and topics of current and continuing interest with emphasis on application of thermodynamic principles. Three hours rec. a week. Pr.: M. E. 513.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

560 612. Systems Dynamics. (3) I. Analysis of the dynamic behavior of mechanical, thermal, fluid and electrical elements using the basic physical laws, with emphasis on the analogies. Derivation of the steady-state and transient responses of systems composed of linear elements using Laplace transforms and block diagrams. Three hours rec. a week. Pr.: Math. 240, E. E. 401; Pr. or conc.: Ap. M. 471.
560 620. Internal Combustion Engines. (3) II. Analysis of cycles, design and performance characteristics. Three hours rec. a week. Pr.: M. E. 513.
560 622. Environmental Engineering I. (3) I, II. Psychrometry; heat transmission; air-conditioning equipment and systems; design problems. Three hours rec. a week. Pr.: M. E. 521.

560 625. The Man-Environment System. (3) II. Basic structure and performance of the human; viewed as a component in information processing and control systems; effect of environment. Three hours rec. a week. (Cross listed with I. E. 625) Pr.: Senior standing in engineering.
560 628. Aerodynamics II. (4) I. Compressibility phenomena, power requirements, airplane performance; stability and control. Three hours rec. and three hours lab. a week. Pr.: M. E. 528.
560 631. Aircraft and Missile Propulsion. (3) II. Analysis of aircraft and missile propulsion systems; fundamentals of jet propulsion including rocket engines. Three hours rec. a week. Pr.: M. E. 513, Ap. M. 471, Math. 240 or equiv.
560 642. Fine Particle Technology. (3) II. Definition, theory and measurement of particle properties, particle dynamics, size distribution and characteristics of powders encountered in particle transport, gas cleaning, air pollution sampling and particle processing; the physics of air ion generation, transport and decay; and requisites of accurate sampling of airborne contaminants. Three hours rec. a week. Pr.: Ap. M. 471 and one course in statistics or consent of instructor.
560 651. Mechanical Engineering Design. (3) II. Professional-type problems involving thermal, thermodynamic, electrical, mechanical, and economic factors. One hour rec. and six hours lab. a week. Pr.: M. E. 521, 551 .

560 656. Machine Vibrations I. (3) I, II. A general consideration of free and forced vibration in machines for various degrees of freedom; critical speed; vibration isolation. Three hours rec. a week. Pr.: Ap. M. 412, Math. 240 or equiv
560 657. Kinematics. (3) I. Geometry of constrained motion applied to point paths, specific input-output relations, function generators, kinematic synthesis. Three hours rec. a week. Pr. : M. E. 452.
560 660. Engineering Analysis I. (3) I. Methods of analysis employed in the solution of problems selected from various branches of engineering. Emphasis is placed on discrete systems. Three hours rec. a week. Pr.: Math. 240 or equiv. and senior standing in engineering. 560 666. Aeronautical Engineering Design. (2) I. Design problems related to aircraft, missiles, and space vehicles. Six hours lab. a week. Pr.: M. E. 521, 628, 631. 560 671. Reservoir Engineering. (3) II. Reservoir fluid properties, forces, and energies; mechanics of fluid flow in porous media; control of reservoir performance. Two hours rec. and three hours lab. a week. Pr.: M. E. 571, Math. 240 or equiv., Ap. M. 471.
560 675. Problems in Mechanical Engineering. Credit arranged. I, II, S. Pr.: Approval of department head.
560 700. Random Vibration. (3) I. Theory of random processes and application to random vibration of mechanical systems. Three hours rec. a week. Pr.: M. E. 656.

560 711. Advanced Thermodynamics I. (3) I. Application of the laws of thermodynamics to unsteady-flow processes; processes involving friction; available and unavailable portions of various forms of energy; the concept of flux mass, energy, available energy, and entropy. Three hours rec. a week. Pr.: M. E. 513, Ap. M. 471, Math. 240 or equiv.

560 715. Gas Dynamics I. (3) II. Properties of compressible fluids, subsonic and supersonic flow, steady and non-steady motion, with emphasis on onedimensional flow. Three hours rec. a week. Pr.: Math. 240 or equiv., M. E. 513, Ap. M. 471.
560 722. Environmental Engineering II. (3) II. Study and analysis of environmental factors and man's response to these factors; air pollution, air cleaning, biological heat transfer; factors affecting comfort, health, learning and productivity. Two hours rec. and three hours lab. a week. Pr.: Four hours biological science or consent of instructor; Pr.: M. E. 622.
560 725. Combustion. (3) I. Dynamics and thermodynamics of combustion processes; solid, liquid, and gaseous fuels. Three hours rec. a week. Pr.: M. E. 521. 560 731. Automatic Controls. (3) II. Design and application of control devices, hydraulic pneumatic and electronic systems, computer control systems. Two hours rec. and three hours lab. a week. Pr. : M. E. 612 or consent of instructor.
560 733. Automatic Controls Laboratory. (3) II. Experimental methods for automatic control systems and components. Six hours lab. a week. Pr. or conc.: M. E. 731.

560 735. Fluid Control Systems. (3) II. Analysis and design of control devices and systems which utilize gases or liquids as the working media; formulation of nonlinear and linearized mathematical models; laboratory projects applying analytical and experimental design techniques. Two hours rec. and three hours lab. a week. Pr.: M. E. 612 or consent of instructor.
560 756. Machine Vibrations II. (3) II. Advanced consideration of systems having free and forced vibrations, with particular reference to several degrees of freedom, distributed mass, generalized coordinates, and nonlinear forms. Three hours rec. a week. Pr.: M. E. 656.
560 757. Mechanics of Machines. (3) II. Analysis of inertia effects in rotating discs, gyroscopes, cams and gear trains. Three hours rec. a week. Pr.: M. E. 452.
560 760. Engineering Analysis III. (3) II. Cont. of Engineering Analysis I. Emphasis placed on continuous systems. Three hours rec. a week. Pr.: M. E. 660 or consent of instructor.

\section*{GRADUATE CREDIT}

560 810. Research in Mechanical Engineering. Credit arranged. I, II, S. The laboratory work is correlated with the work of the Engineering Experiment Station. Research in any field pertinent to subjects taught in the Mechanical Engineering Department. Pr.: Approval of department head.
560 813. Laboratory Investigations in Mechanical Engineering. Credit arranged. I, II, S. Pr.: Approval of department head.
560816 . Advanced Topics in Mechanical Engineering. Variable credit. I, II, S. A course reserved for study of current topics in mechanical engineering. Topics announced when offered. Pr.: Consent of instructor.
560 818. Advanced Thermodynamics II. (3) II. Kinetic theory and statistical thermodynamics, with emphasis on transport properties and engineering applications. Selected topics from classical thermodynamics. Pr.: M. E. 513,521 or consent of instructor.

560 822. Advanced Air Conditioning. (3) I. Advanced psychrometric analysis; physiological factors; biotechnology and heat transfer. Three hours rec. a week. Pr.: M. E. 622.
560 825. Advanced Machine Design. Credit arranged. I, II. At the option of the student this course may include a study of some advanced subject related to courses in this area. Pr.: Approval of department head.
560 830. Gas Dynamics II. (3) I. An extension of Gas Dynamics I, with emphasis on two and three-dimensional problems, shock waves. Three hours rec. a week. Pr.: M. E. 715.

560 831. Boundary Layer Theory I. (3) I. The development and solution of various laminar boundary layer problems involving momentum, heat and mass transfer for a compressible viscous fluid. Three hours rec. a week. Pr.: M. E. 521.
560 832. Boundary Layer Theory II. (3) II. Study of boundary layer transition; the development and solution of various turbulent boundary layer problems involving momentum, heat, and mass transfer and chemical reactions for compressible viscous fluid. Three hours rec. a week. Pr.: M. E. 831.
560 835. Heat Conduction in Solids. (3) I. General differential equation of heat conduction and methods of solution for two-dimensional steady-rate transient heat flow, periodic heat flow, and internal heat sources. Three hours rec. a week. Pr.: M. E. 521.
560 842. Convection Heat Transfer. (3) II. Energy and momentum equations in convective heat transfer, laminar and turbulent thermal boundary layers, steady and non-steady convection problems. Three hours rec. a week. Pr.: M. E. 521.
560 843. Radiation Heat Transfer. (3) I. Basic theories of thermal radiation, shape factors; exact and approximate solutions of integral equations for radiation heat transfer between solid surfaces with absorbing or non-absorbing medium. Three hours rec. a week. Pr.: M. E. 521 .

560 850. Advanced Power Plant Engineering. Credit arranged. I. An advanced course in the economic problems in the design of power plants and in the generation of power, selection of equipment, choice of station heat balance, generation of by-product power in industries, and interconnections between utilities and industrial plants for the economical interchange of power. Pr.: M. E. 651.
560 861. Advanced Topics in Automatic Control. (3) I. Selected advanced topics in automatic control with emphasis on recent developments. Topics will normally be selected in the areas of analysis and design of nonlinear control systems, stochastic processes and statistical design concepts in automatic control, and optimal and adaptive control. Three hours rec. a week. Pr.: M. E. 731 or equiv.
560 865. Approximate Methods of Higher Analysis. (3) II in alt. years. Approximate procedures for solving differential and integral equations encountered in engineering analysis; emphasis on continuous and discrete methods of approximation, convergence and error analysis. Three hours rec. a week. Pr.: Math. 622.

\section*{Nuclear Engineering}

CURTIS G. CHEZEM, Head of Department
Professors Chezem*, Donnert*, Faw*, Meyer*, and Mingle; Adjunct Professors Smith and Swanson; Associate Professors Robinson \({ }^{*}\) and Merklin*; Assistant Professors Clack, Eckhoff*, Hightower, Krick*, and Shultis* : Instructor Verser.

The Curriculum in Nuclear Engineering is designed to prepare students for professional positions in industry, government, and education in the nuclear field and in related areas such as environmental science and aerospace studies. Through technical electives, the student may organize a program of study suited to his particular needs and interests.

As a profession, nuclear engineering requires understanding and competence in many and diverse disciplines. Hence, undergraduate nuclear engineering students at Kansas State University take courses in advanced mathematics, physical chemistry, chemical process principles, thermodynamics, fluid mechanics, electronics, heat transfer, analog and digital computer technology, and economics. With background established in these courses, able students will then be prepared for course work in the Department of Nuclear Engineering, involving reactor theory and analysis, neutron and charged particle interactions, nuclear radiation detection, radiation shielding, radiation effects on materials, nuclear fuel processing, metallurgy of nuclear systems, industrial isotope application, reactor instrumentation, reactor heat transfer, thermodynamics, radiation safety, and such topics as nuclear energy systems for both terrestrial and extraterrestrial applications, the latter involving both primary and auxiliary power systems.

\section*{GRADUATE STUDY}

The Department offers graduate programs leading to the degrees Master of Science and Doctor of Philosophy.

Applicants for graduate status are expected to hold the Bachelor's Degree with adequate preparation in mathematics and physical sciences. However, students without this preparation will be considered for admission. Programs of study will be modified or structured with a proper balance of subject matter from other fields to meet the needs of individual students.

Laboratory facilities include a 250 kilowatt TRIGA Mark II reactor with a pulsing capability to 250,000 kilowatts, the Kansas State University Nuclear Engineering Shielding Facility located on a 180-acre remote site, experimental shielding structures, 100 -curie pumped source for simulating fallout radiation fields, many cobalt-60 sources ranging in source strength from 100 curies down to the millicurie level, a positive ion accelerator-type neutron source, an autoand cross-correlation noise analysis system, a graphite subcritical reactor, a low-level liquid scintillation counting system, NaI (T1), \(\mathrm{Ge}(\mathrm{Li}), \mathrm{Si}(\mathrm{Li})\) gamma-ray spectrometer system, a neutron spectrometer system, a multiparameter pulse-height analysis system and four multi-channel analyzers with pulseheight, time-of-flight, pulse-neutron and multiscaler logics, a 4,000-curie cobalt-60 gamma irradiation facility, three analog computers, a pressurized water heat transfer loop, a recording spectrophotometer, and a thermoluminescence-dosimeter system.

\section*{Courses in Nuclear Engineering}

\section*{UNDERGRADUATE CREDIT}

580 110. Nuclear Engineering Concepts. (2) I, II. This first course in the Nuclear Engineering curriculum acquaints freshmen students with the professional activities and responsibilities of nuclear engineers. It presents this information through lectures, recitations, and laboratory demonstrations.
580 116. Nuclear Engineering Seminar. (1) II. Introduction to professional nuclear engineering. Student career planning One hour rec. a week.
580 200. Fundamentals of Nuclear Planning. (2) I. Effects of nuclear weapons-blast, thermal radiation, initial nuclear radiation and fallout; attenuation, detection and biological effects of nuclear radiation; structure of matter and radioactivity; structure shielding against fallout radiation, shelters and environmental engineering; probabilities of destruction from nuclear weapons; chemical and biological warfare considerations. Two hours rec. a week. Pr.: Sophomore standing.
580 390. Introduction to Nuclear Engineering Analysis. (3) II. Introduction to analytical, statistical, and numerical analysis to nuclear engineering, including computer programming. Three hours rec. a week.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

580 410. Introduction to Nuclear Engineering. (3) I, II. A course to acquaint non-nuclear engineers with introductory aspects of nuclear engineering; a study of nuclear reactions, reactor core calculations, reactor safety and dynamics, shielding, fuels, waste disposal,
electric power generation and radioisotopes applications engineering. Three hours rec. a week. Pr.: Phys. 311, Math. 240 or equiv.
580 450. Elements of Nuclear Engineering. (3) I, II. Nuclear reactions, nuclear energy releases, ionizing radiation, radiation attenuation; introduction to nuclear reactor concepts of criticality, multiplication factor, period reactivity, neutron lifetime, fission product poisoning and introduction to reactor instrumentation and control, standards for protection against radiation, health physics, nuclear safety, licensing, survey and monitoring instrumentation, instrument calibration, calculation of dose, dose rates, determination of maximum permissible concentrations and body burdens. Pr. or conc.: Math. 240.
580 500. Applied Nuclear Engineering Analysis. (3) II. Methods and applications of analytical, statistical, and numerical analysis as applied to nuclear engineering including computer programming. Three hours rec. a week. Pr.: Math. 240, Phys. 311.
580 510. Neutron Activation Analysis. (3) II. Basic nuclear properties, neutron flux characteristics, nonreactor neutron sources, radio-chemical separations, radiation detectors and counting statistics, gamma-ray spectroscopy, analysis of gamma-ray spectroscopic data, case studies. Two hours rec. and three hours lab. a week. Pr.: Chem. 535 or N. E. 410 or N. E. 450.
580 555. Nuclear Reactor Fundamentals. (3) II. Introduction to reactor cooling. Analysis of power cycles. Basic reactor thermal design. Three hours rec. a week. Pr.: N. E. 450, or conc.: Ap. M. 471, M. E. 413.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

580 606. Nuclear Engineering Materials. (3) II. Investigation of the nuclear properties, metallurgy and processing of nuclear engineering materials. Three hours rec. a week. Pr.: N. E. 450.
580 611. Radioisotope Applications Engineering. (3) I. A course in the use of radioisotopes and measurement of radiation for industrial, medical and agricultural applications. Material includes operating characteristics of G-M tubes, proportional counters, scintillation detectors, ratemeters, counting statistics, beta backscatter, elements of analog and digital simulation as applied to system design. One hour rec. and six hours lab. a week. Pr.: N. E. 450 or N. E. 410.
580 620. Problems in Nuclear Engineering. Credit arranged. I, II, S. Specific studies in current and advanced problems in various phases of nuclear engineering. Pr.: Consult head of department.
580 640. Reactor Operations Planning. (2) I. Siting, licensing, radiation safety and nuclear safety for personnel programs, indemnity, waste disposal, fuel transport and state-federal relations. Two hours rec. a week. Pr. or conc.: N. E. 671.
580 671. Applied Reactor Theory. (3) I. Diffusion and slowing down of neutrons. Theory of critical and subcritical reactors. Reactor dynamics. Three hours rec. a week. Pr.: N. E. 450, 500.
580 680. Neutron and Particle Interactions. (3) I. Engineering approach to the mechanics of the interactions of neutrons and other radiation with matter; production and detection of neutrons and other types of radiation. Three hours rec. a week. Pr.: N. E. 450, N. E. 500.

580 692. Nuclear Reactor Technology. (3) II. Thermal and neutronic design analysis of power reactors. Engineering economic analysis of reactor power systems. Nuclear ecology. Three hours rec. a week. Pr.: N. E. 555, 671.

580 695. Nuclear Reactor Technology Laboratory. (2) II. Nuclear electronics, and experiments related to subcritical reactors, including cadmium ratio, diffusion length, Fermi Age, approach to criticality and critical size, neutron diffraction, pulsed neutron experiment andor fuel fabrication, and heat transfer. Six hours lab. a week. Pr. or conc.: N. E. 692.
580 699. Constructive Uses of Nuclear Explosives. (3) II, S. Characteristics and effects of nuclear explosives; Plowshare tests; industrial uses of nuclear explosives; scientific applications of nuclear explosions. Pr.: N. E. 671, N. E. 680 or consent of instructor.
580 705. Principles of Nuclear Reactor Analysis. (3) I. Theories of neutron diffusion, slowing down, time dependency, multigroup methods, heterogeneous assemblies, kinetics, perturbation and application of computers to reactor physics calculation. Three hours rec. a week. Pr.: N. E. 692.
580 708. Nuclear Fuel Processing Laboratory. (1) II. Experimental investigation of the methods and principles of separation and purification as they apply to the production and recovery of nuclear fuel and materials. Three hours lab. a week. Pr. or conc.: Ch. E. 430.
580 710. Nuclear Fuel Processing. (3) I. Application of unit operations to production and reprocessing of nuclear materials such as uranium, plutonium, graphite, and heavy water. Three hours rec. a week. Pr.: N. E. 606, Ch. E. 430 .

580 715. Radiation Shielding I. (3) II. Introduction to important sources of radiation, kernel concepts, and application of diffusion and ray theory to shielding calculations, applications principally in the field of stationary nuclear reactor shielding. Three hours rec. a week. Pr.: N. E. 671.
580 720. Nuclear Systems Analysis. (3) II. Introduction to nuclear reactor kinetics and simulation. Linear stability of reactor systems. Noise analysis. Application of hybrid computers to nuclear systems analysis. Three hours rec. per week. Pr.: N. E. 671.
580 750. Direct Energy Conversion. (3) II. Principles and analysis of direct conversion phenomena, with special emphasis on direct conversion of nuclear energy including thermoelectric, thermionic, photovoltaic, magnetohydrodynamic and electrochemical processes. Three hours rec. a week. Pr.: N. E. 555, Chem. 595.
580 761. Radiation Detection and Measurement. (3) I. Theory of detection of nuclear radiation. Measurement devices and systems. Applications to radiation dosimetry and spectroscopy, and instrumentation systems for nuclear reactors. Three hours rec. per week. Pr.: N. E. 611 or consent of instructor.
580 762. Nuclear Instrumentation. (4) II. Design and analysis of nuclear instrumentation. Application to nuclear reactor control, radiation dosimetry and nuclear spectroscopy. Three hours rec. and three hours lab. per week. Pr.: E. E. 404 and E. E. 416 or consent of instructor.
580 765. Numerical Engineering Analysis. (3) I. Engineering analysis approached from the viewpoint of
those numerical analysis procedures especially useful with large capacity computer facilities. Three hours rec. per week. Pr. : Ap. M. 716 or Math. 761 or consent of instructor.
580 772. Radiation Effects on Materials I. (3) I. General theory of radiation damage to solids. Specific effects of radiation on nuclear reactor components and materials of construction. Applications to nuclear reactor design. Three hours rec. per week. Pr.: N. E. 680.
580 774. Radiation Effects on Materials II. (3) II. General theory of radiation effects on liquids and gases. Principles of radiation chemistry, photochemistry, and biophysics. Medical, agricultural and industrial applications. Three hours rec. a week. Pr.: N. E. 680, Chem. 595 , or consent of instructor.

\section*{GRADUATE CREDIT}

580 810. Research in Nuclear Engineering. Credit arranged. I, II, S. Independent investigation of an advanced nuclear engineering problem preparatory to writing a thesis. Pr.: Approval of head of department.
580 815. Advanced Nuclear Reactor Heat Transfer. (3) II. Temperature distribution throughout nuclear reactors; hot channel factors; numerical methods in heat transfer design; interaction of heat transfer and nuclear parameters. Three hours rec. a week. Pr.: N. E. 692.
580 820. Control of Nuclear Reactors (3) I. Fundamental concepts of nuclear reactor kinetics. Linear and non-linear stability. Neutron wave propagation. Spatially dependent nuclear reactor kinetics. Three hours rec. per week. Pr.: N. E. 705, 720.
580 834. Radiation Effects on Materials Laboratory. (2) II. Experimental investigations of the mechanisms of radiation effects, techniques of dosimetry and principles of radiation processing. Six hours lab. a week. Pr. or conc.: N. E. 774 or consent of instructor.
580 835. Slow Neutron Scattering. (3) II, S. Classical and quantum theory of slow neutron scattering in gases, liquids and crystalline materials. Time dependent correlation functions and neutron scattering; theories of liquid structure. Three hours rec. a week. Pr.: N. E. 680 or Phys. 640.
580 840. Advanced Nuclear Reactor Theory. (3) II. Solutions and applications of the neutron transport equation; integral transport theory; energy dependent theory; Monte Carlo methods; small source theory and fast reactor theory. Three hours rec. a week. Pr.: N. E. 705.

580 845. Radiation Shielding II. (3) I. Solutions and applications of the transport equation as applied to neutrons, gamma-rays and charged particles. Applications principally in the field of fallout and space shielding. Three hours rec. a week. Pr.: N. E. 715, N. E. 680. Pr. or conc.: N. E. 705.

580 851. Nuclear Engineering Laboratory. (2) I, S. Reactor kinetics, reactor noise analysis determinations of \(\mathrm{b}-\mathrm{l}\), reactor power calibration, auto and crosscorrelation techniques, pulsed neutron measurement, radiation shielding, radiation effects, activation analysis, neutron diffraction, and heat transfer. Six hours laboratory a week. Pr.: consent of instructor.
580 855. Computational Methods in Nuclear Engineering. (3) II. An analysis of the algorithms utilized in nuclear engineering computations; requirements of
generalized computational programs, design of a typical program. Three hours rec. a week. Pr.: N. E. 815, 840, 845.

580 860. Advanced Topics in Nuclear Engineering. (Var.) I, II, S. A presentation of various special topics covering advanced nuclear engineering specialties. Pr.: Consent of instructor.
580 870. The Interaction of Radiation with Matter. (3) II. Classical and quantum theories of the interaction of radiation with matter. Energy and charge transfer processes. Applications to nuclear reactor theory, radiation shielding, and nuclear instrumentation. Three hours rec. per week. Pr.: N. E. 680.
580 890. Nuclear Engineering Colloquium. (1) I, II. Presentation and discussion of progress reports on research, special problems, and outstanding publications in nuclear engineering and related fields. Pr.: Graduate standing in nuclear engineering.
580 891. Controlled Thermonuclear Reactions I. (3) I. Basic principles of plasma theory and controlled thermonuclear processes, based on treatment of Boltzmann equation. Plasma phenomena, including confinement, radiation, and stability. Energy balance and materials problems. Three hours rec. a week. Pr.: N. E. 705, 870 or consent of instructor
580 893. Controlled Thermonuclear Reactions II. (3) II. Continuation of N. E. 891. Collisionless plasmas; plasma waves and instabilities; plasma diagnostics, experimental approaches. Other topics of current interest. Three hours rec. a week. Pr.: N. E. 891.
580 895. Nuclear Systems Design. (3) I, S. Design analysis of nuclear power reactor systems, including criticality determinations, heat transfer, shielding change in reactivity with fuel irradiation, fuel cycles, power plant thermodynamics, and economics of nuclear power. Three hours rec. a week. Pr.: N. E. 715, 815, 820.

\section*{Engineering Experiment Station}

\section*{DWIGHT A. NESMITH, Director}

In the dynamic state that engineering finds itself today, there is no way to separate research activity and teaching activity.
Thus, the significance of the Engineering Experiment Station's work cannot be measured solely on the basis of increased research support or publications of research results-teaching and research are so intermingled as to be virtually inseparable. The growth of outside sponsorship of our engineering research is extremely encouraging, since it reflects greater support for both undergraduate and graduate students, considerable support for faculty research, and frequently provides resources for equipment and facilities which find use in both the academic and research functions.
The Engineering Experiment Station is the division of the College of Engineering
responsible for the administration of research. It was established March 24, 1910, by the Board of Regents for the purpose of undertaking research of engineering and manufacturing value to the State of Kansas, and for collecting and presenting technical information for the use of industry and the people of the state.

The staff of the Engineering Experiment Station is composed of members of all departments in the College of Engineering except Agricultural Engineering, and is supplemented by staff in other departments of the University who work with staff members on joint projects.

In the past five years engineering research has grown from a modest program involving a handful of staff members to a significant part of the College effort, currently contributing more than a million dollars annually. Research now being carried out in the Engineering Experiment Station includes the following:

Life support in altered environments, including confined spaces and very hot spaces.
The effect of shifting light-dark cycles on performance.
The physiological effects of shelter environments.
Positive aspects of nuclear energy including studies of radiation effects of materials, the production of new materials and analysis.

A study of concrete pavement surface failures and methods of preventing them.

Properties of structural steel.
Protein production from petroleum.
Application of integrated circuits to agricultural machinery.

Air and Water Pollution control.
A complete list of the Engineering Experiment Station research projects and a brief description of each are published in an annual report. A copy of the most recent report will be sent free of charge on request.

\section*{Institute for Environmental Research}

RALPH G. NEVINS, Dean and Director
FREDERICK H. ROHLES, JR., Associate Director

\section*{OBJECTIVES}
1. Provide a focal point for interdisciplinary research relevant to the effect of normal and altered environments on man including living and working conditions under the ocean and in space.
2. Determine response of human and other organisms to environmental factors affecting health, comfort, affectivity, productivity and
learning, including-but not limited tothermal factors, air composition, sound, light, color, and spatial relationships.
3. Investigate methods of environmental control and modification including cost studies for optimum system performance.
4. Provide opportunities and facilities for M.S. and Ph.D. research projects and specialized graduate level courses and seminars.
5. Collect and disseminate data and provide research and service to industry and governmental agencies interested in environmental problems.

\section*{ORGANIZATION}

The Institute for Environmental Research is organized to provide opportunities and facilities for research into man's relation and response to environmental factors. University staff and graduate students carry out projects and research using the facilities of the Institute and with the assistance of its staff. The Institute is attached, administratively, to the Department of Mechanical Engineering, and its research is administered through the Engineering Experiment Station.

The Institute is composed of a director, two associate directors, a policy board, participating faculty, graduate research assistants, technicians and clerical workers. The policy board is an interdisciplinary group appointed from members of the participating staff and Directors which formulates policy procedures, initiates and directs research, and advises faculty and graduate students who associate with the Institute for special projects. The participating faculty are also members of their respective major departments throughout the University and members of the graduate faculty.

Interested faculty from the areas of mechanical, electrical, chemical and industrial engineering, psychology, physiological sciences, architecture, family and child development, clothing, textiles and interior design, foods and nutrition, grain science and industries, infectious diseases, pathology, statistics and computer science, and education are participating members of the Institute staff. The Institute is organized so faculty members or students from any department can carry out research in the Institute within its stated objectives.

\section*{Institute for Systems Design and Optimization}

\author{
L. T. FAN, Director \\ F. A. TILLMAN, Associate Director
}

The Institute for Systems Design and Optimization at Kansas State University, to promote interdisciplinary research, teaching and communications in systems engineering, was approved in 1967 by the Kansas Board of Regents.
The Institute is administered through the College of Engineering and the Engineering Experiment Station and provides channels of communications between disciplines throughout Kansas State University in the area of engineering systems design.

Specific objectives of the Institute include the promotion of interdisciplinary research, the development of opportunities for interdisciplinary communication in systems engineering through seminars and conferences; preparation of research proposals, and providing assistance in recruitment of graduate students, post-doctoral students, and faculty in systems design.

\section*{Institute for Computational Research in Engineering}

\section*{J. O. MINGLE, Director \\ H. S. WALKER, Associate Director}

The Institute for Computational Research in Engineering promotes engineering research, development, and service for computer-oriented activities. The interdisciplinary aspects of these activities are stressed with emphasis upon the role of the small computer in modern technology.
The Institute is administered through the College of Engineering and provides a college-wide center for information concerning computational engineering. Other functions of the Institute include the preparation of research proposals; the encouragement of creative uses of computers; the dissemination of information through conferences, workshops, and publications about computational engineering; and the development of software engineering concepts. The members of the Institute encourage students and faculty to be more cognizant of the challenges in the computational engineering field.

\section*{Engineering Computing Facility}

\section*{J. J. SMALTZ, Director}

The College of Engineering provides an Engineering Computing Facility under the direction of the Department of Industrial Engineering. The digital computer used is an IBM 1620 with one-disk drive and supporting peripheral equipment. It is available to students on an openshop, hands-on basis, 24 hours per day, seven days per week. FORTRAN II-D, FORGO, SPS, AMTRAN, AUTOSPOT, COGO, ECAP, and LP1620 are on disk for immediate use. Other processors and many scientific subroutines are available in the Engineering Computing Facility library. Formal course work is offered in the application and use of these facilities. Basic information is disseminated at the departmental level for the necessary operating capabilities required to solve the many problems in each particular engineering discipline.

The College of Engineering maintains a very amiable working relationship with the University Computing Center. Their computer is an IBM \(360-50\) with much greater capacity and higher operating speeds than are available at the Engineering Computing Facility.

\section*{Nuclear Engineering Shielding Facility}

\section*{CURTIS G. CHEZEM, Head, Nuclear Engineering RICHARD E. FAW, Director}

Through the Department of Nuclear Engineering, Kansas State University operates a 180 -acre radiation shielding test site for large-scale experimental work in radiation shielding and related areas. Research facilities at the test site include fullscale as well as scale-model buildings for experimental studies in structure shielding. A wide variety of nuclear instrumentation and calibration installations are available. In addition to its use in research, the test site is used during Nuclear Engineering Department Summer Institutes in such areas as industrial radiography and nuclear defense design.

\section*{Nuclear Reactor Center}

CURTIS G. CHEZEM, Head, Nuclear Engineering ROBERT W. CLACK, Director, Nuclear Reactor Facility N. DEAN ECKHOFF, Director, Neutron Activation Analysis

Kansas State University has, within its Department of Nuclear Engineering, a nuclear reactor and a well-equipped Neutron Activation Analysis Laboratory. The reactor is capable of steady-state operation at 250 kilowatts and pulsed operation to 250,000 kilowatts and is used for teaching and research by many departments. The reactor can be used as a controllable source of ionizing radiation including neutrons. The latter is the basis for neutron activation analysis, an analytical technique which is essentially non-destructive and offers sensitivities better than one part per billion. Activation analysis finds application in diverse fields such as diagnostic medicine, plant improvement studies, nutrition studies, age dating of geological specimens, forensics, toxicology and metabolic studies.

\section*{Office of Civil Defense \\ Professional Advisory Service Center}

\author{
C. G. CHEZEM, Head, Nuclear Engineering \\ F. A. VERSER, Director
}

Kansas State University maintains a Professional Advisory Service Center which administers and operates the Direct Mail Shelter Development System of the Office of Civil Defense.
The Center is operated by the Department of Nuclear Engineering and consists of a full time adviser and a part time assistant. The highly qualified fallout shelter instructors and analysts are faculty members of the University. Advisers are available to all Kansas architects and engineers to explain how radiation protection can be maximized in the design of buildings. They are also available to conduct seminars, workshops,
and lectures on fallout shelter analysis and design. The Center does not engage in actual design of buildings.

\section*{Kansas Industrial Extension Service}

WILLIAM H. HONSTEAD, Director
The Kansas Industrial Extension Service provides information, technical assistance and continuing education for technical persons in Kansas industries.
Using the faculty and facilities of the University, answers to questions about materials, manufacturing processes, management techniques, new product development, patents, and similar matters, are provided for manufacturing industries in Kansas.
Short courses, seminars, workshops, conferences and other continuing education functions for technical people are arranged on the campus, or in off-campus locations. Suggestions and inquiries about such offerings are welcome.
The Kansas Industrial Extension Service cooperates with the Cooperative Extension Service at Kansas State University as well as the extension activities of each individual school in order to furnish a total extension program. In particular, project activities are coordinated with the Cooperative Extension Service for the purpose of developing agriculturally related industrial operations. Particular emphasis is being placed on the development of manufacturing industries for rural areas.
By virtue of its location at Kansas State University, a quick response to information inquiries is assured since the K-State faculty is immediately available to develop special programs. Business and industry in the State are invited to participate in the Kansas Industrial Extension Service programs. Requests should be submitted to the Director, Kansas Industrial Extension Service, 131-A Seaton Hall, Kansas State University, Manhattan, Kansas 66502.


\title{
THE COLLEGE OF HOME ECONOMICS
}

DORETTA HOFFMAN, * Dean
RUTH HOEFLIN, Associate Dean
JEAN REEHLING, Assistant Dean
JEAN SEGO, Assistant to the Dean

Home economics majors study creative approaches to the understanding and solution of challenges facing families today. The whole world is within the realm of activity of home economists, whose primary goal is to serve families.

Students in home economics learn to recognize the many and varied ways in which people react to each other and to their physical and social environments, whether in this country or abroad. They learn to understand and work with the poor and the affluent, the old and the very young, the healthy and the handicapped, the homemaker and the professional.

A degree in home economics, based on the application of scientific principles, provides a broad, liberal education along with a specialty that prepares young adults to enter today's careers and to explore the unknown world of tomorrow.

\section*{Honors Program and Master's Degree Project}

Students with a potential for outstanding scholastic attainment are invited to participate in the Home Economics Honors Program. Eligible students have excellent high school records and rank at the top of their entering university class. Transfer students with superior academic records also are eligible as are upperclassmen in the College of Home Economics who demonstrate outstanding abilities and are recommended by the faculty. Advisers to honors students help them plan individual programs of study that include honors courses, seminars and independent study.

The Home Economics Master's Degree Project identifies potential graduate students early in their college careers. Each year, students with a minimum of a " \(B\) " average are invited to join the project. Selected members of the graduate faculty advise those students who participate in the Master's Degree Project. Together they plan the students' academic program to include educational experiences in preparation for graduate study.

\section*{A Degree in Home Economics}

Programs of study leading to the Bachelor of Science degree are offered within the four curriculums in the College of Home Economics. These curriculums are designed to interest students with varying academic and professional objectives. The curriculums and the options within them are listed and described on the following pages.

\footnotetext{
1. Curriculum in Home Economics with Options

Home Economics Education - Vocational Teaching
Extension
Radio and Television
Clothing and Retailing
Textile Research
Fashion Design
Interior Design
Community Services
Early Childhood Education
Consumer Interest
Housing and Equipment
Foods and Nutrition in Business
Foods and Nutrition Science
Dietetics and Institutional Management
2. Curriculum in Home Economics and Journalism
3. Curriculum in Home Economics with Liberal Arts
4. Curriculum in Restaurant Management
}

Entering students who are undecided about a specific major may enroll in General Home Economics. Students in this area may take courses from all fields of general education and home economics. The program allows time for students to consider the many possibilities available before they make the final decision of a college major. Special advisers work with these students to select courses that will later apply to almost any curriculum at Kansas State University.
Each student has a faculty adviser under whose guidance a program is planned that will prepare the student for such professional positions as teacher, home economics agent, interior designer, home economist in business or social welfare, nursery school supervisor, specialist in housing or home management, women's page editor, textile chemist, clothing designer, food and equipment demonstrator, nutritionist, dietitian, restaurant manager, or research technician.

The course requirements for the first year are similar for all majors, so the student has time to study possibilities in all areas in home economics before choosing the one best suited to his individual needs and interests. The Bachelor of Science degree is earned by fulfilling the requirements in the curriculum chosen by the student.

The home economics student takes courses offered by many departments over the entire campus at Kansas State University. Home economics courses are offered by the five departments in the College of Home Economics: Clothing, Textiles and Interior Design; Family and Child Development; Family Economics; Foods and Nutrition; and Institutional Management. Courses in Home Economics Education are offered by the College of Education.

An excellent foundation for graduate study is provided for the student who wishes to continue beyond the Bachelor of Science degree. Graduate courses are offered which lead to the Master of Science and Doctor of Philosophy degrees.

\section*{Transfer Students}

Careful planning enables a student to transfer to the College of Home Economics at Kansas State University without loss of credit. The courses listed below can be transferred to the College of Home

Economics and be applied toward the Bachelor of Science degree although not all courses are required for every major. A potential transfer student should write for a list of required courses as soon as he selects his major. Any student who plans to transfer for the junior year should write for suggestions or preferably come to the K-State campus for a conference before beginning the sophomore year. A degree may be earned in two years from Kansas State University by capable transfer students of junior standing with good academic records.

Two-Year Program Without Home Economics Courses
\begin{tabular}{|c|c|}
\hline Courses & Sem. Hrs.* \\
\hline English Composition & ...... 6 \\
\hline Speech & 2 \\
\hline General Psychology & 3 \\
\hline "General \& Elem. Organic Chemistry & 10 \\
\hline American Govt, or Political Sci. & 3-6 \\
\hline Sociology & 3.6 \\
\hline Civilization or World History & 3.6 \\
\hline General Zoology or Biology with a lab & 4 \\
\hline Economics & 3 \\
\hline Literature or Modern Language (if in education) & 6 \\
\hline College Algebra & 3 \\
\hline Elementary Design (with lab) & 2 \\
\hline Human Grnwth \& Dev. or Child and Psych. (if in education) & 3 \\
\hline Art Appreciation & - 3 \\
\hline
\end{tabular}

Electives to bring total to 62 hours

Two-Year Program with Home Economics Courses
\begin{tabular}{|c|c|}
\hline Courses & Sem. H \\
\hline English Composition & \\
\hline General and Elem. Organic Chemistry** & \\
\hline General Psychology & \\
\hline American Govt. or Political Science & \\
\hline Elementary Design (with lab.) & \\
\hline Foods or Nutrition \({ }^{\text {a* }}\) & \\
\hline Clothing Selection, or Socio economics of Clothing & \\
\hline Human or Family Relations & \\
\hline General Zoology or Biology (Lab.) & \\
\hline Modern Language or Literature (if in education) & \\
\hline Economics & \\
\hline Sociology & \\
\hline Clothing Construction (if education or clothing and textiles maior) & \\
\hline Human Growth \& Devel. or Child \& Adol. Psych. (i) & ation) \\
\hline Art Appreciation & \\
\hline
\end{tabular}

Electives to bring total to 62 hours

\section*{Curriculum in Home Economics with Options}

\section*{B.S. in Home Economics}

This curriculum is designed primarily for preparation in professional home economics fields. Courses are included for general education and home economics together with those needed for specialization. Options, or courses needed for professional proficiency in specific areas, are listed on the following pages.
Sufficient flexibility is provided to permit combinations suited to individual needs. Electives may be used to build strong combinations with other fields of interest.

Liberal-General Education Courses, 34 Hours


Additional Requirements, 20 Hours
Four disciplines of Humanities, Social, Biological, and Physical Sciences shall be represented in Liberal.General Education and-or Supporting Courses. (One discipline, not represented in Supporting Courses, shall in clude 8-12 credit hours, with two courses in sequence plus one additional course.)
\begin{tabular}{|c|c|c|c|c|}
\hline I. Des. & 611 & 101 & Design for Cont. Living & 3 \\
\hline F.C. Dev. & 620 & 250 & Human Relations & 2 \\
\hline F. Ec. & 630 & 300 & Family Economics & 3 \\
\hline F. \& N & 640 & 133 & Food for Man .... OR & 3 \\
\hline F. \& N & 640 & 300 & Meal Management OR & 3 \\
\hline F. \& N & 640 & 132 & Basic Nutrition & 3 \\
\hline Gn. H. E. & 650 & 110 & Intro. to Home Economics & 1 \\
\hline Gn. H. E. & 650 & 300 & Home Economics Seminar & 1 \\
\hline
\end{tabular}

Professional and Supporting Courses, 52 to 69 Hours
(See specific option)
Unrestricted Electives, 8 to 25 Hours
For men who take Air or Military Science, the credits will be accepted in lieu of unrestricted electives.

Other
Physical Education (2 semesters)
Total for Graduation, 124 Hours

\section*{Option in Radio and Television}

National broadcasting stations are requesting qualified radio and television personnel who understand the viewpoint of women, especially homemakers. This option provides opportunities for a specialty in home economics and courses in radio and television.
\begin{tabular}{|c|c|c|c|}
\hline \multicolumn{4}{|l|}{Professional and Supporting Courses} \\
\hline R. TV & 290 & 152 & Radio-TV Speech Procedures \\
\hline R.TV. & 290 & 160 & Survey of Broadcasting . \\
\hline R.TV. & 290 & 225 & Radio-TV Continuity . \\
\hline R TV & 290 & 326 & Intro. to Television \\
\hline R. TV. & 290 & 661 & TV Production \\
\hline R. TV. & 290 & 670 & Radio TV Prog. ............ OR \\
\hline R. TV. & 290 & 685 & Radio-TV Writing \\
\hline
\end{tabular}

Home Economics Courses, 24
\[
\begin{aligned}
& \text { Area of Concentration } \\
& \text { Courses selected from two areas other than } \\
& \quad \text { Concentration }
\end{aligned}
\]

Basic Disciplines, 10
Courses selected to support home economics areas
Speech and-or Social Sciences, 12
Option Requirements
Unrestricted Electives
Curriculum Requirements

\footnotetext{
The credit hours given above apply to courses af Kansas State University. Some transfer courses have more or less hours; substitutions or readjustments can usually be made for the difference in credit hours. Up to 62 hours may be transferred from a junior college; 124 hours are required for graduation by the College of Home Economics at Kansas State University. \({ }^{4}\) Textile Research and Foods and Nutrition Science require Chemistry i and 11 ( 10 credits of General Chemistry) and 5 hours of Organic Chemistry. Eight hours of physical science may be taken in place of General and Organic Chemistry in the following majors: Clothing Retailing, Fashion Design, and Home Economics with Liberal Arts. Only four hours of physical science are required for majors in Family and Child Development.
\(\cdots\) Students planning to major in Foods and Nutrition. Dietetics, or Home Economics Education should take Principles of Nutrition after transferring to Kansas State University
}

\section*{Option in Home Economics EducationVocational Teaching}

This option prepares the student for teaching home economics in Kansas secondary schools. With a B.S. degree, the student is eligible for a secondary three-year certificate to teach home economics in any Kansas junior or senior high school and for approval to teach in a vocational homemaking department.
Refer to pages 180-181 for admission requirements to teacher education and the Professional Semester.



\section*{Option in Clothing and Retailing (C. \& T.)}

Courses prepare students for careers in fashion merchandising in department stores and specialty shops.

- Under Liberal.General Education Additional Requirements, take Hist. 101 and 202 or 615; Soc. 211; Chem. 110 and 190, or Phys. 101-104; and at least three hours of biological science.

\section*{Option in Textile Research (C. \& T.)}

Courses in science, mathematics, textile testing, and research are combined with those providing a comprehensive background in home economics to prepare students for textile testing and as assistants in textile research. Career opportunities are found in the laboratories of colleges and universities, commercial firms, or government agencies.


\section*{Option in Fashion Design (C. \& T.)}

This option provides students with a working knowledge of color, line and sources of fashion inspiration together with experience in sketching, designing and creating garments in suitable fabrics.

- Under Liberal.General Education Additional Requirements, take Hist. 101. Math. 100, and Chem. 110 and 190 or Physics 101-104

\section*{Option in Interior Design (I. Des.)}

Two areas of specialization are open to students majoring in Interior Design. Interior Retailing prepares students for professional careers in business and interior designing. Designing Living Environments allows for study in all aspects of the planning and designing for interior space.


Area II - Retailing
\begin{tabular}{|c|c|c|c|}
\hline Art & 209 & 230 & Sculpture 1 .................... 2 OR \\
\hline Art & 209 & 265 & Ceramics 1 ............ ... 2 \\
\hline Bus. Ad. & 305 & 275 & Fund. of Accounting ........ 4 \\
\hline Bus. Ad. & 305 & 343 & Sales Communication ... ... 3 \\
\hline Bus. Ad. & 305 & 400 & Managements Concepts ...... 3 \\
\hline Bus. Ad. & 305 & 440 & Marketing . ................... 3 \\
\hline Bus. Ad. & 305 & 545 & Consumer Behavior ......... 3 \\
\hline 1 . Des. & 611 & 500 & Interior Des. Store Serv. Lab. . 5 \\
\hline
\end{tabular}

Under Liberal.General Education take a minimum of seven hours in Physical Science including Math. 100.


See Area of Specialization for Additional Requirements.

\section*{Option in Early Childhood Education (F. C. Dev.)}

This option is for the student who wishes to work in pre-kindergarten education programs in an administrative or teaching position.


\footnotetext{
- Or Pol. Sci. 444 (juniors and seniors)
*Selected in consultation with faculty advisor
- Under Liberal-General Education take six hours of literature or language; eight hours Biological Science and four hours Physical Science
}

\section*{Option in Community Services (F. C. Dev.)}

This option is for students interested in family life programs, child welfare with community agencies, or youth leadership in organized groups.
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|l|}{Protessional and Supporting Courses} \\
\hline Pol. Sci. & 269 & 110 & Intro. Pol. Sci.* & 3 \\
\hline \multirow[t]{3}{*}{Sociology} & \multirow[t]{3}{*}{277} & \multirow[t]{3}{*}{211} & \multicolumn{2}{|l|}{\multirow[t]{2}{*}{Intro. to Sociology Social Science electives}} \\
\hline & & & & 9 \\
\hline & & & Communications elective** & 3 \\
\hline C. \& T. & 610 & 131 & Socio-Econ. of Clothing OR & 3 \\
\hline C. \& T & 610 & 440 & Socio. Psych. Aspects & \\
\hline F.C. Dev. & 620 & 325 & The Preschool Child & 3
3 \\
\hline F.C. Dev. & 620 & 350 & Family Relationships & 2 \\
\hline F.C. Dev. & 620 & 360 & Middle Childhood & 3 \\
\hline F.C. Dev. & 620 & 475 & The Adolescent & 3 \\
\hline F.C. Dev. & 620 & 660 & The Family & 3 \\
\hline F.C. Dev. & 620 & 675 & Parent Education & 3 \\
\hline F. \& N . & 640 & 132 & Basic Nutrition & 3 \\
\hline \multicolumn{5}{|l|}{(CHOOSE ONE AREA)} \\
\hline \multicolumn{5}{|l|}{Social Welfare} \\
\hline Sociology & 277 & 260 & Intro. to Social Work & 3 \\
\hline \multirow[t]{2}{*}{Sociology} & \multirow[t]{2}{*}{277} & \multirow[t]{2}{*}{510} & Soc. Work as Soc. Inst. & 3 \\
\hline & & & Additional hours in man. agement; nutrition; community organization, problems and resources; language \({ }^{*}\) & 12-15 \\
\hline \multicolumn{5}{|l|}{Youth Work} \\
\hline \multirow[t]{2}{*}{Soc.} & \multirow[t]{2}{*}{277} & \multirow[t]{2}{*}{260} & & 3 \\
\hline & & & Additional hours in reccreation, literature, crafts, special education, music, community programs** & 15-18 \\
\hline \multirow[t]{2}{*}{Family Life Education Sociology} & \multirow[t]{2}{*}{277} & \multirow[t]{2}{*}{260} & Intro. to Social Work & 3 \\
\hline & & & Additional hours in communications, adult education, family problems and resources, and related areas of home economics** & 15-18 \\
\hline Option Requirements & & & & 59.62 \\
\hline Unrestricted Electives & & & & 15-18 \\
\hline Curriculum Requirem & ents* & & & 47 \\
\hline
\end{tabular}

Or Pol. Sci. 444 (iuniors and seniors).
- Selected in consultation with faculty advisor

Under Liberal.General Education take eight hours Biological Science and four hours Physical Science.

\section*{Option in Extension (F. C. Dev.)}

This option prepares a student to become a County Extension Home Economist. On graduation the student is prepared to join the Extension service for work in a county in Kansas or another state.
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|l|}{Professional and Supporting Courses} \\
\hline \multirow[t]{4}{*}{Pol. Sci. Sociology} & \multirow[t]{4}{*}{\[
\begin{aligned}
& 269 \\
& 277
\end{aligned}
\]} & \multirow[t]{4}{*}{\[
\begin{aligned}
& 110 \\
& 211
\end{aligned}
\]} & \multicolumn{2}{|l|}{\multirow[t]{4}{*}{\begin{tabular}{l}
Intro. Pol. Sci. \({ }^{*}\) \\
Intro. to Sociology \\
Social Science electives at 400 level or above** \\
Communications elective \({ }^{-}\)
\end{tabular}}} \\
\hline & & & & \\
\hline & & & & \\
\hline & & & & \\
\hline \multirow[t]{2}{*}{C. \& T} & \multirow[t]{2}{*}{610} & \multirow[t]{2}{*}{131} & \multicolumn{2}{|l|}{\multirow[t]{2}{*}{Socio-Econ. of Clothing OR}} \\
\hline & & & & \\
\hline \multirow[t]{2}{*}{C. \& \(T\).} & \multirow[t]{2}{*}{610} & \multirow[t]{2}{*}{440} & \multicolumn{2}{|l|}{\multirow[t]{2}{*}{Socio. Psych. Aspects of Clothing}} \\
\hline & & & & \\
\hline F.C. Dev. & 620 & 325 & The Preschool Child & 3 \\
\hline F.C. Dev. & \multicolumn{2}{|l|}{\(620 \quad 350\)} & Family Relationships & 2 \\
\hline F.C. Dev. & \multicolumn{2}{|l|}{620360} & Middle Childhood.. & 3 \\
\hline F.C. Dev. & \multicolumn{2}{|l|}{\(620 \quad 475\)} & The Adolescent . & 3 \\
\hline \multirow[t]{2}{*}{F.C. Dev.} & 620 & \multirow[t]{2}{*}{660} & \multirow[t]{2}{*}{The Family ...} & 3 \\
\hline & & & & 3 \\
\hline F. \& N. & \multirow[t]{2}{*}{} & \multirow[t]{2}{*}{132
605} & F. C. Dev. Elect
Basic Nutrition & 3 \\
\hline A. \& 0 . & & & Intro. Univ. Adult Educ. & 3 \\
\hline A. \& 0 . & \multirow[t]{2}{*}{410} & \multirow[t]{2}{*}{752} & Methods of Adulf Tchi. & 3 \\
\hline \multicolumn{3}{|l|}{\multirow[t]{2}{*}{Option Requirements}} & \multirow[t]{2}{*}{Protessional Electives \({ }^{\text {* }}\)} & \\
\hline & & & & 59 \\
\hline \multicolumn{3}{|l|}{Unrestricted Electives} & & 18 \\
\hline Curriculum & ent & & & 47 \\
\hline
\end{tabular}

\footnotetext{
-Or Pol Sci. 444 (juniors and seniors).
-Selected in consultation with faculty advisor
"Under Liberal. General Education take eight hours Biological Science and four hours Physical Science.
}

\section*{Consumer Interest Option (F. Ec.)}

This option allows 31 hours of electives, designed to permit combinations of course work in social work, marketing, family financial counseling, consumer education, business or public service with a new emphasis, that of recognizing the growing concern for the consumer. The curriculum is well balanced, enabling students to consider a variety of job opportunities.
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|l|}{Professional and Supporting Courses} \\
\hline Economics & 225 & 120 & Economics II & 3 \\
\hline Pol. Sci. & 269 & 110 & Intro. Pol. Sci. & 3 \\
\hline Sociology & 277 & 211 & Intro. to Sociology & 3 \\
\hline & & & Soc. Sci. Electives & 9 \\
\hline C. \& T & 610 & 131 & Socio-Econ. of Clothing OR & 3 \\
\hline C. \& \(T\). & 610 & 260 & Textiles & 3 \\
\hline F.C. Dev. & 620 & 325 & Preschool Child OR & 3 \\
\hline F.C. Dev. & 620 & 660 & The Family & 3 \\
\hline F. Ec. & 630 & 200 & Family Finance & 3 \\
\hline F. Ec. & 630 & 320 & The House & 3 \\
\hline F.Ec. & 630 & 340 & Household Equipment & 3 \\
\hline F. Ec. & 630 & 360 & Home Management & 2 \\
\hline F. Ec. & 630 & 365 & Home Management Lab & 2 \\
\hline F.Ec. & 630 & 600 & Fam. in Amer. Econ. & 3 \\
\hline F. Ec. & 630 & 605 & Consumers and the Mkt. & 3 \\
\hline F. \& N & 640 & 132 & Basic Nutrition Prof. Electives** & 15 \\
\hline \multicolumn{5}{|l|}{Option Requirements} \\
\hline \multicolumn{5}{|l|}{Unrestricted Electives (if F. C. Dev. \(620 \quad 660\) is elected, take F. C. Dev. 620 350)} \\
\hline \multicolumn{5}{|l|}{Curriculum Requirements***................................. 47} \\
\hline
\end{tabular}

Or Pol. Sci. 444 (juniors and seniors).
Selected in consultation with faculty advisor
"Under Liberal General Education additional requirements take Math. 100 and Stat. 320.

\section*{Housing and Equipment Option (F. Ec.)}

The required courses are basic. Electives allow for further specialization: in equipment for those interested in design, evaluation and education; in housing for those interested in house planning, kitchen designing, or research; and in home management for those interested in social work, in developing homemaker services and home management aides for urban renewal and poverty programs, in positions as "home adviser" with commerical companies or press, radio, and TV. This option also provides basic training for those who wish to prepare for research.
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|l|}{Professional and Supporting Courses} \\
\hline Chemistry & 221 & 110 & General Chemistry & 5 \\
\hline Chemistry & 221 & 190 & El. Org. Chemistry WITH & 3 \\
\hline Chemistry & 221 & 191 & \(\qquad\) & 2 \\
\hline Biochemistry & 020 & 120 & Intro. Org. \& Biochem. & 5 \\
\hline Mathematics & 245 & 100 & College Algebra & 3 \\
\hline Physics & 265 & 112 & Descriptive Physics & 4 \\
\hline Mathematics & 245 & 150 & Plane Trigonometry OR & 3 \\
\hline Statistics & 285 & 320 & Elem. of Statistics & 3 \\
\hline C. \& T. & 610 & 260 & Textiles & 3 \\
\hline F. C. Dev. & 620 & 660 & The Family OR & 3 \\
\hline Sociology & 277 & 646 & Sociology of the Family & \\
\hline F. Ec. & 630 & 200 & Family Finance ........ & 3 \\
\hline F. Ec. & 630 & 320 & The House ..... & 3 \\
\hline F. Ec. & 630 & 340 & Household Equipment & 3 \\
\hline F. Ec. & 630 & 360 & Home Management & 2 \\
\hline F. Ec. & 630 & 605 & Consumers and the Mkt. & \\
\hline F. Ec. & 630 & 620 & Housing Requirements of Families & 2 \\
\hline F. Ec. & & 640 & Adv. Household Equip. & 3 \\
\hline F. \& N. & 640 & 245 & Food Science Prof. Electives* & 4
16 \\
\hline \multicolumn{5}{|l|}{Option Requirements .............................................. . . 65} \\
\hline Unrestricted is elected, ta & dif & & \[
\begin{gathered}
\text { Dev. } 620660 \\
350) \\
\hline
\end{gathered}
\] & 2 \\
\hline
\end{tabular}

Selected in consultation with faculty advisor
- Under Liberal General Education Additional Requirements, take Biology 198 and Biology 450; sociology 211.


\footnotetext{
- Option requirement, unless taken as part of Home Economics Core.

May be waived by consent of instructor
Under Liberal-General Education Additional Requirements, take Speech 225 ; and an additional six hours social science including Sociology 211; five hours communication electives; six hours humanities.
}

Option in Foods and Nutrition in Business (F. \& N.)

Students take positions with food processors, food promotional agencies, utility companies and other business organizations. Home economists in these positions do educational work, giving demonstrations and illustrated talks, writing food columns for newspapers, and taking part in radio and television programs.
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|l|}{CHOOSE ONE OF THE PROFESSIONAL AREAS \(1, \|\), 111} \\
\hline ASI & 005 & 280 & Meat Sel. Utiliz., HE & 2 \\
\hline Journalism & 289 & 306 & Reporting I & 3 \\
\hline Journalism & 289 & 610 & Family Page & 3 \\
\hline F. Ec. & 630 & 340 & Household Equip. & 3 \\
\hline F.Ec. & 630 & 605 & Consumer \& Market OR & 3 \\
\hline Bus. Ad. & 305 & 440 & Marketing & 3 \\
\hline F. \& N. & 640 & 300 & Meal Management* & 3 \\
\hline F. \& N. & 640 & 301 & Trends in Food Products & 3 \\
\hline F. \& N. & 640 & 410 & Prin. of Food Demon. & 2 \\
\hline F. \& N & 640 & 601 & Food Science & 4 \\
\hline \(F .8 N\). & 640 & 602 & Principles of Nutrition & 3 \\
\hline F. \& N. & 640 & 605 & Food Research Tech. & 3 \\
\hline F. \& \(N\). & 640 & 680 & Seminar Foods \& Nutr. & 2 \\
\hline I. M. & 660 & 340 & Quantity Foods & 4 \\
\hline \multicolumn{5}{|l|}{Area II - Extension Service} \\
\hline & 005 & 280 & Meal Sel. Utiliz., HE & 2 \\
\hline Journalism & 289 & 306 & \begin{tabular}{l}
Reporting 1 ...... \\
OR
\end{tabular} & 3 \\
\hline journalism & 289 & 350 & Agri. Jounalism & 3 \\
\hline A. \& 0. & 410 & 605 & Intro. Univ. Adult Educ. & 3 \\
\hline A. \& 0 . & 410 & 752 & Methods of Adult Tchg. & 3 \\
\hline F.Ec. & 630 & 305 & Family Finance & 3 \\
\hline F. Ec. & 630 & 340 & Household Equip. & 3 \\
\hline F.Ec. & 630 & 605 & Consumer \& Marke† OR & 3 \\
\hline Bus. Ad. & 305 & 440 & Marketing & 3 \\
\hline F. \& N . & 640 & 300 & Meal Management* & 3 \\
\hline F. \& \(N\). & 640 & 301 & Trends in Food Products & 3 \\
\hline F. \& N . & 640 & 410 & Prin. of Food Demon. & 2 \\
\hline F. \& \(N\). & 640 & 601 & Food Science & 4 \\
\hline F. \& N. & 640 & 602 & Principles of Nutrition & 3 \\
\hline F. \& N . & 640 & 680 & Seminar Foods \& Nutr. & 2 \\
\hline I.M. & 660 & 340 & Quantity Foods. & 4 \\
\hline
\end{tabular}

\section*{Option in Foods and Nutrition Science (F. \& N.)}

Students prepare for positions as assistants or technologists in university or government research laboratories, as home economists in test kitchens, food product development laboratories, or food promotional agencies, or as nutritionists in business or governmental agencies. Many research positions offer opportunity for graduate study.
\begin{tabular}{|c|c|c|c|c|}
\hline Professional and & ting & Cour & & \\
\hline Biochemistry & 020 & 200 & Elem. Biochemistry & 5 \\
\hline Biology & 215 & 198 & Prin. of Biology & 4 \\
\hline Biology & 215 & 450 & Microbiology & 4 \\
\hline Biology & 215 & 425 & Human Physiology & 4 \\
\hline Chemistry & 221 & 210 & Chemistry 1 & 5 \\
\hline Chemistry & 221 & 230 & Chemistry II & 3 \\
\hline Chemistry & 221 & 250 & Chemistry II Lab. & 2 \\
\hline Chemistry & 221 & 350 & Gen. Org. Chemistry & 3 \\
\hline Chemistry & 221 & 351 & Gen. Org. Chem. Lab. & 2 \\
\hline Physics & 265 & 112 & Descriptive Physics & 4 \\
\hline F. \& N . & 640 & 133 & Food for Man OR & 3 \\
\hline F. \& N. & 640 & 300 & Meal Management & 3 \\
\hline F. \& N . & 640 & 601 & Food Science & 4 \\
\hline F. \& N . & 640 & 602 & Prin. of Nutrition & 3 \\
\hline F. \& N & 640 & 605 & Food Research Tech. & 3 \\
\hline F. \& N. & 640 & 680 & Seminar in Foods and Nutrition \(\qquad\) & 2 \\
\hline F. \& N & 640 & 710 & Nutr. Thoughout Life Cycle & \\
\hline & & & Food and Nutr. Elective & 3 \\
\hline & & & Home Ec. Elective . . . & 3 \\
\hline Option Require & & & & 60 \\
\hline Unrestricted E & & & & 14 \\
\hline Curriculum Re & ment & & & 50 \\
\hline & & & & 124 \\
\hline
\end{tabular}

\footnotetext{
- Under Liberal.General Education Additional Requirements, take five hours elective, nine hours humanities, Math. 100 or 220 , and an additional
} six hours social science

\section*{Option in Dietetics and Institutional Management (Ins. M.)}

The demands and opportunities for dietitians or directors of food services in hospitals, college residence halls, schools, and cafeterias far exceed the supply. To help meet the need for more dietitians a new innovative program has been developed. A four year undergraduate program that combines classroom teaching with clinical experiences of an internship leads to a B.S. degree and membership in the American Dietetic Association. (See Area III). A B.S. degree may be earned by the completion of Area I or II and qualifies graduates to accept internships. Graduates may apply for membership in the American Dietetic Association at the conclusion of an approved internship.
Supporting Courses
Biology
Biology
Biology
Chemistry
Chemistry
Chemistry


CHOOSE ONE OF THE PROFESSIONAL AREAS \(1,11,\| \|\)
Area 1 - College and School Food
Servic
ASI
Bus. Ad.
Bus. Ad.
Bus. Ad.
Bus. Ad.
F. \& N.
F. \& N.
F. \& N.
Ins. M.
Ins. M.
Ins. M.
Ins. M.
Ins. M.
\begin{tabular}{|c|c|c|}
\hline 005 & 280 & Meat Sel. Utiliz., HE \\
\hline 305 & 275 & Fund. of Accounting \\
\hline 305 & 305 & Mangerial Accounting \\
\hline 305 & 431 & Personnel Adminstration OR \\
\hline 305 & 400 & Mangement Concepts \\
\hline 640 & 602 & Principles of Nutrition \\
\hline 640 & 601 & Food Science \\
\hline 640 & 605 & Food Research Tech. \\
\hline 660 & 340 & Quantity Foods \\
\hline 660 & 605 & Food Production Management \\
\hline 660 & 625 & Quan. Food Pur. \& Control \\
\hline 660 & 635 & Food Serv. Equip. \& Layout \\
\hline 660 & 640 & Org. \& Mngt. of Food Services \\
\hline
\end{tabular}

Area 11 - Hospital Dietetics
To meet academic requirements for application to American Dietetics Association approved internship
ASI 005280 Meat Sel. Utiliz., HE ........ 2

Biochemistry 020200 Elem. Biochemistry ........... 2 Mana. Biochent Concepts …...... 5
\begin{tabular}{|c|c|c|c|}
\hline & & & OR \\
\hline Bus. Ad. & 305 & 431 & Personnel Adminstration \\
\hline A. \& 0 . & 410 & 551 & Meth. of Tchg. for Diet. Stu. \\
\hline F. \& N . & 640 & 601 & Food Science \\
\hline F. \& N. & 640 & 602 & Principles of Nutrition \\
\hline F. \& N. & 640 & 605 & Food Research Tech. \\
\hline F. \& N. & 640 & 710 & Nutr. Life Cycle \\
\hline F. \& N. & 640 & 712 & Diet. Therapy \\
\hline Ins. M. & 660 & 340 & Quantity Foods \\
\hline Ins. M. & 660 & 605 & Food Production Mngt. \\
\hline Ins. M. & 6.60 & 625 & Quan. Food Pur. \& Control \\
\hline Ins. M. & 660 & 635 & Food Serv. Equip. \& Layout . . . \\
\hline Ins. M. & 660 & 640 & Org. \& Mngt. of Food Services \\
\hline
\end{tabular}

Area III - Coordinated Undergraduate Program in Dietetics
An interdepartmental program with institutional Management and Foods and Nulrition to meet academic and clinical requirements for mem. bership in the American Dietetics Association. Selected Admission. (See below) Biochemistry Bus. Ad.

Bus. Ad.
A. \(\& 0\).
\(020 \quad 421\)
Gen. Biochemistry
Management Concepts
OR
A. \& O .
\(F . \& N\).
Ins. \(M\).
Ins. \(M\).
Ins. M.
Ins. M.
ersonnel Administration
Meth. Of Tchg. for Diet. Stu
Principles of
Principles of Nutrition
intro. Dietetics
Food Serv Systems
Mngt. in Dietetics


Criteria for Admission to and Continuation in Program:
1. Fulfillment of KSU admission requirements.
2. Grade point average 2.2 (on 4.0 basis) for first two years
3. Approval of Dietetics Coordinating Committee, based on grades and
personal qual ications
4. Grade point average 2.5 in professional courses at end of junior year for
continuation in program
5. Application to program is made in the spring of the sophomore year.

Option Requirements
Unrestricted Electives \(\begin{array}{r}12.21 \\ \hline\end{array}\)
- Under Liberal.General Education take Sociology 211 and 9 hours elective in Soc. Sci. and Humanities.

\section*{Curriculum in Restaurant Management}
B.S. in Restaurant Management

Qualified men and women fill administrative positions in commercial and industrial food services, such as restaurants, hotels, coffee shops, cafeterias, and tea rooms. Summer experience under approved conditions is advised throughout the time students are enrolled in this curriculum.
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|l|}{Liberal-General Education Courses, 47 Hours} \\
\hline English & 229 & 100 & English Composition i & 3 \\
\hline English & 229 & 120 & English Composition II & 3 \\
\hline Speech & 281 & 105 & Oral Communication I Communications Elective & \[
\begin{aligned}
& 2 \\
& 3
\end{aligned}
\] \\
\hline \multicolumn{5}{|l|}{Humanities Electives} \\
\hline Social Science & & & & 12 \\
\hline Economics & 225 & 110 & Economics & 3 \\
\hline Economics & 225 & 120 & Economics II & \\
\hline Psychology & 265 & 110 & General Psychology & 3 \\
\hline Sociology & 277 & 211 & intro. to Sociology & 3 \\
\hline \multicolumn{5}{|l|}{Biological Science} \\
\hline Biology & 215 & 198 & Principles of Biology & 4 \\
\hline \multicolumn{5}{|l|}{Physical Science ........................................................... 10} \\
\hline Chemistry & 221 & 110 & General Chemistry & 5 \\
\hline Biochemistry & 020 & 120 & Intro. Org. \& Bio. Chem. & - 5 \\
\hline
\end{tabular}
\begin{tabular}{|c|c|c|c|}
\hline ASI & 005 & 280 & M \\
\hline Biology & 215 & 200 & Pub. Health Bact. .............. 3 \\
\hline Bus. Ad. & 305 & 275 & Fund. of Accounting .......... 4 \\
\hline Bus. Ad. & 305 & 305 & Managerial Accounting ....... 3 \\
\hline Bus. Ad. & 305 & 400 & Management Concepts ........ 3 \\
\hline Bus. Ad. & 305 & 425 & Business Law 1 ................ 3 \\
\hline Bus. Ad. & 305 & 431 & Personnel Admin. ............. 3 \\
\hline Bus. Ad. & 305 & 440 & Marketing ..................... 3 \\
\hline 1. Des. & 611 & 101 & Design for Contem. Living ... 3 \\
\hline F. \& N & 640 & 132 & Basic Nutrition OR ............ 3 \\
\hline F. \& N & 640 & 133 & Food for Man . . . . . . . . . . . . . . . 3 \\
\hline F. \& N & 640 & 303 & Food Prep ........................ 3 Or \\
\hline F. \& N. & 640 & 601 & Food Science .................. 4 \\
\hline Ins. M. & 660 & 340 & Quantity Foods . . . . . . . . . . . . . 4 \\
\hline Ins. M. & 660 & 605 & Food Production Mngt. ....... 4 \\
\hline Ins. \(M\). & 660 & 625 & Quan: Food Pur. and Control \\
\hline Ins. M. & 660 & 635 & \begin{tabular}{l}
Food Serv. Equip. and \\
Layout ......................... 2
\end{tabular} \\
\hline Ins. M. & 660 & 640 & Org. and Mngt. of Food Serv. \\
\hline Ins. \(M\). & 660 & 780 & Prob. in Inst. Mngt. . . . . . . . . . . 3 \\
\hline \multicolumn{4}{|l|}{Choose Three Courses: 315} \\
\hline Journalism & 289 & 635 & Public Relations .............. 3 \\
\hline Bus. Ad. & 305 & 540 & Retailing .................... 3 \\
\hline Bus Ad. & 305 & 631 & Org. Behavior and Admin. .... 3 \\
\hline
\end{tabular}

Unrestricted Electives, 16-17 Hours
Other
Physical Education (two semesters)
................................

\section*{Curriculum in Home Economics and Journalism}
B.S. in Home Economics and Journalism

Opportunities for graduates in this curriculum include writing for national magazines, editing special interest pages on newspapers, or writing promotional material for businesses and other organizations. The curriculum includes journalism and mass communications courses and a concentration in one field of home economics.
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|l|}{Communications} \\
\hline English & 229 & 100 & English Composition I & \\
\hline English & 229 & 120 & English Composition II & 3 \\
\hline Speech & 281 & 105 & Oral Communication & 2 \\
\hline \multicolumn{5}{|l|}{Social Science} \\
\hline Economics & 225 & 110 & \multirow[t]{2}{*}{Economics I} & \\
\hline & 273 & 110 & & 3 \\
\hline \multicolumn{5}{|l|}{Additional Requirements*} \\
\hline \multicolumn{5}{|l|}{\multirow[t]{2}{*}{Four disciplines of Humanities, Social, Biological, and Physical Scienc shall be represented in Liberal-General Education and-or Supporti}} \\
\hline & & & & \\
\hline \multicolumn{5}{|l|}{\multirow[t]{3}{*}{Courses. (One discipline, not represented in Supporting Courses, shall clude 8 - 12 credit hours, with two courses in sequence plus one addition course.)}} \\
\hline & & & & \\
\hline & & & & \\
\hline \multicolumn{5}{|l|}{Home Economics Core, 13 Hours} \\
\hline I. Des. & 611 & 101 & Design for Cont. Living & 3 \\
\hline F.C. Dev. & 620 & 250 & Human Relations & 2 \\
\hline F.Ec. & 630 & 300 & Family Economics & 3 \\
\hline F. \& N. & 640 & 133 & Food for Man & 3 \\
\hline & & & Or & \\
\hline F. \& N. & 640 & 300 & Meal Management & 3 \\
\hline & & & OR & \\
\hline F. \& N & 640 & 132 & Basic Nutrition & \\
\hline General H.E. & 650 & 110 & Intro. to Home Ec & 1 \\
\hline General H. E. & 650 & 300 & Home Economics Seminar & 1 \\
\hline \multicolumn{5}{|l|}{Professional and Supporting Courses, 63 Hours} \\
\hline Journalism & 289 & 235 & Survey of Mass Media & 3 \\
\hline & & & OR & \\
\hline Journalism & 289 & 660 & Journalist in a Free Society & 3 \\
\hline Journalism & 289 & 306 & Reporting I & 3 \\
\hline Journalism & 289 & 316 & Reporting II & 3 \\
\hline Journalism & 289 & 330 & Editing I & \\
\hline Journalsim & 289 & 610 & Family Page & 3 \\
\hline
\end{tabular}

Home Economics Courses," 24 Hours
Area of Concentration (14)
Courses selected from at least one area other than concentration (10)
Basic Disciplines," 9 Hours
Courses selected to support home economics areas
15 to 18 Hours in Journalism may be selected from, but not limited to the


Unrestricted Electives, 14 Hours
Other
Physical Education (two semesters) .................................... 0 Total for Graduation ................................................ 124

\section*{Curriculum in Home Economics with Liberal Arts}

\section*{B S in Home Economics}

This curriculum is for the student who wishes to combine a broad liberal arts education with home economics. Maximum flexibility is provided for the selection of courses best suited to individual abilities and interests. The student in consultation with a faculty adviser selects a sequence of courses for concentration in one or more academic areas. This curriculum provides excellent background for professional careers, graduate study, and the responsibilities of homemaking and citizenship.
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|l|}{Liberal-General Education Courses, 65-68 Hours} \\
\hline English & 229 & 100 & English Composition 1 & 3 \\
\hline English & 229 & 120 & English Composition II & 3 \\
\hline Speech & 281 & 105 & Oral Communication I & 2 \\
\hline \multicolumn{5}{|l|}{Social Science .. ....... ...... .............................. 12} \\
\hline Economics & 225 & 110 & Economics I & 3 \\
\hline Psychology & 273 & 110 & General Psychology Electives in Soc. Sci & \[
3
\] \\
\hline \multicolumn{5}{|l|}{Humanities} \\
\hline \multicolumn{5}{|l|}{Philosophy, Mathematics, Logic . . . .................. 3} \\
\hline \multicolumn{5}{|l|}{Literature or History . ..} \\
\hline Electives in Hum & & & & 8.9 \\
\hline \multicolumn{5}{|l|}{Physical Science ... . . . .................. 8-10} \\
\hline \multicolumn{5}{|l|}{\multirow[t]{2}{*}{\begin{tabular}{l}
Biological Science \\
Concentration in one subject matter area
\end{tabular}}} \\
\hline & & & & \\
\hline \multicolumn{5}{|l|}{Home Economics, 33 Hours} \\
\hline 1. Des. & 611 & 101 & Design for Contemp. Living & 3 \\
\hline F.C. Dev. & 620 & 250 & Human Relations & 2 \\
\hline F.Ec & 630 & 300 & Family Economics & 3 \\
\hline F. \& N & & 133 & Food for Man OR & 3 \\
\hline F. \& N & 640 & 300 & Meal Management & 3 \\
\hline F. \& N & 640 & 132 & Basic Nutrition & 3 \\
\hline General H. E. & 650 & 110 & Intro. to Home Economics & 1 \\
\hline General H E. & 650 & 300 & Home Economics Seminar & 1 \\
\hline \multicolumn{5}{|l|}{Courses in Home Economics in one of the following areas of concentration} \\
\hline \multicolumn{5}{|l|}{\multirow[t]{2}{*}{a Clothing, Textiles, and Interior Design. C. \& T. 131 (3), C. \& T. 260 (3),}} \\
\hline & & & & \\
\hline \multicolumn{5}{|l|}{\begin{tabular}{l}
home economics (14). \\
b. Family and Child Development: F. C. Dev 325 (3), F. C. Dev. 350 (2),
\end{tabular}} \\
\hline \multicolumn{5}{|l|}{F. C. Dev. 660 (3), courses in Family and Child Development and related areas in home economics (12).} \\
\hline \multicolumn{5}{|l|}{c. Family Economics: F. Ec. 305 (3), F. Ec. 360 (2), F. Ec. 605 (3), courses} \\
\hline \multicolumn{5}{|l|}{\multirow[t]{2}{*}{\begin{tabular}{l}
in Family Economics and related areas in home economics (12). \\
d. General Home Economics F. \& N. 132 (3), F. Ec. 350 (2), F. C. Dev. 325
\end{tabular}}} \\
\hline & & & & \\
\hline \multicolumn{5}{|l|}{(3) and selected home economics courses (12).} \\
\hline \multicolumn{5}{|l|}{Unrestricted Elecfives, 23-26 Hours} \\
\hline \multicolumn{5}{|l|}{Other} \\
\hline \multicolumn{5}{|l|}{Physical Education (two semesters)} \\
\hline \multicolumn{3}{|l|}{Total for Graduation} & & 124 \\
\hline
\end{tabular}

\footnotetext{
Under Liberal-General Education Additional Requirements, take Soc. 211 and Pol. Sci. 220 (freshmen and sophomores) or Pol. Sci. 444 ( \(j u n i o r s\) and eniors)

Selected in consultation with Home Economics faculty adviser.
}

\section*{Clothing, Textiles, and Interior Design}

JESSIE A. WARDEN,* Head of Department
Professors Brockman* and Warden;* Associate Professor Cormany;* Assistant Professors Craigie,* Friend," and Newby; Instructors Braun, Coleman, Munson, Dollar, Peterson, and Zaccagnini; Emeritus: Professors Barfoot* and Latzke;* Associate Professors Hess,' Hill,' Howe,* and Lienkaemper.*
The Department of Clothing, Textiles and Interior Design offers opportunities for study in socio-economics of clothing, textiles, clothing construction, history of costume, and design of interiors. Four options leading to a Bachelor of Science degree are: (1) retailing, (2) fashion design, (3) textile research, and (4) interior design. Major sequences leading to the Master of Science degree in the field of clothing, textiles and interior design may be selected according to the individual's choice.

Facilities include an extensive University Library, well-equipped studios, laboratories, and equipment for physical and chemical analysis of textiles.

\section*{Courses in Clothing and Textiles}

\section*{UNDERGRADUATE CREDIT}

610 131. Socio-Economics of Clothing. (3) I, II, alt. S. Clothing needs and practices of individuals and social groups; wardrobe planning and buying procedures. Pr.: Not open to juniors and seniors without the consent of department head.
610 210. Pattern Study and Garment Construction. (3) I, II. Selection and fitting of commercial patterns; development of construction techniques using various fabrics. Six hours lab. a week.
610 220. Costume Design I. (2) I, II. Exploration and application of the principles and problems of costume design. Function, form and color studies applied to costume art. One hour rec. and three hours lab. a week. Pr.: Art 100, I. Des. 101.
610 230. Fashion Merchandising I. (3) I, II. Factors which influence the merchandising of fashion goods.
610 260. Textiles. (3) I, II, alt. S. Fundamentals of textiles as related to the problems of the consumer. Two hours rec. and two hours lab. a week. Pr.: Sophomore standing. 610 310. Tailoring. (3) I, II, and alt. S. Tailoring techniques; construction of a coat or suit based on a commercial pattern using the "dress-maker method." Six hours lab. a week. Pr.: C. \& T. 210 or consent of instructor.
610 315. Costume Illustration. (3) II. The changing fashion figure and fashion renderings; fundamental fashion layout. Pr.: Art 244, C. \& T. 220, or consent of instructor.
610 320. Costume Design II. (3) I. Design by illustration, with emphasis on functional and original design solutions; fashion sources. Pr.: C. \& T. 315 or consent of instructor.

610 365. Weaving I. (2) I, II, S. Principles of design, color, and texture applied to textile construction. Pr.: Art 100 or consent of instructor. May be taken more than one semester.
610 395. Window Display. (3) II. Designing and executing displays for windows and interior cases. Experience through cooperation of local stores. Pr.: Art 100.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

610 440. Socio-Psychological Aspects of Clothing. (3) II, alt. S. An interdisciplinary approach to the concepts and theories applied to the study of clothing and its expression and use in relation to self, society and culture. Pr.: Soc. 211 and Psych. 110.
610 520. Fashion Life Sketch. (2) II. Fashion drawing from the model, both sketches and finished work from life. Pr.: Art 224 or consent of instructor.
610 525. Fashion Store Service Laboratory. (5) I. Observation and supervised experience in merchandising procedures in a retail establishment. Laboratory experience arranged. Pr.: C. \& T. 230 and B. S. 545. Senior in option, 2.00 GPA .

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

610 605. Study Tour in Clothing and Textiles. (Var.) On demand. A study of significant aspects of environment, culture and technology as related to Clothing and Textiles. Pr.: Six hours Clothing and Textiles or consent of instructor.
610 610. Pattern Development Theory I. (3) I, II, S. Introduction to basic principles and techniques used in the development, alteration, and styling of patterns by drafting, draping, construction. Pr.: C. \& T. 210; C. \& T. 220 recommended.
610 615. Designing by Draping. (3) II, alt. S. Social significance of fashion; application of design principles to dress. Designs draped in muslin and then completed in suitable fabircs. Six hours lab. a week. Pr.: C. \& T. 610. 610 620. Costume Design III. (3) alt. years. Design orientation for market size range. Pr.: C. \& T. 320 or consent of instructor.
610 625. Fashion Promotion. (3) II alt. years. Procedures involved in promotion of fashion merchandise: budgeting, planning, selecting merchandise, and other promotional activities. Pr.: C. \& T. 230, or consent of instructor, and B. A. 540.
610 630. Clothing Economics. (3) I, alt. S. The organization of textile industries and markets; consumer problems in relation to market conditions. Pr.: Econ. 110. 610 635. Fashion Merchandising II (3) I. The processes involved in planning and controlling the operation of fashion departments. Pr.: C. \& T. 230 and B. S. 545 or consent of instructor.
610 650. Intermediate Textiles. (3) I, alt. S. Characteristics of fibers and current developments in textiles. Two hours rec. and two hours lab. a week. Pr.: C. \& T. 260, Chem. 190 or Phys. 101-104.
610 655. Advanced Textiles. (3) II, alt. S. Physical, chemical, and optical testing of textiles; emphasis placed on research techniques. One hour rec. and six hours lab. a week. Pr.: C. \& T. 260, Chem. 190, 191.

610 680. Clothing and Textiles Seminar. Credit arranged. II, alt. S. Discussion of current developments in the field. May be taken more than one semester with consent of student's advisory committee. Pr.: Eight hours credit basic to field involved.
610 710. Advanced Tailoring. (3) II, alt. S. Development of a design and construction of a coat or suit; techniques of custom tailoring; Six hours lab. a week. Pr.: C. \& T. 610 or 615 or consent of instructor.
610 715. Pattern Development Theory II. (3) II, alt. S. Continuation of development, alteration, and styling of patterns with application to size ranges and figure types. Pr.: C. \& T. 610; C. \& T. 320 recommended.
610 725. Pattern Development Theory III. (3) I, alt. S. A critical analysis of pattern styling for women's fashions with emphasis on the development of original designs. Pr.: C. \& T. 320, and C. \& T. 715; C. \& T. 625 recommended.
610 730. History of Costume. (3) II, alt. S. Aspects of the culture of various countries and periods of history as reflected in costume. Pr.: Hist. 101.
610 750. Experimental Textiles. Credit arranged. I, II, S. Individual investigation into textile research. Pr.: C. \& T. 655.

610 780. Problems in Clothing and Textiles. Credit arranged. I, II, S. Work is offered in garment designing, textiles, history of costume, clothing economics. Pr.: Senior or graduate standing; consent of instructor.
610 785. Problems in Costume Design. Credit arranged. I, II, S. Problems planned with the student to meet particular needs. Pr.: C. \& T. 320 or consent of instructor.

\section*{GRADUATE CREDIT}

610 800. Master's Report. (1 or 2) I, II, S. Written report required of students adopting Plan II for meeting the requirements for the degree Master of Science in clothing and textiles. Subject chosen in consultation with major instructor. Pr.: Consent of department head.
610 830. Advances in Clothing. (2) Alt. S. Recent developments related to production, distribution, and use of clothing. Pr.: Six hours of clothing and textiles, three hours economics or equivalent, and consent of department head.
610 840. Clothing Consuetude. (3) II in alt. years. Costume as a reflection of cultural change upon nonwestern peoples. Pr.: Anthro. 200, C. \& T. 730 or consent of instructor.
610 850. Advances in Textiles. (2) Alt. S. Recent developments in research related to fibers, yarns and finishes. Pr.: Eight hours of clothing and textiles, eight hours of physical science, and consent of department head.
610 870. Case Studies in the Fashion Industry. (3) On sufficient demand. Independent and creative solutions to typical problems in the fashion industry by means of case study method. Pr.: B. A. 540, C. \& T. 630, or consent of instructor.
610 980. Research in Clothing and Textiles. Credit arranged. I, II, S. Research in clothing or textiles which may form the basis for the master's thesis. Pr.: Graduate standing.

\section*{Interior Design}

Concentration in interior design prepares students for professional work in this field. The curriculum follows closely the proposed degree course of the national organizations: National Society of Interior Designers and the American Institute of Interior Designers.

Work leading to the master's degree is offered. Graduate students may become teachers, color consultants, or designers of interiors and furnishings.

Prerequisite to graduate work is the completion of an undergraduate curriculum substantially equivalent to that in interior design. Commercial experience is desirable.

\section*{UNDERGRADUATE CREDIT}

611 101. Design for Contemporary Living. (3) I, II, S. Development of critical awareness of the application of principles of design in contemporary living.
611 215. Introduction to Interior Design. (2) I, II, S. Artistic and social aspects of the home and its furnishings; laboratory experience in selection and arrangement of furnishings. Not open to interior design majors. One hour rec. and three hours lab. a week. Pr.: Art 100.
611 240. Interior Design I. (3) I, II, alt. S. Designing of interiors for homes today. One hour rec. and three hours lab. a week. Pr. : Art 100, 190 and Arch. 208 (or concurrent enrollment).
611 245. Contemporary Homes. (3) II. The design of the contemporary home as an art expression of the family in relation to everyday living. Three rec. periods a week. Pr.: Art 100 or equiv.
611 340. Interior Design II. (3) I. The design of interiors; scale drawings in elevation and perspective. Pr.: I. Des. 240.

611 345. Interior Design Practicum. (3) I. Refinishing, restyling, upholstering and-or slipcovering furniture; also designing and making draperies and lamp shades. Pr.: I. Des. 240.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

611 500. Interior Design Store Service Laboratory (5) I. Observation and supervised experience in merchandising procedures in a retail establishment. Pr.: Senior in option, 2.0 GPA, I. Des. 340, B. A. 545.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

611 640. Interior Design III. (3) II, alt. S. Creative design of furnishings; introduction to markets and selling; decorator-client relationships; qualifications of the professional decorator. Pr.: I. Des. 340.
611 645. Historic Furniture Design. (3) II, alt. S. Design expressed in furniture in each of the great art periods. Pr.: I. Des. 240 or consent of instructor.
611 650. Study Tour in Interior Design. (Var.) On demand. A study of significant aspects of environment, culture and technology as related to Interior Design. Pr.: Six hours Interior Design or consent of instructor.

611 720. Keadings in Interior Design. (2) I, II, S. Directed study in current problems of interior design. Pr.: I. Des. 340 or consent of instructor.
611 740. Historic Fabric Design. (3) I, alt. S. Design employed in fabrics in each of the great art periods. Pr.: Art 100, C. \& T. 260 or consent of instructor.
611 782. Problems in Interior Design. Credit arranged. I, II, S. Problems planned with the student to meet particular needs. Pr.: I. Des. 640 or consent of instructor.
611 980. Research in Interior Design. Credit arranged. I, II, S. Research which may form the basis for the master's thesis or master's report. Pr.: Graduate standing.

\section*{Family and Child Development}

MARJORIE STITH,* Head of Department
Professors Kennedy,* McCord* and Stith;* Associate Professor Bollman;* Assistant Professor Parker; Instructors Bailey, Bergen, Coates, Leonard, Lewis, Moxley, and Sistrunk; Emeritus: Professors Kell* and Williams;* Associate Professor Aldous;* Assistant Professor Raffington.
This department offers unique opportunities for study of the child and his family, with enriching experiences in the child development laboratory. Courses are planned to create an awareness of the child as a developing personality and to promote an understanding of the dynamics of family relationships. Three options for those interested in working with children or adults are: (1) Early Childhood Education, (2) Community Services, and (3) Extension. Within the Community Services option there are three areas of specialization: social welfare, youth work, and family life education.

Early Childhood Certification: Completion of the option in Early Childhood Education meets the requirements for a degree ThreeYear Early Childhood Certificate as established by the State Board of Education. In addition to the option requirements, the following criteria must be met: (1) An overall grade point average of 2.2 on all work taken at Kansas State University, and (2) Recommendation for certification by the Director of the Child Development Laboratory and by the Head of the Department of Family and Child Development to the certifying officer of Kansas State University.

Departmental facilities include a research room with one-way vision mirrors and an intercommunication system that provides opportunities for students to observe individuals or groups in an experimental set-
ting. The Child Development Laboratory, with morning and afternoon sessions, is located on campus. Field experiences are available through the Friendship Tutoring Program, Larned Semester, and additional programs in Manhattan and other communities. During one semester a field placement out of Manhattan is arranged for an eight-week period.
The Department offers work toward the degree Master of Science for students interested in professional opportunities such as child development programs, child guidance clinics, family life programs in the public schools, college teaching, student personnel work, child welfare with community agencies, or research in child development and family life. Current emphasis on day care programs and on culturally disadvantaged families and children provides new professional opportunities to the home economist with a graduate degree in child development and family relationships.

\section*{Courses in Family and Child Development}

\section*{UNDERGRADUATE CREDIT}

620 250. Human Relations. (2) I, II, alt. S. Increases the student's knowledge of individual development through awareness and understanding of his relationships with his family, his peers, and others; concepts and generalizations describing development and relationships.
620 325. The Preschool Child. (3) I, II, alt. S. Principles of development and guidance of preschool children in homes and in groups; application of principles in nursery school. Pr.: Psych. 110 and sophomore standing.
620 340. Problem in Family and Child Development. Credit arranged. I, II, S. Independent or small group study. Pr.: Consent of instructor.
620 350. Family Relationships. (2) I, II, S. Effects of family interaction upon individual development; consideration of pre-marital, marital, and parent-child relationships. Pr.: Sophomore standing.
620 360. Middle Childhood. (3) I, II, alt. S. Developmental characteristics of middle childhood as a basis for guidance, with emphasis on understanding of family and peer group relationships; observation of children 6 to 12 ; field work arranged. Pr.: Psych. 110; and one of the following: F. C. Dev. 325, Educ. 202 or Psych. 415.
620 370. Field Study in Family and Child Development. Credit arranged. I, II, S. Directed study of processes of human development and participation in a field setting. Pr.: Sophomore standing; consent of department head. 620 375. Family Health. (2) I, II. Factors conducive to maintaining health for family members from the prenatal period through old age. Pr.:Sophomore standing.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

620 470. Creative Experiences for Preschool Children. (3) I, II. Techniques of meeting the needs of preschool children through their experiences with stories, music, play activities, and creative media. Pr.: F. C. Dev. 325; Family and Child Development major or consent of instructor.
620 475. The Adolescent. (2-3) I, II, S. Focus on interpersonal processes; principles and characteristics of the helping relationship in light of developmental aspects of adolescence. Pr.: Five hours of Family and Child Development, or five hours of a combination of Psychology and Educational Psychology, and junior standing.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

620 625. Community Resources for Children. (3) I. Study of legislation, community agencies and programs pertaining to children. Field trips arranged. Pr.: F. C. Dev. 325 and Soc. 211.
620 650. Advanced Study of Children. (3) II, S. History and methods of child study; analysis of developmental theory; laboratory experience for graduate students. Pr.: Psych. 420 or equiv. and F. C. Dev. 325 or Psych. 415 or consent of instructor.
620 660. The Family. (2-3) I, II, S. Consideration of the family throughout the family life cycle; developmental tasks at each stage. Present-day resources available for strengthening American families. Pr.: F. C. Dev. 350 or consent of instructor.
620 661. The Black Family. (2-3) I, II, S. Interim semester. Selected topics for understanding life styles of black families. Implications for professionals working with black children and families. Pr.: 9 hours of Social Science or consent of instructor.
620 670. Directed Experiences in Early Childhood Education (with children 2-5). (4-6) II, S. Participation in the Child Development Laboratory: planning, instruction, administration, evaluation. Field experiences arranged. Pre-arrangement and consent of instructor required. Two hours rec. and two hours conference, eight weeks preschool participation. Pr.: F. C. Dev. 470 or equiv.
620 675. Parent Education. (2 or 3) II, S. Principles in child development and family relationships applied to professional group and individual work with parents. Pr.: F.C.Dev. 325, 660, six hours psychology, or consent of instructor.
620 680. Seminar in Family and Child Development. Credit arranged. I, II, S. Interpretation and evaluation of inf ormation on varied topics relating to family members. May be taken more than one semester with consent of head of department. Pr.: F. C. Dev. 660 or consent of instructor.
620 690. Concepts of Activity Therapy. (3) On sufficient demand. Introduction to theory and methods of activity therapy in programs facilitating human development and rehabilitation. Pr.: 15 hours in Family and Child Development or consent of instructor.
620 700. Child Development Center Programming. (2 or 3) S alt. years. Rationale for and techniques of administering programs for preschool children, including health, education, social services, parent involvement.

Pr.: Nine hours Family and Child Development or consent of instructor.
620 720. Infant Behavior and Development. (3) II. Study of the infant as a developing individual within the family; examination of the theories and research relevant to development from conception through the second year. Pr. : F. C. Dev. 325,375 , and Biol. 425 or equiv.
620 730. Low-Income Families. (2-3) II, S. Factors affecting family life in disadvantaged families; life styles of sub-cultures; proposed programs; implications for persons working with low-income children and families. Pr.: F. C. Dev. 660 or consent of instructor.
620 780. Problems in Family and Child Development. Credit arranged. I, II, S. Independent study on aspects of Family and Child Development. Students writing a master's report enroll in this course. Pr.: Consent of department head.

\section*{GRADUATE CREDIT}

620 803. Research Methods in Family and Child Development. (2-3) I, II or S. Study and application of family and child development methodology for research in graduate programs and professional carreers. Pr.: Six hours in family and child development at 600 level or higher or consent of instructor.
620 820. Readings in Family and Child Development. (3) II, S. Implications of research findings in preparation for professional work in counseling, teaching, and research in family and child development. Pr.: F. C. Dev. 325 or equiv. and F. C. Dev. 660 or equiv. and six hours in social science or consent of department head. May be taken more than once.
620 830. Characteristics and Developmental Processes of College Students. (3) II. Study of characteristics of college students: relate patterns of maturity to academic experiences, to formulation of life styles and to development of a sense of vocation. Pr.: 12 hours in F. C. Dev., Psych., Soc., Physiol., or Educ. and consent of instructor.
620 840. Family Processes. (3) alt. years. Examination of theoretical approaches to the study of the family unit from the perspective of interpersonal relationships; participant observation of families and-or analysis of case materials. Pr.: F. C. Dev. 660 and consent of instructor.
620 851. Principles of Marriage and Family Counseling. (3) I, S. Examination of processes in marriage and family counseling; study of interactions within the counseling setting; and application of knowledge of the family and of marriage to the helping relationship. Pr.: F. C. Dev. 835; Educ. 832; F. C. Dev. 881, 882, or 883 or consent of instructor.
620 860. Practicum in Counseling. Credit arranged. I, II, S. Supervised experience in couseling. Pr.: Psych. 844 or Educ. 832; and F. C. Dev. 881, 882, or 883 or equiv., and consent of department head. (Same as Psych. 860 and Educ. 863).
620 861. Practicum in Family and Community Services. Credit arranged. I, II, S. Supervised experience in providing help or instruction to family members in community settings. Pr.: Nine hours social science; F. C. Dev. 881, 882, or 883; six other graduate hours in Family and Child Development; consent of department head.

620 862. Practicum in Human Development Research. Credit arranged. I, II, S. Observation, codification, and reporting of behavior. Pr.: F. C. Dev. 881, 882, or 883; course in methods of research; six other graduate hours in Family and Child Development; consent of department head.
620 863. Practicum in Early Childhood Education. Credit arranged. I, II, S. Supervised participation in child development laboratory and other group situations involving young children, 2 to 5. Pr.: F. C. Dev. 650; F. C. Dev. 881, 882, or 883; three other graduate hours in Family and Child Development; consent of department head.
620 864. Practicum in Parent Education. Credit arranged. I, II, S. Supervised experience in providing help to parents; organization of parent groups. Pr.: F. C. Dev. 675; F. C. Dev. 881, 882, or 883; three other graduate hours in Family and Child Development; consent of department head.
620 881. Social Processes in Human Development. (3) I, S. Integration of principles of social maturation and growth with physiological and self-processes of human development. Pr.: Eight hours natural science and eight hours social science or consent of instructor.
620 882. Physiological Processes in Human Development. (3) II. Integration of principles of physiological growth with social and self-processes of human development. Pr.: Eight hours natural science and eight hours social science or consent of instructor.
620 883. Self-Processes in Human Development. (3) S. Integration of precepts relating to self with principles of social and physiological processes in human development. Pr.: Eight hours natural science and eight hours social science or consent of instructor.
620 895. Practicum in Study of Student Development. (3) I, II. Supervised professional experience in the study of college students in individual and group situations; collecting and processing in-life data. Pr.: F. C. Dev. 830, Psych. 856, Educ. 826, or equiv. or conc. enrollment.
620 980. Research in Family and Child Development. Credit arranged. I, II, S. Individual research problems which may form the basis for the master's thesis. Pr.: Consent of department head.

\section*{Family Economics}

RICHARD L. D. MORSE, \({ }^{*}\) Head of Department
Professor Morse;* Assistant Professors Annis* and Rasmussen; Instructors Fasse and Riemann; Emeritus: Associate Professor Agan.*
This department prepares students for professional work in the areas of housing, household equipment, home management, consumer education, family finance, and family economics. Modern laboratory facilities and equipment are provided.
Emphasis in the department is twofold: to study the effect of social and economic forces on the family, and to study management of resources in relation to family goals. Un-
dergraduate options are: (1) Consumer Interest, and (2) Housing and Equipment.
Work leading to the Master of Science degree is offered by this department. Graduate students can prepare for positions in social work, home management, family financial counseling, consumer education, or as specialists in extension or college and university faculty. Field study and research is conducted in community programs, consumer issues, public policy on housing, credit and family resource management. Research opportunities also are available in air pollutants, environmental factors, and household equipment. Several research and teaching assistantships are avilable each year.
Prerequisite to graduate work in these fields is a B.S. or B.A. degree, with a major in home economics or a related field.

\section*{Courses in Family Economics undergraduate credit}

630 300. Family Economics. (3) I, II, S. Economics forces affecting families, and management by families of their economic resources. Pr.: Econ. 110 or equiv.
630 305. Family Finance. (3) I, II, S. Financial problems involved in the effective management of the family's resources.
630 320. The House. (3) I, II, S. A consideration of dwellings, their environment, plans, and space requirements, which promote effective utilization of family resources. Six hours rec. and lab. a week. Pr.: Sophomore standing.
630 340. Household Equipment. (3) I, II, S. Principles of operation, care and design of equipment used in the home; methods of evaluating equipment performance and demonstrating application of principles. Two hours lec. and three hour lab. a week.
630 360. Home Management. (2) I, II, S. Study of the use of family's resources toward maximum achievement of family's goals. Pr.: Junior standing.
630 365. Home Management Laboratory. (2) I, II, S. Residence in home management or equivalent experience with consent of department. Arrangements for enrollment must be made prior to registration. Pr.: F. Ec. 360 or conc. enrollment.
630 380. Field Study in Family Economics. Credit arranged. I, II, S. Supervised experiences with community action programs, homemakers' service, and consumer services in industry. May be taken more than one semester. Pr.: F. Ec. 300, 360, or consent of department head.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

630 600. Families in the American Economy. (3) I, S. Study of the interrelation of the national economy and the family, family incomes and expenditures, cost of living estimates, measures of family welfare, public policies affecting family welfare and standards of living. Pr. or conc.: Econ. 110 or consent of instructor.

630 605. Consumers and the Market. (2 or 3) I, S. Problems of the consumer in the present market, market practices, aids toward intelligent buying of commodities, and the types of protection, including legislation. Pr.: Econ. 110.
630 610. Consumer Marketing Programs and Policies. (3 or 2) II, S. Review of consumer marketing programs and policies of education, business and government as they bear upon consumer decision making in the market. Pr.: F. Ec. 605 or equiv

630 620. Housing Requirements of Families. (1-4) I, S. Housing requirements of families as influenced by their interests, activities, and socio-economic status; effective ways of meeting these requirements in homes in this area. Rec., lab. \& field trips. Pr.: F. Ec. 320, 340; or consent of instructor.
630 630. Household Equipment Theory. (3) I, S. Analytical study of appliance design, performance and evaluation concepts for application in consumer decisionmaking. Not opem to students with credit in F. Ec. 340. Six hours rec. and lab. a week. Pr.: 4 hours lab. science course.
630 640. Advanced Household Equipment. (2 or 3) II, S. Application of basic electrical, optical, refrigeration, heat transfer, psychometric, and detergent chemistry principles to the study of household equipment, with emphasis on techniques and instrumentation for consumer testing. Six hours rec. and lab. a week. Pr.: F. Ec. 340, Phys. 112; senior or graduate standing.
630 660. Work Simplification. (2) II, S. The application of the principles of motion economy in the performance of certain household tasks to promote effective use of time and energy. One hour rec. and two hours lab. a week. Pr.: Junior standing.
630 680. Seminar in Family Economics. ( 1 to 3) I, II, S. A review of research literature; trends in the field of family economics; the contribution of the area to the family and community. Pr.: Senior or graduate standing.
630 705. Financial Problems of Families. (2) II. Financial problems confronting families, primarily of the middle-income classes; study of insurance, credit, savings, and estate planning as they relate to family living. Pr.: F. Ec. 305 or consent of instructor.
630 710. Resources for Consumer Education. (3 or 2) S. Survey and evaluation of the subject matter content of consumer education books, pamphlets and audio-visuals. Pr.: C. \& I. 550, A. \& O. 652 or degree in social science.
630 711. Consumer Education. (2 or 3) S. Evaluate syllabi and approaches to teaching consumer education. Relate consumer education to consumer economics and consumer aff airs. Pr.: C. \& E. 550 or A. \& O. 752 and F. Ec. 300 or consent of instructor.
630 715. Advances in Consumer Economics. (3 or 1) S. Fundamental principles of consumer economics emphasizing money management, decision making in consumer purchases, institutional factors bearing on consumer decisions. Pr.: F. Ec. 600, 605 or equiv.
630 780. Problems in Family Economics. Credit arranged. I, II, S. Individual investigation in standards of living and family expenditures; housing and household equipment; time and motion study; and use of family resources. Pr.: Consent of instructor.

\section*{GRADUATE CREDIT}

630 820. Seminar on Aging. (2 or 3) S. Selected aspects of problems and current developments concerning the economic, housing, equipment and managerial needs of the aging. Pr.: F. Ec. 360, 600, Econ. 110, Soc. 211 or consent of instructor. May be taken more than once with consent of department head.
630 840. Experimental Methods in Household Equipment. (2) I. Philosophy of household equipment evaluation and experimentation; emphasis upon instrumentation, selection of variables and data analysis. Pr.: A course in statistics, F. Ec. 640 or consent of instructor.
630 860. Advanced Home Management. Credit arranged. II, S. Review of current research in management, administration, decision making, goal evaluation, and problems of families handicapped by low income, physical disability, or age. Pr.: F. Ecc. 365 or consent of department head.
630 980. Research in Family Economics. Credit arranged. I, II, S. Individual research problems which may form the basis for the master's thesis. Pr.: Consent of instructor.

\section*{Foods and Nutrition}

\section*{LUCILLE WAKEFIELD,* Head of Department}

Professors Caul, \({ }^{*}\) Finkelstein, \({ }^{*}\) Harrison, \({ }^{*}\) Tinklin, \({ }^{*}\) and Wakefield;* Associate Professors Bowers* and Fryer;* Assistant Professors Newell and Stucky; Instructor Vaden; Emeritus: Associate Professors Browning* and McMillan; * Assistant Professor Mullen.*
The Department of Foods and Nutrition provides through its two options specialized instruction for students who wish to become nutritionists, research workers in food and nutrition, dietitians, extension specialists, food editors or work with food in business and test kitchens.
Two options in foods and nutrition lead to a bachelor's degree: (1) foods and nutrition in business and (2) foods and nutrition science. Basic courses in foods and nutrition are offered for all home economics students and for those outside the field of home economics.
The Departments of Institutional Management and Foods and Nutrition offer the four-year undergraduate coordinated program in Dietetics leading to a B.S. degree and membership in The American Dietetic Association.
M.S. and Ph.D. programs are offered by the department. Research and teaching laboratories provide students with excellent equipment. Research with other departments makes possible a variety of studies. Graduate research assistantships are available to qualified students.

The Department of Foods and Nutrition is a participating member of the graduate programs in Food Science and in Physiology.

\section*{Courses in Foods and Nutrition}

\section*{UNDERGRADUATE CREDIT}

640 101. Food Preparation for Men. (1) I. Rudimentary aspects of food purchasing, preparation and service, including basic equipment required.
640 132. Basic Nutrition. (3) I, II. Nutritional requirements of man with emphasis on developing judgment in the selection of foods. Not open to students in Foods and Nutrition, Dietetics and Institutional Management, and Home Economics Education.
640 133. Food for Man. (3) I, II, S. Food production, distribution, significance and consumption. Nutritional status of world population and local national and international programs for improvement.
640 300. Meal Management. (3) I, II. Factors involved in purchasing, production, marketing, and legal regulations of foods; preparation and service of food in varying cultures.
640 301. Trends in F ood Products. (3) I, or II. The effects of food processing and convenience foods on today's consumer.
640 302. Introduction to Flavor. (3) I, or II. Rudiments of flavor perception and its role in food acceptance and preference. 6 hours of combined lecture, discussion and laboratory.
640 303. Food Preparation. (3) I, II. Effect of preparation, conditions, and ingredients on physical characteristics of standard food products. Pr.: Biochem. 120 or Chem. 190 and 191.
640 304. Applied Normal Nutrition (3) I, II. Theory observation and supervised application. Emphasis on communication and nutrition with child, aged and psychiatric patients. Two credits recitation, 1 credit of supervised experience. Pr.: Biochem. 200 or 421, Biol. 425, consent of instructor.
640 305. Nutrition in Medical Science (6) I, II. Therapeutic nutritional principles related to anamolies in disease. Supervised experience. Three credits recitation and 3 credits of supervised experience. Pr.: Biochem. 200 or 421, Biol. 425, consent of instructor.
640 306. Nutritional Care of Patients. (6) I, II. Routine observation and supervised experience in nutritional care of patients. One credit recitation and five credits of supervised experience. Pr.: Biochem. 200 or 421 , Biol. 425, consent of instructor.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

640 410. Principles of Food Demonstration. (2) II. Fundamentals in food demonstrations used by the teacher, home economics agent, and commercial demonstrator. Six hours lab. a week. Pr.: F. \& N. 132 or 300.

640 450. Practicum in Foods and Nutrition. (5) I, S. Supervised professional field experience in foods and nutrition. 2 credits recitation and 3 credits of supervised experience. Pr.: F. \& N. 300, 410 and-or consent of instructor.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

640 601. Food Science. (4) I, II, S. Preparation of foods as related to their chemical, physical, and organoleptic properties. Two hour rec. and five hours lab. a week. Pr.: Chem. 190, 191 or 350,351 , or Biochem. 120.
640 602. Principles of Nutrition. (3) I, II, S. Functions and interrelationships of various nutrients in the body. Two hours rec. and two hours lab. a week. Pr.: Chem. 190, 191, or 350, 351 and Biol. 198.
640 603. Child Nutrition. (3) II, S. A study of the principles of prenatal, infant, and child nutrition emphasizing the practical application to life situations. Pr.: F. \& N. 132, Biol. 198 or consent of instructor.
640 604. Advances in Foods. (2 or 3) S. Recent developments in research related to foods. Pr.: F. \& N. 601 or equiv. and consent of instructor.
640 605. Food Research Techniques. (3) I, II, S. Fundamental principles of food quality evaluation and development of an independent research problem. Pr.: F. \& N. 601.

640 606. Advances in Nutrition. (2 or 3) S. Recent developments in research related to nutrition. Pr.: F. \& N. 602 or equiv. and consent of instructor.

640 608. World Nutrition. (2 or 3) I, or II. Analysis of factors that contribute to malnutrition, effects of undernutrition and malnutrition, methods for assessing nutritional status and measures for improvement. Pr.: F. \& N. 602 or consent of instructor.

640 609. Community Nutrition. (3) I, or II. Organizations and persennel involved in action programs for nutrition; methods for determining and implementing nutrition education programs. Pr.: F \& N 132, or 602; or consent of instructor.
640 610. Practicum in Community Nutrition. (3) I, II, S. Supervised experience in community nutrition agencies. Pr.: F \& N. 609.
640 611. Nutrition for Social Service Agencies. (2-3) S. Socio-psychological, physical aspects of food intake including food function in society and needs of socioeconomic and cultural groups during life cycle. Pr.: Three hours sociology, nutrition course, or consent of instructor.
640 612. Principles of Food Product Development. (3) I, or II. Food product concept, feasibility and evaluation. Pr.: 3 cr. foods or consent of instructor.
640 680. Seminar in Foods and Nutrition. (2) I, II, S. Individual reports and discussion of current research in foods and nutrition. Pr. or conc.: F. \& N. 602 and 605 or consent of instructor.
640 710. Nutrition Needs Throughout the Life Cycle. (3) I, II. Food patterns, dietary intakes and nutritional requirements of infants, children, adolescents, and adults. Pr.: Biochem. 200 or 421, Biol. 425, F. \& N. 602.
640 712. Diet Therapy. (3) II. Dietary modifications for pathological conditions. Pr.: F. \& N. 602.
640 760. Fundamentals of Food Flavor Analysis. (3) I, II. Flavor perception considered from both the human senses of taste, feeling, and smell and the chemical and physical attributes of food; practical bases for reliable organoleptic measurement. One hour lec. and six hours lab. a week. Pr.: Chem. 190, 350, or \(450 ;\) F. \& N. 605; or consent of instructor.

640 761. Application of Food Flavor Analysis. (2) I, II, S. Application of flavor panel analysis to food research problems. One hour lecture, two hours lab. a week. Pr.: F. \& N. 760, or consent of instructor.

640 780. Problems in Foods and Nutrition. Credit arranged. I, II, S. Laboratory and library experience in current problems in foods and nutrition. Three hours lab. a week for each hour of credit. Pr.: For home economics majors, F. \& N. 602 or 605.

\section*{GRADUATE CREDIT}

640 800. Bionutrition. (3) I, S. Evaluation of nutrient needs of the whole man by integration of knowledge of biochemistry, physiology, and nutrition. Pr.: Biochem. 200 or 421, Biol. 425 and F. \& N. 602 or equiv.
640 801. Advanced Nutrition. (3) II, S. Current knowledge of metabolic functions of food in the human organism. Pr.: Biochem. 200 or 421, Biol. 425, F. \& N. 602.
640 806. Food Systems. (3) I, S. Application of principles of biochemistry to emulsions and egg, meat, and dairy products. Two hours rec. and three hours lab. a week. Pr.: Biochem. 200 or 421, F. \& N. 601, or consent of instructor.
640 807. Advanced Foods. (3) II, S. Properties and functions of fats, oils, and starches in food; the structure of batters and doughs; and principles and techniques in food preservation. Two hours rec. and three hours lab. a week. Pr.: Biochem. 200 or 421, and F. \& N. 601, or consent of instructor.
640 809. Research Methods in Foods and Nutrition. (3) I or II, on demand. Chemical, biological, and histological methods applied to research in foods and nutrition. One hour rec. and six hours lab. a week. Pr.: F \& N. 710 and 806, or consent of instructor.
640 810. Methods of Nutrition Consultation. (3) I or II. Consultation techniques stressing technical and sociopsychological factors in meeting nutritional problems of individuals and agency personnel. Pr.: F. \& N. 712.
640 880. Graduate Seminar in Foods and Nutrition. (1) I, II. Discussion of investigations in foods and nutrition. May be taken four semesters for credit. Pr. : F. \& N. 605 and 710 or consent of instructor.
640 881. Food Science Colloquium. (1) I, II. Discussion of investigations in food science. Attendance required of all graduate students in food science. Maximum of two hours may be applied toward an M.S. degree or four hours toward a Ph.D. degree.
640 890. Readings in Foods and Nutrition. Credit arranged. I, II, S. Reports and discussions on current research and literature in foods and nutrition and allied areas.
640 980. Research in Foods and Nutrition. Credit arranged. I, II, S. Three hours a week for each hour of credit. Pr.: Consent of instructor.

\section*{General Home Economics}
doretta hoffman, Head of Department
Professors Hoeflin \({ }^{*}\) and Hoffman;* Assistant Professor Reehling; Instructor Sego; Emeritus: Professor Kramer;* Assistant Professor Barnes.*

\section*{Courses in General Home Economics}

\section*{UNDERGRADUATE CREDIT}

650 110. Introduction to Home Economics. (1) I. Scope, educational preparation and trends in home economics professions.
650 300. Home Economics Seminar. (1) I, II. Current issues, professionalism and place of research in home economics. Pr. : Senior standing or consent of instructor.
650 308. Home Economics Colloquium. Credit arranged. I, II, S. Special topics for home economics majors.
650 385. Problem in General Home Economics. Credit arranged. I, II, S. Independent study. Pr.: Consent of instructor.
650 399. Honors Seminar in Home Economics. (1) I, II. Selected topics in home economics. May be taken more than once for credit. For students in Honors Program only.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

650 780. Problem in General Home Economics. Credit arranged. I, II, S. Individual investigation into work in area of general home economics. Pr.: Consent of instructor.

\section*{GRADUATE CREDIT}

650 880. Seminar in Home Economics. (1-3 hours) I, II, S. Current research and trends in home economics. May be taken more than once for credit. Pr.: Consent of instructor.
650 900. Methods of Research in Home Economics. (2) I, S. Fundamental procedures for research; meaning and organization of research from conception through publication.
650 980. Research in General Home Economics. Credit arranged. I, II, S. Individual research problems. Pr.: Consnet of instructor.

\section*{The Merrill-Palmer Program}

Selected graduate and undergraduate students may attend Merrill-Palmer Institute in Detroit for a summer session or one or two semesters if recommended by the Dean of College of Home Economics and accepted by Merrill-Palmer Institute.

\section*{Master's Degree Programs in General Home Economics}

Graduate study leading to the degree Master of Science is offered in General Home Economics in combination with one or two related areas. Prerequisites for graduate work include a background in home economics or related areas and admission to Graduate School. The Deans of the College of

Home Economics serve as advisers to General Home Economics majors.

\section*{Master's Degree Programs in Home Economics Education}

The College of Home Economics and the College of Education have a cooperative arrangement so that a student who wishes a minor or major in home economics education may plan a graduate program of study to include one or more areas in home economics with emphasis in one area. A student may choose one of three options for a Master's degree: (1) thesis, (2) report, or (3) non thesis or report plan based on course work. Prerequisites for graduate work include admission to Graduate School and a background in home economics and education courses as required for undergraduate students majoring in home economics education. Home Economics Education courses are listed on pages 190-192. Graduate faculty members in Home Economics Education serve as major advisers for those students who select this area as their major.

\section*{Institutional Management}
grace m. Shugart,* Head of Department
Professor Shugart;* Associate Professors Riggs and Zeigler;* Assistant Professors Bottger and Middleton;* Instructor Roach; Emeritus: Professor West.*
The Department of Institutional Management provides instruction for students preparing to become dietitians or managers in hospital, college, university, school, commercial, or industrial food services. Two degrees are offered: a Bachelor of Science in Home Economics for students majoring in Dietetics and Institutional Management and a bachelor of Science in Restaurant Management. A four-year undergraduate program that combines classroom teaching with clinical experiences of an internship leads to a B.S. degree and membership in the American Dietetic Association.
Graduate study toward the M.S. degree is offered after the completion of a four-year undergraduate curriculum substantially equivalent to that required of undergraduate students majoring in institutional management at this University.

A well-designed laboratory furnished with institutional equipment provides experiences in quantity food preparation and management. A research laboratory with large-scale equipment is used for quantity food production research. Facilities for undergraduate and advanced study include units of the residence hall food services and K-State Union.

\section*{Courses in Institutional Management}

\section*{UNDERGRADUATE CREDIT}

660 300. School Lunch Management I. (2) S. Basic principles of nutrition, menu planning and quantity food production as related to school food services.
660 310. School Lunch Mana gement II. (2) S. Problems of the school food service manager, including employee training and scheduling, supervision, and financial control. Pr.: Ins. M. 300.
660 320. School Lunch Management III. (2) S. School food service supervision in the unified district; problems of centralization; planning layout and equipment selection, purchasing, financial and personnel management. Pr.: Ins. M. 310.
660 330. Introduction to Dietetics. (1) I. A study of the dietitian's role in the nutritional care of people with emphasis on the attributes and characteristics of professional practice.
660 340. Quantity Foods. (4) I, II. Principles and methods of preparing food items in quantity with emphasis on acceptability by people. 2 hr . rec. and 6 hr . lab. Pr. or concurrent: 3 hour foods course and Biochem. 120 or Chem. 190 and 191.
660 350. Food Service Systems. (6) II. Institutional food service as a system; menu planning, forecasting; food ordering, production and service; employee training; supervisory experience in campus food services. 3 hr . rec., 8 hr . lab. Pr.: Ins. M. 340.
660 360. Management in Dietetics. (9) I, II. Functions of management in food service; financial control policy making, interdepartmental relationships, food service planning; independent study and management experience in campus and other food services. 3 hr . rec., 16 hr. lab. Pr.: Ins. M. 350 and consent of instructor.
660 370. Seminar in Dietetics. (1) I, II. Investigation of trends and current research in dietetics. Pr.: Ins. M. 350 and consent of instructor.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

660 605. Food Production Management. (4) I. Production planning and controls in food service systems, with management experience in campus food services. Two hours rec. and six hours lab. a week. Pr.: Ins. M. 600.
660 625. Quantity Food Purchasing and Control. (2) I. Principles and methods of purchasing food in quantity; use of specifications; food cost control through estimating, buying, and storage. Pr.: Ins. M. 600.
660 635. Food Service Equipment and Layout. (2) I. Factors affecting the selection and arrangement of equipment in food service systems. Pr.: Ins. M. 600.

660 640. Organization and Management of Food Services. (2 or 3) II, S. Principles of management as applied to food services; study of food service policies, budgets, supervision and personnel. Three hours rec. a week. Field trip required. Pr.: Ins. M. 605 or consent of instructor.

660 655. Food Service in Community Institutions. Credit arranged. I, S. Management of the food service in small hospitals, nursing homes, and schools. Pr.: Ins. M. 600 or consent of instructor.

660 780. Problems in Institutional Management. Credit arranged. I, II, S. Individual investigation of problems in institutional management. Conferences and reports at appointed hours. Pr. or conc.: Ins. M. 640 or equiv., consent of instructor.

\section*{GRADUATE CREDIT}

660 885. Seminar in Institutional Management. Credit arranged. I, S. Developments in research related to food service management. May be taken more than one semester with consent of student's advisory committee. Pr.: Ins. M. 605 or equiv. and consent of department head.
660 890. Food Service Administration. (2 or 3) II, S. Advanced study of management as applied to food service systems; organizational structure, financial and personnel policies, responsibilities and problems of management. Pr.: Ins. M. 640 or equiv.
660 895. Food Service Facilities Planning. (2) II, S. Programming and planning of food service layout, with emphasis on the team approach.
660 980. Research in Institutional Management. Credit arranged. I, II, S. Pr.: Consent of instructor.


\title{
THE COLLEGE OF VETERINARY MEDICINE
}

\author{
DONALD M. TROTTER, \({ }^{*}\) Dean
}

LEE. T. RAILSBACK, Assistant to the Dean

\section*{Veterinary Enrollment Limited}

By authority of the State Board of Regents, enrollment in the curriculum in Veterinary Medicine is limited. Advancement to each of the four professional years is based upon the applicant's scholarship record and completion of the previous year's or semester's requirements in the curriculum.

Resident students wishing to enter this curriculum should apply for admission to the Dean of the College of Veterinary Medicine on or following December 1 upon completion of two or more semesters' requirements in the pre-veterinary curriculum.
Transfer students should make application to the Director of Admissions before applying to the Dean of the College on or following November 1.
Selection of applicants for the professional curriculum is based upon the applicant's scholarship record in the required preveterinary curriculum and other evidence of his fitness. First preference is given to applicants who have qualified for resident fees at Kansas State University. Ordinarily application blanks for the professional curriculum are to be returned in completed form to the dean's office within six days, after which time the Committee on Selection will proceed with interviews and the process of selection. In general, no requests for ad-
mission to the professional curriculum will be approved after February 15.
Applicants must offer: (1) satisfactory evidence of completing the high school units required for admission to the University, and (2) evidence of completing 64 hours of university work as indicated in the list to follow or evidence that such work will be completed satisfactorily by the end of the fourth semester of pre-veterinary medical training.

\section*{Pre-Veterinary Medical Requirements}

The pre-veterinary medical work may be pursued at Kansas State University in the College of Arts and Sciences or the College of Agriculture or in any approved junior college or university.

\footnotetext{
Course Composition
English Composition I
English Composition II
Social Science Electives
Chemistry 1
Chemistry II
Chemical Analysis
General Organic Chemistry
Principles of Animal Science
Animal Science \& Industry
Oral Communications
Humanities Electives
Physics I and II
Trigonometry
General Zoology or Principles of Biology
Genetics
Dairy Science
Poultry Science
Electives*
Total Semester Hours
Number depending on selection of other courses
}

A Kansas State University student who completes the pre-veterinary curriculum in the College of Arts and Sciences or the College of Agriculture may be awarded a Bachelor of Science Degree at the end of his successful completion of the second year in the Professional Veterinary Medical Curriculum.

A Kansas resident is interpreted as a student who is entitled to pay resident fees; a nonresident is one who is required to pay nonresident fees. (See general section of this catalog for further details.)

\section*{Veterinary Medical Library}

As a result of generous contributions from alumni and friends plus a federal grant, the College of Veterinary Medicine has a well equipped library consisting of approximately 6,000 volumes which deal with all phases of veterinary medical literature and many allied fields. Numerous additional textbooks and journals are available at the main Library on campus.

\section*{Fees for Veterinary Medical Students}
\begin{tabular}{|c|c|c|}
\hline \multicolumn{3}{|l|}{Assessments} \\
\hline \multicolumn{3}{|l|}{Per semester (if enrolled in more than six hours)} \\
\hline & Kansas Residents or Staff Members & Nonresidents \\
\hline 1. Incidental & \$220.00 & \$535.00 \\
\hline 2. Student Health . & 25.00 & 25.00 \\
\hline 3. Student Union Annex I & 2.25 & 2.25 \\
\hline 4. Student Union Annex II & 10.25 & 10.25 \\
\hline 5. Student Activities (incl. Union operations) & 16.25 & 14.25 \\
\hline 6. Stadium Bonds ... & 4.25 & 4.25 \\
\hline Total for Veterinary Medical Students & \$278.00 & \$593.00 \\
\hline
\end{tabular}

\section*{Doctor of Veterinary Medicine Curriculum}

The Curriculum in Veterinary Medicine at Kansas State University was established to give the young men and women of this state an opportunity to pursue these studies in an environment where the facilities offered by other branches of the University would be at their command. To fit the veterinarian to deal with the livestock problems he has to meet, he is required to take the work in livestock feeding, breeding, judging, poultry, in milk and dairy inspection, chemistry, bacteriology, parasitology, and zoology, in addition to his purely professional work.

Work must be taken as prescribed, except that certain courses may be selected from extracurricular electives if the student has the prerequisites.

While not required, fifth year students are encouraged to accept summer internships with practicing veterinarians, federal and state regulatory forces.

See the Graduate School section for the program leading to the MS and PhD degrees.
For admission to the curriculum in Veterinary Medicine consult the previously listed 'Pre-veterinary Medical Requirements."

The carefully planned two or two and onehalf year pre-veterinary program plus the four year (total of at least six years) professional curriculum may lead to the two degrees, Bachelor of Science and Doctor of Veterinary Medicine. (Hours required for graduation: Pre-veterinary-64; professional-149; total-213.)

First Professional Year


Spring Semester
Infectious Diseases Physiological Sci Physiological Sci Physiological Sci. \(\begin{array}{ll}720 & 610 \\ 740 & 605 \\ 740 & 615\end{array}\)

Course Semester Hours

Second Professional Year
\begin{tabular}{llll} 
Fall Semesíer \\
& & \\
Animal Sci. \& Ind. & 005 & 240 \\
Infectious Diseases & 720 & 620 \\
Physiological Sci. & 740 & 645 \\
Pathology & 730 & 603 \\
& & \\
& & \\
& \\
Spring Semester \\
& & \\
Physiological Sci. & 740 & 670 \\
Pathology & 730 & 610 \\
Infectious Diseases & 720 & 675 \\
Infectious Diseases & 720 & 695 \\
Surgery & 750 & 610
\end{tabular}


Third Professional Year
\begin{tabular}{lll} 
Fall Semester \\
& & \\
& & \\
Surgery & 750 & 695 \\
Infectious Diseases & 720 & 697 \\
Surgery & 750 & 605 \\
Surgery & 750 & 630 \\
Surgery & 750 & 640 \\
Surgery & 750 & 700
\end{tabular}
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{5}{|l|}{Spring Semester} \\
\hline Spring Semester & & & Course & Semester Hours \\
\hline Physiological Sci. & 740 & 620 & Anatomy III & 2 \\
\hline Surgery & 750 & 615 & Surgery II & 8 \\
\hline Surgery & 750 & 650 & Medicine II & 7 \\
\hline Surgery & 750 & 710 & Clinic II & 2 \\
\hline
\end{tabular}

Those receiving the BS degree in Agriculture must use Economics I (3 hours) and Principles of Agricultural Economics ( 3 hours) for their social science requirements. In lieu of their electives they must have Agriculture in Our Society ( 2 hours) and Agricultural Journalism or other communications ( \(2-3\) hours).

\section*{Fourth Professional Year}


\section*{Infectious Diseases}

\section*{S. E. LELAND, JR.* Acting Head of Department}

Professors Coles* Kelley,* Leland,* and Lindquist;* Associate Professors Burroughs, \({ }^{*}\) Heuschele, Minocha, \({ }^{*}\) and Osbaldiston;* Assistant Professors Moore* and Ridley.

\section*{Basic courses in parasitology,} microbiology, public health and clinical pathology are offered for students enrolled in the veterinary medicine curriculum. Classroom instruction is by lecture, recitation, laboratory experience, seminar and demonstrations. Third and fourth year veterinary medical students receive practical instruction in clinical laboratory procedures and the interpretation of results of laboratory tests.

Major work leading to the degrees Master of Science and Doctor of Philosophy is offered. (See description in Graduate School section.) Work at the graduate level includes advanced courses in clinical pathology, parasitology and public health.

\section*{Courses in Infectious Diseases UNDERGRADUATE AND GRADUATE CREDIT}

720 610. Veterinary Microbiology I. (5) II. A study of host-parasite interaction and principles of immunology. Three hours rec. and four hours lab. a week. Pr.: Physi. 630 or consent of instructor.
720 620. Veterinary Microbiology II. (5) I. Morphology, biology, classification of pathogenic microorganisms and their study in relation to the cause of disease. Three hours rec. and four hours lab a week. Pr.: Inf. Dis. 610 or consent of instructor.
720 645. Veterinary Mycology. (3) I. Detailed study of etiology of cutaneous, subcutaneous and systemic fungus infections of animals, using histopathologic examinations and culture studies. Two hours rec. and three hours lab. a week. Pr.: Biol. 220, Path. 610.
720 650. Fundamentals of Veterinary Public Health. (3)
II. Organization and function of food inspection services; zoonoses as related to foods of animal origin. Three hours rec. a week. Pr.: Biol. 220 and consent of staff.

720 675. Clinical Pathology. (3) II. Principles, application and interpretation of clinical laboratory procedures and experience with applicable techniques. Two hours lec. and three hours lab. a week. Pr.: Secondyear standing in College of Veterinary Medicine.
720 690. Veterinary Hematology. (3) II. A detailed study of the blood of domestic animals. Emphasis is placed on the species variabilities. Two hours lec. and three hours lab. a week. Pr.: Path. 675 or consent of instructor.
720 695. Veterinary Parasitology I. (3) II. General introduction to parasitology and study of helminth parasites-nematodes, cestodes, trematodes, and acanthocephalans of domestic animals; emphasis on disease prevention, signs and lesions of parasitisms, Biologic and medicinal controls, and the relationship of parasites to public health. Taxonomy, structure, physiology and life cycles pertinent to identification and diagnosis of diseases are included. Two hours lec. and three hours lab. a week. Pr.: Second-year standing in the College of Veterinary Medicine or consent of instructor.
720 697. Veterinary Parasitology II. (3) I. Study of arthropod and protozoan parasites of domestic animals. Emphasis, procedures and objectives are similar to those of Veterinary Parasitology I. Two hours lec. and three hours lab. a week. Pr.: Veterinary Parasitology I. 720 715. Experimental Parasitology. (3) I. In even years. Planning, execution, analysis and reporting of experiments in parasitology. Techniques concerning interaction between host and parasite, in vitro cultivation, tracers, anthelmintic evaluation. Pr.: Consent of instructor and two semesters of parasitology.
720 751. Public Health I. (4) I. Theory and procedures of meat and dairy inspection, sanitation and public health. Consideration of domestic and international livestock regulations. Four hours lec. a week. Pr.: Fourth-year standing in College of Veterinary Medicine.
720 753. Public Health II. (3) II. Consideration of zoonotic diseases; sanitary aspects of food processing, handling and storage. Three hours lec. a week. Pr.: Fourth-year standing in College of Veterinary Medicine. 720 775. Advanced Food Hygience. (3) I, II, S. Further studies of the more recent detailed procedures used in the preservation and sanitary control of manufactured products prepared from sea food, poultry, animal meat, and dairy products. Two hours lec. and three hours lab. a week. Pr.: Inf. Dis. 753.
720 780. Principles and Tecniques of Research in Medical Investigations. (4) I, S. A study of the procedures in planning and evaluating medical experiments and the use of special research instruments in medical research. Three hours rec. and three hours lab. a week. Pr.: Inf. Dis. 603, Physi. 645.

\section*{GRADUATE CREDIT}

720 820. Advanced Clinical Pathology. (3) I, S. Further studies and application of the more detailed laboratory procedures and tests in hematologic, serologic, bacteriologic, chemic and pathologic diagnosis. Pr. Path. 760 and consent of staff.
720 825. Pathology of Body Fluids. (3) II. A detailed study of the alterations of the components of body fluids occurring in disease processes, and interpretations of these changes. Pr.: Inf. Dis. 820 or consent of staff.

720 835. Veterinary Epidemiology. (2) I, II. The scope and objectives of epidemiologic principles relative to infectious and noninfectious diseases transmissible from animals to man, and application of these principles by use of case investigations. Two hours lec. a week. Pr.: Pat. 753, Med. 670.
720 850. Advanced Veterinary Parasitology. (3) II in odd years. Structure, life cycle, pathology, immunology, public health significance, diagnosis and treatment of protozoan and metazoan parasites of veterinary significance. Pr.: Consent of instructor and two semesters of parasitology.

\section*{Pathology}

\section*{S. M. DENNIS,* Head of Department}

Professors Dennis* and Cook;* Associate Professors Anthony," Leipold,* McGavin,* Smith,* and Strafuss;* Assistant Professors Gray* and Munger; Instructors Bozarth, Njoku, and Rapp.

Basic courses in pathology are offered for students enrolled in the veterinary medicine curriculum. Instruction is by lecture, recitation, laboratory work, seminars and demonstrations. Practical necropsy experience is provided for students as an adjunct to their pathology training and as an aid to disease diagnosis.

Major work leading to the degree Master of Science and Doctor of Philosophy is offered.

Work at the graduate level includes advanced courses in general, systemic, cellular and molecular pathology.

\section*{Courses in Pathology}

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

730 603. General Pathology. (5) I. Study of etiology, pathogenesis, lesions and termination of processes of disease, including inflammation, necrosis, regeneration, oncology and disturbances of metabolism, circulation and growth. Three hours lec. and six hours lab. a week. Pr.: Second-year standing in College of Veterinary Medicine.
730 610. Systemic Pathology. (S) II. Pathology of the organ systems of domestic animals including gross and microscopic study of lesions. Three hours lec, and six hours lab. a week. Pr.: Path. 603.
730 745. Advanced Histopathology. (3) I, S. Advanced study of pathologic alterations of disease. Pr.: Path. 610 and consent of staff.
730 757. Avian Medicine. (3) I. The prevention, diagnosis and treatment of avian diseases. Three hours lec. a week. Pr.: Fourth-year standing in College of Veterinary Medicine.
730 760. Pathological Technique and Diagnosis. (3) I, II. Practical experience in mammalian necropsy, avian necropsy, clinical pathology, histologic techniques, and diagnostic laboratory procedures. Pr.: Path. 610 and consent of staff.

730 865. Cellular and Molecular Pathology (4) I. Biochemistry of the injured cell; relationship of intracellular parasitism to cellular metabolism; metabolic and genetic basis of inherited disease. Pr.: three hours credit in biochemistry or physiological chemistry and consent of instructor.
730 866. Cellular and Molecular Pathology Lab. (1) I, II, S. Basic techniques used in the study of cellular and molecular pathology. Pr.: Path. 870 or conc. enrollment and consent of instructor

\section*{GRADUATE CREDIT}

730 800. Pathology of the Diseases of Laboratory Animals. (3) I, S. The pathology of the diseases affecting the more common laboratory animals. Pr.: Path. 745 and consent of staff.
730 802. Research in Pathology. (1-6) I, II, S. Individual research in the pathology of animal disease. Pr.: Path. 610,760 . This work may form the basis for the master's thesis and the Ph. D. dissertation.
730 810. Problems in Pathology. (1-6) I, II, S. Work is offered in poultry diseases, parasitology, clinical pathology, food hygiene, public health, and pathology. Pr.: Path. 610 and consent of staff.
730 830. Pathology Seminar. (1) I, II, S. Pr.: Consult department head.
730 840. Advanced Systemic Pathology I. (5) I in odd years. Study of etiology, pathogenesis, gross and microscopic characteristics and systemic effects of diseases of cardiovascular, respiratory, gastrointestinal, urinary, and endocrine systems. Pr.: Path. 745 and consent of staff.
730 845. Advanced Systemic Pathology II. (5) II in even years. Study of etiology, pathogenesis, gross, and microscopic characteristics and systemic effects of diseases of the skin, musculoskeletal, genital, nervous systems, and special senses. Pr.: Path. 840 and consent of staff.
730 850. Pathology of Infectious Diseases. (5) I in even years. Detailed study of gross and microscopic lesions of specific diseases; emphasis given to diagnostic characteristics and procedures. Pr.: Path. 745 and consent of staff.
730 855. Oncology. (4) II in odd years. Etiology, behavior, gross, microscopic characteristics, identification and prognosis of tumors. Pr.: Path. 745 and consent of staff.
730 860. Necropsy Diagnosis. (1) I, II, S. Necropsy procedures and diagnosis. May be repeated each semester by all pathology majors with a maximum total of 10 credit hours. Pr. : Path. '745 and consent of staff.

\section*{Physiological Sciences}

EMERSON L. BESCH,* Head of Department
Professors Trotter,* and Underbjerg;* Associate Professors Besch,* Cardinet,* Clarenburg,* Erickson,* Fedde, Gronwall,* Oehme,* Upson,* and Westfall;* Assistant Professors Chapman, \({ }^{*}\) Chen,* and Klemm;* Instructors Barnhart, Baugh, Erichsen, Frey,* and Schoning.
The Department of Physiological Sciences presents courses in the areas of physiology,
pharmacology, physiological chemistry, gross anatomy, and microscopic anatomy at both the undergraduate and graduate levels.

Biophysical electronic instrumentation, an electron microscope, environmental chambers, scintillation counter, and other instruments are available for physiological and anatomical studies.

Graduate programs are offered leading to the Doctor of Philosophy degree in the field of physiology and to the Master of Science degree in anatomy and in physiology.

A combined anatomy-physiology course is offered for undergraduate and graduate students outside the field of veterinary medicine.

\section*{Courses in Physiological Sciences UNDERGRADUATE CREDIT}

740 140. Veterinary Orientation. (1) I. Lectures on introduction to veterinary medicine. One hour lec. a week. Pr.: Third-year standing in College of Veterinary Medicine.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

740 431. Anatomy and Physiology. (4) I. General anatomy and physiology of the domestic animals. Three hours rec. and three hours lab. a week.
740 531. Introduction to Pharmacology of Farm Animals. (2) Interim Semester. The study of the basic principles of pharmacology as related to the proper and safe use of drugs and chemicals by the livestock industry. Pr.: Physiological Sciences 431 or equivalent.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

740 600. Gross Anatomy I. (7) I. Dissection of the body cavities, limbs, head, neck and genital organs of the ruminant. Three hours rec. and twelve hours lab. a week. Pr.: First-year standing in College of Veterinary Medicine.
740 605. Gross Anatomy II. (5) II. Dissection of the body cavities, limbs, head, and neck of the horse and the dog. Parallel comparative studies on the laboratory animals, pig, checken, and cat. Two hours rec. and nine hours lab. a week. Pr.: Gross Anat. 600.
740 610. Microscopic Anatomy I. (5) I. Origin, development and microscopic structure and appearance of the cells and tissues of the animal body. Three hours lec. and six hours lab. a week. Pr.: First-year standing in veterinary medicine.
740 615. Microscopic Anatomy II. (3) II. Origin, development and microscopic structure and appearance of the cells and tissues of the animal body. One hour lec. and six hours lab. a week. Pr.: Micro. Anat. 610.
740 620. Anatomy III. (2) II. Dissections and demonstrations of regions of diagnostic and surgical importance. One hour lec. and two hours lab. a week. Pr.: Third-year standing in veterinary medicine.
740 625. Special Anatomy. Credit arranged, I, II, S. The study of any part of the horse (as the digestive or
reproductive system), ox, sheep, pig, dog, cat, or chicken. Pr.: Anat. 600, 605 or equiv.
740 630. Physiological Chemistry. (2) I. A laboratory course concerned with the physiological chemistry of animals, with special emphasis on basic processes important to veterinary medicine. Six hours lab. a week. Pr.: Biochem 421 lecture or equivalent to be taken concurrently or previously. First-year standing in College of Veterinary Medicine or consent of instructor.
740 635. Physiology I. (5) II. General principles of physiology of the various organ systems of domestic animals. Functional aspects of the cell, principles of body fluids, excitable tissues, endocrine system, blood, cardiology, circulation, respiration, digestion and absorption are included. Four hours rec. and three hours lab. a week. Pr.: Anat. 600, 610, Physiol. Chem. 630, or consent of instructor.
740 645. Physiology II. (5) I. Cont. of Physi. 635 to include liver function, kidney function, electrolyte and acid-base balance, temperature regulation, integumentary system, nutritional physiology, growth and reproduction. Four hours rec. and three hours lab. a week. Pr.: Physi. 635.
740 655. Comparative Physiology (3) II. Comparisons of physiological functions in the animal kingdom; including respiration, circulation, digestion, excretion, locomotion and control. Pr.: Biol. 201, Physi. 431 or equivalent.
740 665. Physiologic Constituents of Body Fluids. (2) I, II, S. Analysis of body fluids, with application to specific and fundamental problems in veterinary medicine. One hour rec. and one to three hours lab. a week. Pr.: Physi. 645 and consent of staff.
740 695. Environmental Toxicology (2) II odd years. An advanced toxicology course concerned with the occurrence, biological effect, detection, and control of foreign chemicals in the environment. Pr.: Consent of staff.
740 670. Pharmacology. (6) I. The history, source, physical and chemical properties, compounding, biochemical and physiological effects, mechanism of action, absorption, distribution, biotransformation and excretion, therapeutic and other uses, and toxicity of drugs. Five hours rec. and three hours lab. a week. Pr.: Physi. 645 and Biochem. 421 or equiv.
740 700. Physiology and Pharmacology of the Hormones. (3) II. The internal secretions, their synthetic analogues and use in research and therapy in domesticated animals will be evaluated. Two hours rec. and one to three hours lab. a week. Pr.: Physi. 645 and consent of staff.
740 798. Problems in Physiology. Credit arranged. I, II, S. Special problem-involving techniques utilized in studying the function of various organ systems of the body. Pr.: Consent of instructor.

\section*{GRADUATE CREDIT}

740 801. Avian Anatomy. (2 to 4) I, S. The study of the gross anatomy of birds, using the chicken as a type. The histology of certain organs is considered. Pr.: Consent of staff.
740 803. Seminar. (1) I, II, S. Designed primarily for graduate and senior students enrolled for graduate credit in physiology. Each student is required to give a report on some subject related to physiology. The course is
intended to stimulate interest in research and evaluate data. One hour a week. Pr.: Consent of staff.
740 810. Bovine Anatomy. (2 to 4) I, S. The study of gross anatomy of the digestive, respiratory, and circulatory systems of the ox. The urogenital system, integument, and certain muscles are included as time permits. Pr.: Consent of staff.
740 812. Canine Anatomy. (2 to 4) I, II, S. Pr.: Consent of staff.
740 815. Histophysiology of Nutritional Deficiencies. (3) I, II, S. The study of changes occurring in tissues from nutritional deficiencies. Two hours rec. and three hours lab. a week. Open to graduate students and veterinary students earning graduate credit. Pr.: Consent of staff.
740 820. Research in Physiology. (1 to 6) I, II, S. For graduate students working toward the M. S. or Ph. D. degrees. Pr.: Consent of staff.
740 824. Physiology of Reproduction. (3) I. Study of reproduction of farm animals as related to the gross and microscopic anatomical structures and physiologic processes in regard to ova and spermatozoa, nutrition, and hormones. Pr.: Anat. 625.
740 825. Advanced Physiology. (3 to 5) I, II, S. The principles and techniques in the investigation of bioelectrical phenomena in relation to: (a) the physiology of the digestive organs; (b) myophysiology; (c) endocrinology and (d) neurophysiology. Advanced physiological experiments will be conducted to provide an understanding of the applications of electronic equipment. Rec. and two three-hour labs. a week. Pr.: Physi. 635, 645, and consent of staff.
740 830. Anatomy of Laboratory Animals. (2 to 4) I of even-numbered years and each S. Pr.: Consent of staff.
740 840. Reproductive Organ Anatomy. (1) II of evennumbered years and each S. Pr.: Consent of staff.
740 850. Anatomical Techniques. (1 to 2) I of oddnumbered years and each S. Pr. : Consent of staff.
740 870. Research in Anatomy. (1 to 4) I, II, S. For graduate students in the field of anatomy.

\section*{Surgery and Medicine}

\section*{J. E. MOSIER,* Head of Department}

Professors Mosier,* Butler,* and Noordsy;* Associate Professors Anderson, \({ }^{*}\) Frey, \({ }^{*}\) Guffy, \({ }^{*}\) Oehme, \({ }^{*}\) Titus, and Wallace;* Assistant Professors Brandt, Carnahan, Harris, Jernigan, Milleret, and Taussig; Instructors Blauch, Hedrich, Henry, Kennedy, Druckenbert, Olson, Schoneweis, Taylor, and Vestweber.
The Dykstra Veterinary Hospital is equipped for diagnosis and treatment of animal disease and for instruction of students in the science and art of veterinary medicine.

The Hospital has a capacity of 35 large animal patients and 100 small animal patients. Members of clinical staff, accompanied by students, conduct a field service for the purposes of diagnosing and treating the various diseases affecting livestock and poultry. Consultation services
result in frequent referral cases or investigational trips.

Third- and fourth-year students are active participants in the hospital and clinical services. Students are regularly assigned on a rotation basis during the year to various specialists within the clinical and pathology staffs. In addition to daily assignments, fourth year students are required to serve a two-week internship in the veterinary hospital, during which time they are responsible for the various management phases of the hospital.

The department presents courses in medicine, surgery, obstetrics and gynecology to veterinary students.

Opportunities leading to the Master of Science degree are offered. Prerequisite to graduate work in the department is the completion of a four-year curriculum substantially equivalent to that required of students majoring in veterinary medicine at this University.

Good library facilities, adequate physical equipment, and an abundance of cases offer excellent resources for research in surgery and medicine.

\section*{Courses in Surgery}

UNDERGRADUATE AND GRADUATE CREDIT
750 605. Surgery I. (3) I. Principles of surgery and consideration of instrumentation, the surgical suite, and preparation and monitoring of the patient. Three hours lec. a week, Pr.: Third-year standing in College of Veterinary Medicine.
750 615. Surgery II. (8) II. Discussions and demonstrations involving surgical and obstetrical patients; participation in surgical and obstetrical laboratories. Six hours lec. and six hours lab. a week. Pr.: Third-year standing in College of Veterinary Medicine.

\section*{GRADUATE CREDIT}

750 801. Research in Surgery. (1 to 6) I, II, S. The purpose of this course is to attempt to solve many of the problems confronting the veterinary surgeon. Pr.: Anat. 600, 605, 620; Surg. 605, 615. Offered especially for graduates, in veterinary medicine.
750 830. Surgical Techniques. (1 to 6) I, S. The study and application of developments in surgical techniques. Pr.: D. V. M. degree or consent of staff.

750 845. Comparative Surgical Ophthalmology. (3) I. Rationale and techniques of orbital and ocular surgical techniques will be studied with primary emphasis on orbital, eyelid, corneal and glaucoma surgery. Pr.: D. V. M., Med. 850.

750 865. The Physiologic Effects of Surgery. (3) II in even numbered years. A study of the effects of surgery on the different body systems. Pr.: D.V.M. degree or consent of staff.

750 870. Organ Transplantation. (3) II in odd numbered years. The study of transplantation of tissues and associated problems. Pr.: D.V.M. degree or consent of staff.
750 875. Orthopedic Surgery. (4) I in even numbered years. Fundamentals, theory and practice concerning genetic, metabolic, infectious, neoplastic and traumatic diseases of bones and joints. Pr.: D.V.M. degree of consent of instructor.
750 885. Problem in Medicine or Surgery. (3) I, II, S. The course provides for the study of medical or surgical problems. The student in conference with his major professor outlines the methodology and procedures, conducts the study, and prepares a detailed report. Pr.: D.V.M.

\section*{Courses in Medicine}

\section*{UNDERGRADUATE CREDIT}

750 135. Principles of Animal Disease Control. (3) II. A study of the factors that influence animal health and disease control. For students majoring in agriculture and other fields. Three hours lec. a week. Pr.: A.S.I. 101 or equiv., Physi. 431, and sophomore standing.

\section*{UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD}

750 400. Diseases of Wildlife. (3) II. Infectious and noninfectious diseases of birds, fur-bearing animals, zoological animals, and fish, with reference to methods of prevention and control. Pr.: Biol. 205, Biol. 220.

\section*{UNDERGRADUATE AND GRADUATE CREDIT}

750 610. Propaedeutic Medicine. (2) II. Introduction to the principles of animal hospitalization, diagnostic procedures and techniques, care of the hospitalized patient and an introduction to the psychology of veterinary medical practice. Two hours lec. a week. Pr.: Pr.: Second-year standing in College of Veterinary Medicine.
750 630. Medicine I. (5) I. Consideration of medical and pathological aspects of diseases affecting the musculoskeletal, respiratory, cardiovascular, hemic and lymphatic, endocrine and nervous systems. Five hours lec. a week. Pr.: Third-year standing in College of Veterinary Medicine.
750 640. Radiology. (2) I. The theory and principles of x-rays, production and interpretation of radiographs and exposure factors, special radiographic methods, film storage and handling, processing, safety measures and biologic effects of radiation. Two hours lec. a week. Pr.: Third-year standing in College of Veterinary Medicine. 750 650. Medicine II. (7) II. Consideration of the medical and pathological aspects of diseases affecting the skin, mucous membranes, urogenital, and digestive systems. Seven hours lec. a week. Pr.: Third-year standing in College of Veterinary Medicine.
750 665. Laboratory Animal Medicine. (3) II. Consideration of the management and health of common species of laboratory animals. Three hours lec. a week. Pr.: Fourth-year standing in College of Veterinary Medicine.
750 670. Medicine III. (6) I. Consideration of the medical and pathological aspects of diseases of special
sense organs and of those affecting the body as a whole. Six hours lec. a week. Pr.: Fourth-year standing in College of Veterinary Medicine.
750 685. Therapeutic Nutrition. (3) II. Veterinary medical aspects of nutrition, including a reinforcement of principles of nutrition, considerations relevant to therapeutic nutrition and discussions involving nutrient requirements of diseased and convalescent animals. Three hours lec. a week. Pr.: Fourth-year standing in College of Veterinary Medicine.
750 690. Medicine IV. (6) II. Consideration of programs of disease prevention for domesticated animals. Six hours lec. a week. Pr.: Fourth-year standing in College of Veterinary Medicine.
750 695. Toxicology. (4) I. Effects of harmful substances on the animal body. Emphasis placed on toxicologic principles, and management of the poisoned patient. Four hours lec. per week. Pr.: Third-year standing in College of Veterinary Medicine.
750 700, 750 710. Clinic I. (2) and II. (2) I and II respectively. Instruction in operation of the outpatient clinic; participation in the receipt, restraint, examination and treatment of the patient and in ancillary services of the animal hospital. Six hours lab. a week. Pr.: Third-year standing in College of Veterinary Medicine.
750 725, 750 735. Clinical Medicine I. (4) and II. (4) I and II respectively. Study of the hospitalized veterinary medical and surgical patient; participation in field studies of animal disease, veterinary public health, seminars, and clinicopathologic conferences. Twentytwo hours lab. a week. Pr.: Fourth-year standing in College of Veterinary Medicine.
750 740. Clinical Medicine III. (6) S. Offered during the summer for those students selected as participants for the Special Undergraduate Program during their fourth year of professional study in lieu of 6 credit hours of Clinical Medicine I and II. Pr.: Fourth-year standing in College of Veterinary Medicine.
750 742. Clinic Seminar 1. (1) and II. (1) I and II respectively. A companion course to Clinical Medicine III designed to allow participants in the Special Undergraduate Program to complete the Clinical Medicine I and II requirement of the professional curriculum. Pr.: Fourth-year standing in College of Veterinary Medicine.

\section*{GRADUATE CREDIT}

750 810. Research in Medicine. (1 to 6) I, II, S. An attempted solution of some of the medical and parasitological problems confronting the practitioner of veterinary medicine. Pr.: Consent of staff.
750 820. Breeding Diseases. (1 to 5) I, II, S. Advanced studies of the breeding diseases of domestic animals. Pr.: D. V. M. degree or consent of staff.
750 825. Systemic Medicine I. (3) I, II, S. Study of the medical aspects of diseases of the urinary, nervous, integumentary systems and special senses. Pr.: D. V. M. degree or consent of staff.
750 827. Systemic Medicine II. (3) I, II, S. Study of the medical aspects of diseases of the urinary, nervous, integumentary systems and special senses. Pr.: D. V. M. degree or consent of staff.
750835 . Interpretation of Radiologic Studies of Body Systems. (4) II in odd numbered years. The rationale of
radiologic procedures are studied and the interpretation of radiographs of body systems emphasized. Pr.: D. V. \(M\). degree or consent of instructor prior to registration.

750 840. Comparative Gastroenterology. (3) II in even numbered years. A comparative medical study of the etiopathogenesis, diagnostic criteria and treatment of gastroenteric disorders in the canine, equine, porcine, and bovine species. Comparable disorders in man are discussed. Pr.: D. V. M. degree.
750 850. Comparative Medical Ophthalmology. (3) II in odd numbered years. Diseases of the eye and orbit of animals are studied utilizing tonometry, photography, slit lamp biomicroscopy, gonioscopy and electroretinography. Pr.: D. V. M. degree and consent of staff.

750 880. Clinical Science Seminar. (1) I, II, S. A participating seminar for graduate students in the clinical sciences. Case studies will form the basis of the seminars. One hour conference weekly. May re-enroll for total maximum of two credits. Pr.: Consent of staff.
750 885. Problem in Medicine or Surgery. (3) I, II, S. The course provides for the study of medical or surgical problems. The student in conference with his. major professor outlines the methodology and procedures, conducts the study, and prepares a detailed report. Pr.: D.V.M.

750 890. Toxins in the Biological System. (2) I. An advanced toxicology course concerned with the cellular and subcellular effects of various groups of toxins on the intact animal organism. Pr.: Biochemistry, organic chemistry, pharmacology, or consent of instructor.

\title{
THE GRADUATE SCHOOL
}

\author{
R. F. KRUH, Dean \\ JOHN P. NOONAN, Associate Dean
}

Graduate Study at Kansas State University: Its Beginning and Development

Although the first graduate student enrolled in 1868, the year 1886 is the significant date for graduate study at Kansas State University. In that year a standing committee on graduate work was created, and it was established then that a Master of Science degree would be granted to candidates who demonstrated a proficiency in one of the industrial arts or sciences and who presented a thesis reporting original research. Industrial arts included agriculture, horticulture, engineering, architecture and design, and domestic economy. The sciences were botany, chemistry, zoology, entomology, and physics.

Requirements for the master's degree evolved through the years and by 1912 definite procedures had been worked out whereby all applications for graduate study were passed upon by the Council of Deans, with student programs determined by the dean of the division (now college) in which the student did his major work. In October, 1919, a Graduate Council of seven members was created to administer graduate courses. It represented the divisions of Agriculture, Engineering, General Science (now Arts and Sciences), Home Economics, and Veterinary Medicine. The Council members and its
chairman were appointed by the president. At that time members of the Graduate Faculty were selected by department heads and approved by the Council. In November, 1931, a separate Division of Graduate Study was established under a dean, and in 1932 the Board of Regents authorized doctoral programs in chemistry, milling industry, bacteriology, and entomology. The Graduate School acquired its present name in 1942, and its policy-forming group is an elected Graduate Council representative of each college or school and the major areas of graduate study.

\section*{The Graduate School Today}

The Graduate School's continued development is demonstrated by enlarged enrollments, improved quality of its programs, and the diversity of the offerings. More and more students are being attracted to graduate study because they have developed interests in advanced scholarly work and because their career opportunities are improved as result of advanced training. The quality of the programs has been recognized by awards for increased research and training support from outside agencies and for the acquisition of sophisticated research apparatus and new library facilities. Faculty members from various departments have pooled their talents and resources in cooperative research and training activities with the result that students' programs of study may readily cross traditional departmental lines.

Graduate study is based on the proposition that students work individually or in small groups with a major professor. Most advanced graduate courses are, therefore, taught in small seminars which provide for the exchange of ideas among the students and instructor. The ultimate objective is to create the desire and capacity for independent study and research.

In keeping with today's trends in higher education, the Graduate School is concerned with a program designed to aid the student to achieve the maximum possible liberality in education while pursuing the specialized professional courses of study. Graduate students are encouraged, therefore, to aspire to a well-rounded self-development, and with it an outlook of a more adequate world view, through participation in those chosen
university courses and activities which may enable them individually to gain such ends.

Wide support of research programs is provided through the Agricultural Experiment Station, the Engineering Experiment Station, and the Bureau of General Research. Each of the experiment stations offers backing for relevant research in many quarters of the campus beyond those traditionally identified with such stations, the the Bureau of General Research specifically serves the Colleges of Arts and Sciences, Commerce, and Education.

\section*{Admission}

Admission to graduate study does not imply admission to candidacy for an advanced degree. For a doctoral degree such candidacy is confirmed upon successful completion of preliminary examinations.

Correspondence regarding admission to the Graduate School should be addressed to the department, which will supply application blanks and supplementary information about its program. The applicant should see that each undergraduate or graduate institution he has previously attended sends two copies of official transcripts directly to the appropriate department head. The application and transcripts should be received by the department at least three months before the time the student expects to enroll. All transcripts become part of the student's official file and may not be returned.

All new graduate students are required to take a physical examination. For students applying from within the United States this examination may be given by a family physician prior to enrollment and recorded on forms furnished by the University. International students report to the Student Health Center during enrollment for a physical examination.

Entrance Requirements. Admission to the Graduate School ordinarily implies the student's intention to work toward an advanced degree. To be considered for admission with full standing the applicant must have:
(1) A bachelor's degree from an approved institution,
(2) Adequate undergraduate preparation in the proposed major field or equivalent evidence of an appropriate background
for undertaking an advanced degree program, and
(3) An undergraduate average of B or better in the junior and senior years.
Probationary admission to the Graduate School will be considered if all of the foregoing requirements are not met provided there is other evidence that the applicant has the ability to do satisfactory graduate work. Such evidence might include an excellent record of postgraduate work at another institution, or high scores on the Graduate Record Examination or the Miller Analogies Test. Those who wish to take the Graduate Record Examination should apply to Educational Testing Service, Box 955, Princeton, New Jersey 08540. The fee for either test must be paid by the applicant.
Students may be admitted provisionally if there is uncertainty in evaluating transcripts, as in the case of some international students, or if there are undergraduate deficiencies which must be removed.

Once admitted, probationary and provisional students will be advised of deficiencies or other conditions to be met to attain full standing. Full standing is attained automatically upon completion of a least nine hours of work for graduate credit with a grade of B or better, and upon the removal of any deficiency which was specified at the time of admission.
Students who do not plan to work for an advanced degree may be admitted to the Graduate School as special students. Applications from such students should be sent to the department in which they plan to take courses or directly to the Graduate School together with two copies of the official transcript from the institution which granted the undergraduate degree. A special student who later wishes to enter a degree program must obtain the permission of the department concerned. No more than 16 semester hours earned as a special student may be transferred into a regular degree program.

International Students. The Graduate School requires each foreign applicant, whose national language is not English, to demonstrate his facility in the English language by making a satisfactory score on the Test of English as a Foreign Language (TOEFL). This test is required in the interest of assuring that the student's progress toward
a degree is not jeopardized by language difficulties. The TOEFL is offered several times a year in the student's home country through the Educational Testing Service, Princeton, New Jersey. Further information is available from the Graduate Office. Foreign students are advised to take the TOEFL as early as possible to avoid delays in processing their applications for admission.

In addition to the TOEFL all international students entering Graduate School will be required to demonstrate proficiency in written and oral English at the time of their enrollment. Students who fail to meet this requirement must enroll in and satisfactorily complete English 075, Speech 070, or both, as appropriate.

A special orientation and advising program is conducted for new international students one week before the date of enrollment.

Registration and Enrollment. Students who have been admitted to the Graduate School register and pay their fees during the regular registration period.

A student enrolled in a short course or workshop during the summer session may take regularly scheduled courses as long as he is able to attend all sessions of both. His enrollment should not exceed the maximum number of hours allowed in the summer session.

Not more than 16 hours, including those obtained from research, may be assigned in a single semester, nor more than nine hours during a summer session. If a part of the assignment is for undergraduate credit, a student may be assigned to 17 hours during a semester or nine hours during a summer session. Full-time staff members of the University may not be assigned to more than six hours in one semester, nor more than three hours in a summer session. (See section on Assistantships and Fellowships for limitations applying to students holding assistantships.) These limitations apply to classes audited as well as classes for which credit is earned.

Any change in a student's enrollment should be carried out through the regular procedures and must be accompanied by the approval of the student's adviser and the Dean of the Graduate School.

All graduate students who have matriculated at Kansas State University and
are using faculty time and-or University facilities for research or other academic pursuits must be enrolled. The enrollment should reflect, as accurately as possible, the demands made on faculty time and use made of University facilities. Further, a graduate degree candidate must be enrolled during the semester in which the requirements for a degree are completed.

A student working for the Ph.D. must enroll during the session in which the preliminary examination is taken and subsequently in each semester until the degree requirements are met and the dissertation is accepted by the Graduate School. Failure to enroll will result in loss of candidacy. To regain candidacy, the student will be re-examined over the areas covered in his preliminary examinations in a manner to be determined by the supervisory committee. If it is necessary to interrupt progress toward the degree after the preliminary examination has been passed, the student (or his major professor) may petition for leave of absence for up to one year which subsequently may be renewed. Renewals for those who are meeting their military service requirement will be automatic. The petition must be submitted at least one month before the effective date of leave. Approval must be granted by the major professor, chairman of the department or graduate group, and the dean of the Graduate School.

Candidates who do not live in the vicinity of Manhattan may make arrangements to enroll by mail but should request permission for doing so by writing the Graduate Office prior to the enrollment period.

Fees. See the General Information section in the front of this catolog for detailed information about fees.

Graduate Study by Seniors. A senior at Kansas State University who is within two semesters of receiving his bachelor's degree may enroll for one or more courses for graduate credit, provided he has at least a \(B\) average on his prior work at the junior-senior level. His total enrollment in such cases may not exceed 17 hours per semester or nine hours per summer session, and not more than 12 semester hours of graduate work may be accumulated in this way.

\section*{Requirements for Degrees}

Graduate Credit. The course and research requirements for graduate degrees are expressed in terms of graduate credit. Graduate credit may not be earned by examination or by correspondence. A previously matriculated graduate student who wishes to enroll in problems or research during August may do so with the approval of his major professor, department head, and graduate dean. Forms for such enrollment are available in the Graduate Office about July 15. Enrollment must be completed by August 1 and may not exceed one credit hour per week.

Grades. The following grades are used in the Graduate School: A, B, C, D, F, Credit, No Credit, Incomplete, and Withdrawn. A candidate for an advanced degree must make a grade of B or better in three-fourths of the credit hours attempted (excluding research). To count for graduate credit the grade in a course must be C or better and no course may be counted more than once. A graduate student's record will be reviewed after he has completed nine hours of graduate work. To be in good standing a graduate student must make at least a 2.65 grade-point average in all graduate course work. Those failing to meet this requirement will be placed on probation. Continued unsatisfactory work will result in dismissal.

Non-Graded Work. At the discretion of the Graduate Faculty of the department or interdepartmental committee concerned, seminars or colloquia in which letter grading conflicts with the objectives intended may be offered on a credit-no credit or pass-fail basis rather than for a letter grade. The seminars and colloquia which are to be offered for credit-no credit or pass-fail shall be listed with the Dean of the Graduate School. All courses on the program of study except research (report, thesis, or dissertation) and seminars or colloquia which have been approved for credit-no credit or pass-fail must be taken for letter grades. Independently of the program of study, additional courses may be taken on a credit-no credit or pass-fail basis with the approval of the major professor and the professor offering the course. These courses may not be applied toward a degree. No more than three hours of credit-no credit or pass-fail courses may appear on the
program of study for the master's degree nor more than six for the Ph.D.

Validation of Credits. All credits, whether from Kansas State University or transferred and which have been acquired more than six years prior to receiving a master's degree or seven years prior to receiving a Ph.D., require validation either by repeating the course, by passing an advanced course in the subject area, or by successfully completing a validation examination. However, credits in a doctoral program which have been earned as part of a master's degree remain valid and require no further validation. The department may choose which of the above methods is to be used for validation, and validation is to be completed at least one semester before the effective date of the degree. The preliminary examinations may not be used for validation.

Master's Degree. Candidates for the master's degree are normally required to spend one academic year in residence. Subject to the approval of the major department, the candidate may choose one of the following options: (1) a minimum of 30 semester hours of graduate credit including a master's thesis of six to eight semester hours, (2) a minimum of 30 semester hours of graduate credit including a written report of two semester hours either of research or of problem work on a topic in the major field, or (3) a minimum of 30 semester hours of graduate credit in course work only but including evidence of scholarly effort such as term papers, production of creative work, and so forth, as determined by the student's supervisory committee. Candidates for the Master of Regional and Community Planning degree must satisfactorily complete a minimum of 48 hours.

The student's program of study is prepared with the assistance of an advisory committee consisting of the major adviser and two other graduate faculty members. The program is subject to the approval of the Dean of the Graduate School upon recommendation of the advisory committee and should be submitted to the Graduate School prior to the end of the candidate's second term. The program may be modified on further recommendation of the advisory committee and the approval of the Dean.

Three copies of theses and reports are required. All such reports and theses will be bound in cloth in accordance with specifications for Class A binding of the Library Binding Institute. To cover the cost of binding the student must deposit with his report or thesis a money order made out to an approved bindery. The University Library will forward manuscripts to the bindery for the candidate. If the student desires to publish all or part of his thesis before the degree is conferred the major professor should notify the Graduate School in advance by letter.

Successful completion of a final oral examination or comprehensive written examination or both shall be required of all master's degree candidates, the specific form being determined by individual departments. The final examination is administered by the advisory committee and may include a defense of the thesis or report, an interpretation of other scholarly products, or a testing of the student's understanding of his field(s) of study.

Doctor of Philosophy. At least three years of two semesters each of graduate study beyond the bachelor's degree equivalent to about 90 semester hours and a dissertation are required of candidates for the degree of Doctor of Philosophy (Ph.D.). A full year of residency (a minimum or 24 credit hours of course work) is required. The foreign language requirement for the Ph.D. is determined as a matter of policy by the graduate faculty in each department. There is no such requirement in the following programs: agronomy, animal breeding, economics, education, food science, foods and nutrition, genetics, grain science, horticulture, pathology, plant pathology, and psychology. For all other programs the department should be consulted for details of the foreign language requirement. Where a language is required, it is understood that "foreign language" refers to languages other than English and that the language(s) required will have a significant body of literature relevant to the field. Required foreign language examinations shall be administered by the Department of Modern Languages. The language requirement must be satisfied before the student is admitted to candidacy.

For each doctoral student a supervisory committee is selected by the student and the
major instructor with the approval of the head of the department and the Dean of the Graduate School. This committee, consisting of at least four members representing the student's field of study, aids the student in the preparation of his program of study (which must be approved by the Dean of the Graduate School) and has charge of the preliminary examination. Before the preliminary examination is arranged the student must have on file in the Graduate School a program of study approved by the supervisory committee.

Ordinarily, at the close of the second year of graduate study and at least seven months before the final examination the student must have met the preliminary examination requirement, successful completion of which is a necessary condition for admission to doctoral candidacy. The supervisory committee is responsible for recommending candidacy to the Graduate Council. On completion of at least three years of graduate study as prescribed by the supervisory committee and on completion of a dissertation, the candidate must pass a final examination. Final dissertation copies must be submitted to the Dean of the Graduate School as a last requirement to be met for award of the degree.

Early in the graduate work a dissertation subject is chosen in the major field and approved by the supervisory committee. The dissertation must represent original investigation, contributing new knowledge or understanding to the candidate's field. All dissertations will be bound in cloth in accordance with specifications for Class A binding of the Library Binding Institute. To cover the cost of binding the student must deposit with his dissertation a money order made out to an approved bindery. The University Library will forward manuscripts to the bindery for the candidate.

Each dissertation is microfilmed and an abstract is published in Dissertation Abstracts. The current fee is \(\$ 20\).

If publication of the dissertation, in whole or in part, is to be made before the degree is conferred, the major professor should notify the dean of the Graduate School by letter in advance of such publication. Publication of any part of a dissertation should show, through footnote or otherwise, that the material is from a dissertation presented in
partial fulfillment of the requirements for the degree Doctor of Philosophy in the subject department at Kansas State University.

\section*{Assistantships and Fellowships}

In order to support research, scholarship, and the acquisition of advanced degrees, the University offers several different kinds of financial aid for graduate students. These include fellowships, traineeships, teaching assistantships, and research assistantships. Applications for graduate teaching assistantships and graduate research assistantships should be made directly to the department concerned before March 15 for the following academic year. Inquiries about other types of support may be directed either to the Graduate Office or to the department.

Graduate Teaching Assistantships and Graduate Research Assistantships. Award of assistantships is based on the student's ability and promise and is usually made for either nine months or 12 months. The usual appointment is for half-time, but appointments for lesser fractions may also be made. A student is eligible for resident fees during each term in which he holds an appointment for at least two-fifths time. In addition, students who have been on appointments for at least two-fifths time during the academic year are eligible for resident fees during the following summer term even though they do not hold assistantships. The maximum enrollment for assistants is 10 hours for halftime and 12 hours for two-fifths time appointments; the minimum is six hours in the regular terms and three in the summer. The corresponding maxima for a summer term are five and six hours respectively. Students desiring such appointments may obtain application blanks from the head of the department concerned.

In addition to assistantships the University has a number of fellowships and traineeships available. These include University Fellowships, which are intended primarily for students in the latter part of dissertation research, NDEA Title IV Fellowships, and NSF Graduate Traineeships. NDEA Title IV Fellowships are available in many departments, while NSF Traineeships are restricted to the sciences. Several departments also have federally supported traineeships available under the programs of the National Institutes of Health.

\section*{Organizations, Housing, Loans}

For information about student organizations, graduate student housing and loans, see the General Information section of this catalog, near the front.

\section*{Offerings of the Graduate School}

\section*{Major Fields for Master of Science}

Major work leading to the degree Master of
Science is offered in the following fields:

\section*{Accounting}

Agricultural Economics
Agricultural Education
Agricultural Engineering
Agricultural Mechanization
Agronomy
Anatomy
Animal Science and Industry
Applied Mechanics
Biochemistry
Biology
Business Administration
Chemical Engineering
Chemistry
Civil Engineering
Clothing and Textiles and Interior Design
Computer Science
Dairy Manufacturing
Dairy Production
Education
Electrical Engineering
Entomology
Family and Child Development
Family Economics
Food Science
Foods and Nutrition
General Home Economics
Genetics
Geochemistry
Geology
Grain Science
Home Economics Education
Horticulture
Industrial Engineering
Institutional Management
Journalism and Mass Communication
Mathematics
Mechanical Engineering
Microbiology
Music
Nuclear Engineering
Parasitology
Pathology
Physical Education
Physical Science Teaching
Physics
Physiology
Plant Pathology
Poultry Science
?sychology
Statistics
Surgery and Medicine

Major Fields for Master of Arts
Major work leading to the degree Master of Arts is offered in the following fields:

\author{
Art \\ Economics \\ English \\ Geography \\ History \\ Mathematics \\ Modern Languages \\ Music \\ Philosophy \\ Political Science \\ Radio and Television \\ Sociology \\ Speech
}

\section*{Major Fields for Master of Architecture}

Major work leading to the degree Master of Architecture is offered in the following fields:

\author{
Architectural Design \\ Architectural Structures \\ Interior Architectural Design
}

\section*{Master of Landscape Architecture}

Major work leading to the degree Master of Landscape Architecture is offered in the College of Architecture and Design.

\section*{Master of Regional and Community Planning}

Major work leading to the degree Master of Regional and Community Planning is offered on an interdepartmental basis, with the program centering administratively in the Department of Regional and Community Planning.

\section*{Major Fields for Doctor of Philosophy}

Major work leading to the degree Doctor of Philosophy is offered in the following fields:

\footnotetext{
Agronomy
Animal Breeding
Animal Nutrition
Applied Mechanics
Biochemistry
Biology
Chemical Engineering
Chemistry
Computer Science
Economics (Agricultural)
Economics (Arts and Sciences)
Education
Electrical Engineering
English
Entomology
Food Science
Foods and Nutrition
Genetics
(Continued on next page)
}

\author{
Geochemistry Grain Science \\ History \\ Horticulture \\ Industrial Engineering \\ Mathematics \\ Mechanical Engineering \\ Microbiology \\ Nuclear Engineering \\ Parasitology \\ Pathology \\ Physics \\ Physiology \\ Plant Pathology \\ Psychology \\ Statistics
}

\section*{Interdepartmental Degree Programs}

The Graduate School recognizes the importance of programs involving interrelationships between fields and has established graduate faculty groups to plan programs and supervise research in interdisciplinary fields. These programs are described in the following paragraphs. For information regarding these programs write to the chairman of the appropriate program in care of the Graduate School.

\section*{Animal Breeding}

\author{
R. R. SCHALLES, Chairman
}

Professors Craig, Farmer, Gier, Huston, and Wheat; Associate Professors Kiracofe and Smith; Assistant Professors Ames, Dayton, Kemp and Schalles.

Major work leading to the degree Doctor of Philosophy in Animal Breeding is offered in the Departments of Animal Science and Industry, Dairy and Poultry Science, and the Division of Biology.

The training for the Ph.D. is planned to equip the candidate for both research and teaching careers, with major emphasis on either reproductive physiology or animal genetics.

Facilities for advanced work in animal breeding include large and small experimental animals and modern laboratories. Faculty members serving as major advisors to degree candidates are conducting active research programs in many phases of animal breeding.
To enter graduate study in animal breeding, the student should have preparation in (1) elementary genetics, (2) college algebra, (3) physics, (4) general and
organic chemistry, (5) general botany, (6) general zoology, and (7) at least six additional credit hours of advanced biological sciences. In addition, a student must have at least six credit hours of undergraduate livestock production or management courses. When necessary background courses are lacking, the student will be required to take such undergraduate courses.

Degree candidates are expected to acquire training in genetics, animal breeding, statistics, biochemistry, physiology, and zoology. Additional courses may be selected from other fields of biological and physical sciences. No foreign language is required for Ph.D. candidates in animal breeding.

A typical program of study for a Ph.D. candidate with major interests in reproductive physiology or animal genetics might include the following graduate level courses:

\section*{Reproductive Physiology}

\author{
Anatomy \\ Embryology \\ Cytology \\ Histology \\ Endocrinology \\ General Physiology \\ Reproductive Physiology \\ Biochemistry \\ Statistics \\ Research Techniques \\ Genetics \\ \section*{Animal Genetics} \\ Statistical and Population Genetics \\ Poultry and Dairy Genetics \\ Population Genetics \\ Animal Breeding \\ Statistics and Experimental Design \\ Physiology and Anatomy
}

In addition to these basic courses the candidate would take specific courses in his area of particular interests such as embryogenesis, biochemistry, population genetics, immunology and pathology, anatomy or endocrinology. Each semester the candidate will participate in at least one graduate seminar which will include visits by guest scholars representing various disciplines associated with animal breeding.

\author{
Animal Nutrition
}

PAUL E. SANFORD, \({ }^{*}\) Chairman
Professors Bartley,* Koch,* Parrish,* Richardson, Sanford," Smith, Underbjerg, and Ward; Associate Professors Adams, Brent," Drake, Frey, \({ }^{*}\) Harbers, and Morrill; Assistant Professors Allee, Ames, and Hines.

Major work leading to the degree Doctor of Philosophy in Animal Nutrition is offered in the Departments of Animal Science and Industry, Dairy and Poultry Science, Biochemistry, and Physiology. Students desiring such a program should consult the Dean of the Graduate School and the representatives of the appropriate departments. For courses, see departmental sections in this catalog.

To enter graduate study in Aminal Nutrition, the student should have preparation in (1) animal, dairy and-or poultry science, (2) biological sciences including general microbiology, (3) general chemistry, including laboratory, chemical analyses, and general organic chemistry, (4) mathematics, including college algebra and trigonometry, and (5) physics for which trigonometry is a prerequisite (Physics I \& II).

Where necessary background courses are lacking, the student will be required to take additional undergraduate courses.

For the advanced degree, candidates are expected to acquire training in (1) nutrition (animal nutrition, Animal Science and Industry 600 ; or principles of animal nutrition, Biochemistry 670 , or equivalent, and 3 credit hrs . selected from advanced animal nutrition, Biochemistry 825 ; dairy cattle nutrition, Dairy-Poultry Science 610; nutrition of the fowl, Dairy-Poultry Science 612); (2) biochemistry, including laboratory; (3) Physiology I and II or ten credit hours equivalent; (4) Statistical Methods 520, 521 or equivalent; (5) Special Anatomy 625 (minimum 2 hours); (6) histology, Biology 415; (7) seminar; (8) tool courses (minimum 3 hours) such as computer science and programing, design of experiments, foreign language. These can be used for credit if graduate level. A foreign language is not a specific requirement.

Additional courses as appropriate to complete the program of study may be selected from the following departments: animal science and industry, biochemistry,
biology, chemistry, dairy-poultry science, foods and nutrition, grain science and industry, physiological sciences, statistics and computer science.
Facilities for advanced work in animal nutrition include large and small experimental animals, well-equipped laboratories and adequate library facilities.

\section*{Biochemistry}

\section*{R. E. CLEGG. Chairman}

Professors Bode, Burkhard, Clegg, H. L. Mitchell, Nordin, Parrish, Ruliffson, and Tsen; Associate Professors Clarenburg, Hedgcoth, and Lineback; Assistant Professors Center, B. Cunningham, Klopfenstein, Mueller, and Williams.

The Graduate Biochemistry Group has the responsibility for the graduate biochemistry program leading to the M.S. and Ph.D. degrees and is directly responsible to the dean of the Graduate School. The Graduate Biochemistry Group consists of biochemists, regardless of department of college affiliation, who are approved for membership in the Graduate Biochemistry Faculty. An executive committee composed of three members of the Graduate Biochemistry Group and elected by the group serves an administrative function. One member of the executive committee serves as chairman of the group. Units of the University currently cooperating in the program are the Department of Biochemistry, the Division of Biology, and the Department of Physiological Sciences.

Entering graduate students must meet the entrance requirements of the Graduate School and must have completed one year of analytical, organic and physical chemistry, differential and integral calculus, and a course in biology, including a laboratory. A student entering this program with considerable training in biology must meet these requirements, but he may satisfy the physical chemistry requirement by including the year of physical chemistry as a part of his graduate program. A year of French, German or Russian is a requirement for admission into the Graduate Biochemistry Program. The Graduate Record Examination is required.

\footnotetext{
Members of the Animal Nutrition Coordinating Committee
}

\section*{Food Science}

DAVID R. LINEBACK, Chairman
Professors Caul, Claydon, Clegg, Deyoe, Fan, Farrell, Finkelstein, Greig, Harrison," Hoover,, J. Johnson, Kyle, H. L. Mitchell, P. Nordin, Parrish, Pfost,* Ruliffson, Shugart, Tinklin, Tsen, Wakefield, and Ward; Associate Professors Allen, Bassette, Brent,* Cunningham,* L. Erickson, B. Fryer, Kropf, Lineback, and Tuma;* Assistant Professors Bowers, Dikeman, Iandolo,* Klopfenstein, Mickelsen,* Middleton, Miller, and R. J. Robinson.

Graduate work leading to the degrees Master of Sceince and Doctor of Philosophy in Food Science is offered in the Departments of Animal Science and Industry, Bacteriology, Biochemistry, Chemical Engineering, Dairy and Poultry Science, Grain Science and Industry, Foods and Nutrition, Horticulture, Institutional Management and the Division of Biology.
Requirements for entering graduate study in Food Science are: (1) mathematics including college algebra, (2) analytical and organic chemistry, (3) a course in physics, (4) an introductory course in microbiology, (5) a course in botany, zoology or biology. When the student's committee believes that it is necessary, the student will be required to take additional undergraduate courses to prepare him more completely for his own program.

Candidates for degrees are expected to select courses so as to give adequate coverage in several food areas, with primary emphasis in one or more areas. The student will be expected to include in the program of study general biochemistry, statistics, microbiology of foods or dairy bacteriology if these courses are not included in previous preparation. Course requirements will be evaluated by the student's advisory committee. At least one member of the Food Science Coordinating Committee should serve on the student's advisory committee.

Facilities are available for a comprehensive range of teaching and research activities including pilot plants for milling, baking, dairy products, poultry products, meats and quantity food production. Laboratories are equipped for research involving biochemistry, heat transfer, fluid flow, filtration, evaporation, microbiology, rheology, freeze drying and nutrition.

There is no foreign language requirement.

\section*{Courses in Food Science}

Animal Science and Industry
Institutional Meats
Meat Technology
Meat Packing Plant Operation
Advanced Meat Science
Analytical Techniques in Animal Science and Industry

\section*{Biochemistry}

Proteins
Chemistry of Carbohydrates
Lipids
Advanced Biochemistry Laboratory
Enzyme Chemistry
Enzyme Laboratory
Conformational Analysis of Biopolymers
Theoretical Biochemistry
Chemical Engineering
Transport Phenomena
Process Analysis and Design
Dairy and Poultry Science
Market Milk and Dairy Inspection
Dairy Products Evaluation II
Dairy Technology
Poultry Products Technology
Chemistry of Foods
Dairy Foods Processing
Dairy Plant Management
Dairy Fermentations
Processing and Chemical Analysis of Fats and Oils

\section*{Division of Biology}

Dairy Bacteriology
Microbiology of Foods
Foods and Nutrition
Food Science
Principles of Nutrition
Advances in Foods
Food Research Techniques
Nutrition in Developing Countries
Fundamentals of Food Flavor Analysis
Bionutrition
Advanced Nutrition
Food Systems
Advanced Foods
Research Methods in Foods and Nutrition
Food Science Colloquium
Grain Science and Industry
Milling Technology I
Flour and Feed Analysis
Advanced Wheat and Flour Testing
Experimental Baking I
Experimental Baking II
Bakery Design and Flow
Bakery Technology
Advanced Flow Sheets
The Qualities of Wheat and Flour
Foods and Feed Plant Sanitation
Milling Technology II
Fundamentals of Grain Storage
Principles of Food Analysis
Advanced Flour and Feed Technology
Flour and Feed Mill Construction
Enzyme Applications

Institutional Management
Food Production Management Quantity Food Purchasing and Control
Food Service Equipment and Layout

\section*{Genetics}

ELMER HEYNE, Chairman
Professors Craig," Eisenstark,* Hall," Heyne, Huston,* Pittenger and Wheat;* Associate Professors Barnett, Casady, Liang, Nassar,* Smith, and Wassam; Assistant Professor Schalles.

Graduate work leading to the M.S. and Ph.D. degrees in genetics is administered through an interdepartmental program. The program is supervised by a Genetics Coordinating Committee of faculty from participating departments which sets the academic requirements for degrees and assigns two of its members to the supervisory committee of each student. Graduate students are associated with the department to which their major professor belongs, but the graduate degrees are awarded in genetics.
In addition to the general entrance requirement set up by the Graduate School, students desiring to do graduate work in genetics should have at least an introductory course in genetics and six hours of biological sciences. Students who do not meet these requirements will be expected to make up these deficiencies either by examination by the appropriate departments or by enrolling in the necessary courses during the first year of graduate study. Although the program of study for each student is determined by his supervisory committee, the Genetics Coordinating Committee has outlined certain specific requirements. These requirements, outlined below, are kept at a minimum to allow specialization in a wide variety of areas of genetics ranging from plant and animal breeding, plant and animal genetics, population and statistical genetics, to microbial as well as cellular and molecular genetics. At present, the minimum academic requirements are as follows:

An introductory course in either cytology or cell biology strongly oriented toward chromosome behavior.

An introductory course in biochemistry or statistics for the M.S. degree.

An introductory course in both biochemistry and statistics for the Ph.D. degree.

\section*{Courses in Genetics}

Three of the following courses will be required for the M.S. degree and five will be required for the Ph.D. degree.

Agronomy
Plant Genetics
Plant Breeding
Animal Science and Industry
Population Genetics
Biology
Genetics of Microorganisms
Microbial Genetic Techniques
Molecular Genetics
Structure and Replication of the Genetic Material Mutations
Genetic Expression and Regulation
Recombination
Recent Advances in Cytogenetics
Dairy and Poultry Science
Poultry and Dairy Genetics I
Poultry and Dairy Genetics II
Horticulture
Horticultural Crop Breeding
Statistics and Computer Science
Statistical Population and Quantitative Genetics I
Statistical Population and Quantitative Genetics II
A more complete description of the above courses can be found in the respective departmental sections.

Participating in the interdepartmental program are the Departments of Animal Science and Industry, Agronomy, Horticulture, Dairy and Poultry Science, Statistics and Computer Science, and the Division of Biology.

No foreign language is required; however, if the supervisory committee believes a reading knowledge of some foreign language is essential to a particular research problem, it may be required in individual cases.

\section*{Parasitology}

\section*{M. F. HANSEN, Chairman}

Professors Ameel, Hansen, Knutson, Leland, Lindquist and Pady; Associate Professors Dickerson, Elzinga, Harvey, Kramer, and Pitts; Assistant Professors Johnson and Ridley.

Graduate study leading to the degrees Master of Science and Doctor of Philosophy in Parasitology is offered in the Division of Biology and the Departments of Entomology, Infectious Diseases and Plant Pathology
(Phytonematology). Graduate courses related to parasitology will be found listed under the above division and departments in this catalog. Supporting courses may be taken in any of the scientific disciplines or in other academic areas with approval of the parasitology faculty and the student's advisory committee.

One foreign language is required for the degree Doctor of Philosophy in Parasitology.

Facilities for research work in parasitology include rearing rooms, small and large parasite-free domestic animals, environmental control chambers, animal rooms, in vitro culturing, laboratories (toxicology, physiology, behavior) and field study areas.

\section*{Pathology}

WILLIAM D. LINDQUIST, Chairman
Professors Coles, Cook, Dennis, Kelley, Leland, and Lindquist; Associate Professors Anthony, Burroughs, Leipold, McGavin, Minocha, Osbaldiston, J. Smith and Strafuss; Assistant Professors Moore and Gray.

Graduate work leading to the degrees Master of Science and Doctor of Philosophy is offered in the Departments of Pathology and Infectious Diseases in the College of Veterinary Medicine. For available courses see the departmental sections of this catalog.

Facilities of the departments for advanced work include a well-equipped clinical pathology laboratory, animal isolation units, virus research laboratories, parasitology research laboratories, a histopathology preparation laboratory, a diagnostic laboratory, a perinatal research laboratory, a wide variety of research equipment, and an extensive file of tissue slides. There is also an opportunity for experimental work with animals in studying diseases and related pathology.

Graduate training is available in the fields of clinical pathology, general pathology, systemic pathology and in the study of infectious diseases as related to pathology.

Requirements for entering graduate study in pathology are completion of a four-year curriculum in veterinary medicine, equivalent training in basic sciences or by approval of the interdepartmental graduate faculty.

There are no requirements for reading knowledge of a foreign language.

\section*{Physical Science Teaching}

HENRY V. BECK, Chairman
Professors Beck, Curnutte, James, Marr, Moore, and Schrenk.

The Departments of Chemistry, Geology, Mathematics, and Physics, and the College of Education jointly offer graduate work leading to the degree Master of Science in the field of physical science teaching. The program is specifically directed towards the needs and interests of present and prospective teachers of physical science in the high schools and junior colleges.

Prerequisite to graduate work in this field is the completion of a four-year undergraduate curriculum including one semester of course work in geology, or acceptable substitute, one year of course work in chemistry, one year of course work in physics, and an adequate background in mathematics. The student must have completed the course work required for a high school teaching certificate.

The purpose of this program is to enable the science teacher to broaden and streng then his knowledge of his teaching field and his profession rather than to specialize in a single discipline. Programs will be designed to fit the students' needs, and each program must be approved by the coordinating committee. The student, with consent of the committee, has the option of a program of 30 hours including a report of two hours or a program of 30 hours of graduate level courses. The nature of the final examination will be governed by the program chosen.

\section*{Physiological Sciences}

\section*{M. R. FEDDE; Chairman}

Professors Bartley, Farmer, Gier,* Hopkins, Koch, Underbjerg, Ward and Wakefield, Associate Professors Besch, Cardinet, Clarenburg, Fedde, Gronwall, Kiracofe, Kropf, Mitchell, J. Morrill, Oehme, Osbaldiston, Upson and Westfall; Assistant Professors Ames," Chen, Chapman, and Wilson.

Graduate work leading to the degree Doctor of Philosophy in Physiology is supervised by members of the Graduate Group in Physiology. The program is designed to provide in-depth training in the various areas of physiology to students located in many departments of the University. Departments
cooperating in the program are Animal Science and Industry, Dairy and Poultry Science, Entomology, Foods and Nutrition, Infectious Diseases, Physiological Sciences, Psychology and the Division of Biology.
Fundamental subjects required of students for entrance into the program are: inorganic chemistry including qualitative analysis; quantitative analysis; organic chemistry; general physics (two semesters); general zoology; introductory statistics; and analytical geometry and calculus (two semesters).
Core courses include: biochemistry (Biochemistry 655, 656, 665, and 666 or the equivalent); physical chemistry; gross and microscopic anatomy (Anatomy 700 and Biology 415 or the equivalent); systemic physiology (Physiology 635 and 645 or the equivalent); cellular physiology; and graduate seminar. Elective courses may be selected from graduate courses in related areas (see selected list following). The student also is encouraged to obtain experience in the teaching laboratory in one or more areas of physiology.
No foreign language is required for this degree.
Following is a selected list of elective courses:

\section*{Animal Science and Industry}

Research Techniques in Reproduction
Analytical Techniques in Animal Science and Industry
Environmental Physiology

\section*{Biochemistry}

Biochemistry of Toxic Materials
Lipids
Vitamins
Intermediary Metabolism
Nucleic Acids
Hormones
Proteins
Chemistry of Carbohydrates
Enzyme Chemistry
Enzyme Laboratory

\section*{Biology}

Advanced Cell Biology I and II
Comparative Anatomy of Vertebrates
Embryology
Human Physiology
Zoological Microtechniques
Principles of Zoophysiology
Comparative Embryology
Endocrinology
Experimental Endocrinology
Advanced Endocrinology

Dairy and Poultry Science
Milk Secretion
Avian Metabolism
Rumen Metabolism
Mammalian Reproduction
Entomology
Insect Physiology
Advanced Physiology of Insects
Insect Behavior
Infectious Diseases
Principles and Techniques of Research in Medical Investigations

Physiological Sciences
Special Anatomy
Avian Anatomy
Bovine Anatomy
Canine Anatomy
Anatomy of Laboratory Animals
Reproductive Organ Anatomy
Anatomical Techniques
Special Microscopic Anatomy
Research in Anatomy
Physiologic Constituents of Body Fluids
Pharmacology
Physiology and Pharmacology of Hormones
Histophysiology of Nutritional Deficiencies
Physiology of Reproduction
Advanced Physiology
Comparative Physiology
Environmental Toxicology
Psychology
Introduction to Physiological Psychology
Vision
Seminar in Physiological Psychology
Members of the faculty participating in this program have well-equipped laboratories and active research programs in the various areas of physiology.

\section*{Regional and Community Planning}

\author{
VERNON P. DEINES,* Chairman
}

Professors Blackburn,* Deines,* Douglas, Ealy,* Emerson, Friedmann,* Kelley,* Miles,* Montgomery, Morse, O'Fallon, Pine, Secher,* Smith and Wright; Associate Professors Edmonds, Erickson, McGraw, Rosebraugh, and Siddall;* Assistant Professors Barnes, Bollman, Day, Ernst, Flora, Funk, Kromm, and Weisenburger.

Graduate study leading to the two-year professional degree Master of Regional and Community Planning is offered on an interdepartmental basis by the Department of Regional and Community Planning and faculty from the Departments of Architecture, Civil Engineering, Commerce, Economics, Education, Family Economics,

Family and Child Development, Geography, Geology, Landscape Architecture, Political Science, and Sociology. The program is directed towards providing broad interdisciplinary training in the social sciences and the professions for directors of planning and development in cities, regions and states, schools, colleges and universities, business firms, industrial plants, and military installations; and other relevant organizational frameworks.
Students with undergraduate degrees in administration, agriculture, architecture, business, economics, engineering, geology, geography, government, home economics, landscape architecture, law, planning, political science, and sociology, who meet the requirements of the Graduate School for admission, are fully acceptable. Students with other academic backgrounds may be accepted upon approval of the interdepartmental committee and subject to such conditions as they may impose. Graduate students may also work toward a traditional one-year Master of Arts, Master of Science, or Ph.D. degree in their discipline or profession with a minor in planning.

Ad hoc committees for curriculum development, professional relations, public service, and research include faculty and students from the University.

Typical courses in the program include the following:

\section*{Agricultural Economics}

Land Economics
Land \& Resource Conservation
Seminar in Land Economics
Rural Community Development
Business Administration
Administration
Business and Society
Management Concepts

\section*{Architecture}

Environmental Seminar
Advanced Environmental Seminar
Theory of Design
Environmental Aesthetics

\section*{Civil Engineering}

Economics of Design and Construction
Planning Engineering
Urban Transportation Analysis I \& II
Air Photo Interpretation
Traffic Engineering I \& II

Computer Science
Computer Organization \& Programming
Programming Systems
Programming Languages
Construction Science
Sanitation Systems
Construction Management I \& II
Construction Estimating

\section*{Economics}

Public Finance
Location of Economic Activities
Regional Economic Analysis
Strategy of Economic Development
Introduction to Econometrics
Urban and Regional Economics
Education
The School Plant
School Business and Finance

\section*{Geography}

Urban Geography
Geography of Transportation
Resource Utilization and Economic Development

\section*{Geology}

Applied Geology
History
American Ethnic History
Black American History
American Urban History
Frontier America
The Great Plains
Home Economics
Housing Requirements of Families
Seminar on Aging
Seminar in Family Economics
Seminar in Family and Child Development
Industrial Engineering
Introduction to Operations Research I
Linear Programming

\section*{Journalism}

Formation of Public Opinion
Public Relations
Communication Theory
Landscape Architecture
Site Planning and Analysis
Community Planning
Design of Parks and Recreation Areas
Mathematics
Determinants and Matrices
Introduction to Analytical Processes
Planning
Planning and Development Codes
Planning Graphics
Planning Principles
Planning Theory
City Planning I
Urban Design I
Regional Planning I
Topics in Planning
Urban Visual Analysis
Housing and Renewal
Institutional Planning and Development
Research Methods in Planning
Planning Administration and Implementation
Internship in Planning
Seminar in Planning
Advanced Planning Theory
City Planning II
Urban Design II
Regional Planning II
Research in Planning
Political Science
The Administrative Process
Urban Politics
Administration in Developing Nations
Seminar in Public Policy and Decision Making
Seminar in Public Administration

Psychology
Group Dynamics
Social Psychology

Sociology
Methods in Social Research
Urban Sociology
Population and Human Ecology
Community Organization and Leadership Advanced Rural Sociology
Methods of Demographic Analysis
Seminar in Community Analysis
Seminar in Demographic Analysis
Racial and Cultural Minorities

Statistics
Statistical Methods I
Statistical Methods II
Introductory Probability and Statistics I
Introductory Probability and Statistics II


\title{
DIVISION OF CONTINUING EDUCATION
}

\author{
HAROLD J. ALFORD, Director \\ MICHAEL WILLIAMSON, Assistant \\ Director, Operations \\ E. NORMAN HAROLD, Assistant Director, Research and Development
}

\begin{abstract}
Professor Alford; Assistant Professors Miller, Mordy, and Williamson; Instructors Clapsaddle, Deyoe, Dieckhoff, Frye, Guard, Harold, Horton, Hummel, McCarthy, Reichow, Richardson and Swegle; Assistant Instructors Gross, Lafferty, Maes, Marr and Nickel.
\end{abstract}

The Division of Continuing Education brings to the residents of Kansas educational services on whatever level and in whatever area of interest the personal demands desire.

Through various means of modern communications and by making use of local facilities and instructional talent across the state, the Division of Continuing Education is able to respond to the requests and needs of citizens and set up and provide the best instruction available to any group in the state on most subjects.

Courses for college credit, non-credit, graduate or undergraduate credit can be arranged through the Division. Course purposes may be for pleasure, personal interest, job advancement, professional updating, job training, skill building, or community and civic services.

Most courses offered on the K-State campus may be brought to any interested group in the state. Courses and subjects unrelated to the university curriculum also may be arranged.

\section*{Telenetwork}

Through special telephone hook ups, the KState campus educational staff comes to you live with two-way remote teaching-learning programs. With connections presently to sixteen towns and cities in the state, the university professor is able to teach his course from the campus to each town at the same time. He can receive and answer questions on the system and transmit graphs and illustrations as he writes them.

Telenetwork can bring any speaker from any location to a local conference or meeting and can include many participants from several locations in a local conference or meeting.

The University Telenetwork is also available to other organizations for educational purposes.

This new method of instruction offers expandable dimensions of the services available from the Division of Continuing Education.

\section*{Conferences and Short Courses}

Staffed with personnel trained in coordinating, planning, budgeting, facilitating and serving conferences and short courses, the Division of Continuing Education offers on the K-State campus, or at any location that contributes educational effectiveness, these services to individuals and organizations.

The combination of facilities and services made available for hosting such activities is the result of a cooperative effort by the Division of Continuing Education with the KState Union for food service and meeting facilities, and nearby modern housing facilities.

Continuing educational programs are set up between a community or interested group and the Division of Continuing Education. Regular extension classes are offered to the students and classrooms are equipped with instructors and supplies.

A continuing program with Fort Riley is offered under this arrangement to provide military persons with instruction in courses in which they express an interest. The courses may vary each session, depending on the requests and needs.

The following extension courses are regularly offered by the Division in addition to other courses described under other University departments.

\section*{Extension Course Offerings}

CAC 300. Accounting Principles I. (3) Principles and structure of accounts designed to give power to analyze commercial accounts and statements; problems used as an application of principles to practice. Lecture and demonstrations.
CAC 310. Accounting Principles II. (3) Partnership and corporation accounting and problems, with special emphasis on payroll records and accounting. Lecture and demonstrations. Pr.: Accounting I (CAC 300, BA 273, or equiv.)
CAR 3. Drawing Fundamentals I. (2) The fundamentals of drawing for non-professional students. Three hours of studio and three hours by arrangement with instructor a week. Not to be taken for credit by students enrolled in curriculums in Architecture and Humanities (Art and Painting Adaptation.)
CAR 4. Drawing Fundamentals II. (2) Continuation of CAR 3.
CAR 5. Sketching Techniques. (2) Exploration and development of sketching skills and concepts intended for the non-professional student. Sketching techniques and approaches in charcoal, conte, pencil, pastel, pen and wash media. Three hours of studio and three hours by arrangement with instructor a week. Not to be taken for credit by students enrolled in Art or Architecture. Pr.: CAR 3 or equiv.
CAR 7. Painting Fundamentals I. (2) The fundamentals of painting in oil or water color intended for non-professional students. Three hours of studio and three hours by arrangement with instructor a week. Not to be taken for credit by students enrolled in curriculums in Architecture and Humanities (Art and Paint Adaptation).
CAR 8. Painting Fundamentals II. (2) Continuation of CAR 7.
CAR 9. Exploration of Painting Media. (2) Development of basic techniques in the use of various painting media for the non-professional student. Experience in the use of several media, such as oil, watercolor, acrylics, casein, tempera, etc. Three hours of studio and three hours by arrangement with instructor a week. Not to be taken for credit by students enrolled in Art or Architecture. Pr.: CAR 7 or equiv.
CAR 10. Appreciation of Art. (2) Study of principles and ideas basic to an intelligent appreciation of drawings, paintings, and sculpture, and of the aims and techniques of the artists whe created them. Two hours rec. a week. Not to be taken for credit by students enrolled in curriculums in Architecture and Humanities (Art and Painting Adaptation).
CAR 11. Clay Modeling I. (2) The fundamentals of clay modeling for non-professional students. Three hours of studio and three hours by arrangement with instructor a week. Not to be taken for credit by students enrolled in Architecture and Art and Painting.

CAR 12. Clay Modeling II. (2) Continuation of CAR 11. CAR 13. Sculpture 1. (2) The fundamentals of sculpture intended for non-professional students. Three hours of studio and three hours by arrangement with instructor a week. Not to be taken for credit by students enrolled in curriculums in Architecture and Art and Painting.
CAR 14. Sculpture II. (2) Continuation of CAR 13.

\section*{Continental Theater Company}

A new and popular service of the Division of Continuing Education is a professional acting troupe. The Continental Theater Company travels on the road offering its repertory of plays to educational groups, civic organizations, school systems, leagues, clubs or any interested sponsor.

A variety of plays are offered by the company during the season. Each is designed for presentation to a different age or type of audience so that the booking organization may request a play to suit its needs.

The Continental Theater Company functions to bring one of the fine arts to a community that may or may not have readily available to it the services of a theater group.

\section*{Kansas Rural-Urban Art Program}

KRUAP is a functional program centered around the appreciation for and the involvement in art. It offers credit and noncredit courses, sponsors regional art shows and critiques, and publishes an art newsletter and a state-wide amateur art exhibition.

\section*{Rural Police Training Program}

An opportunity for rural and small town law officers to advance their educations in or near their home communities is provided through the Telenetwork system of the Division.

Instruction by highly qualified educators supplements the law officers with information not normally available at the rural community level. Courses are offered according to interests and needs of the working police.

\section*{Civil Defense Training}

This program is responsible for the technical Civil Defense training throughout the state of Kansas. Instruction in radiological monitoring, shelter management, and emergency preparedness for business and industry and public officials are among the training courses available.


\title{
dIVISION OF COOPERATIVE EXTENSION
}

\author{
GLENN H. BECK, Vice President for Agriculture \\ ROBERT A. BOHANNON, Director \\ PAUL W. GRIFFITH, Associate Director \\ WILBER E. RINGLER, Assistant Director \\ E. J. PETERSON, Administration Assistant
}

The Division of Cooperative Extension conducts educational programs for Kansas people not enrolled as resident students of the University. The principal purpose of these programs is disseminating up-to-date, practical information developed through research and experimentation by this and other institutions and to encourage the adoption and use of such information.

\section*{Cooperative Extension Service}

The Cooperative Extension Service is so named because the federal, state, and county governments cooperate with the people of a county in planning, conducting, and financing a county-wide educational program for the people of the county.

Kansas State University represents the State in this system through the Division of Cooperative Extension. The United States

Department of Agriculture represents the federal government. The County Agricultural Extension Council and the Board of County Commissioners, all of whom are elected by the voters, represent the county.

The federal and state laws which provide this system, now organized and operating in every Kansas county, state that the purpose is to give instruction to the people in agriculture, home economics and related subjects (including 4-H Club work, marketing and agribusiness, and community resource development.)

Modern conditions continually enlarge the span of subjects related to agriculture and home economics so many subject matter departments on the campus contribute information to the Extension program and are represented in the Division of Cooperative Extension by specialists in their subject matter fields.

The number of persons participating in the Cooperative Extension program also is expanding and now includes urban and suburban people in addition to farm families with whom the original program in agriculture, home economics, and 4-H Club work was developed.

\section*{Extension Takes the University to the People}

The basic idea of the Cooperative Extension Service is to take the University to the people, and this is done by stationing members of the faculty in every county. These faculty are not commonly referred to as professors but are known as county Extension agents and include agricultural agents, home economics agents, and club agents. To literally thousands of people, these Extension agents are a constant channel for communicating with Kansas State University.

\section*{Extension Teaches in Many Ways}

The methods of instruction used by Extension workers are quite informal. Instructions on specific problems may be given by personal conference or in public meetings. Extension workers may train individuals who in turn train others, either individually or in groups.

There are thousands of these public-spirited lay leaders in Kansas who are continually receiving instructions from members of the faculty in the Division of Cooperative Extension. They become, in effect, assistant instructors without pay.

Extension agents extend information through the newspapers, farm magazines, radio and television.

\section*{Extension Stimulates Community Action}

Extension workers may assist persons to work together as a group for common goals such as organizing county-wide campaigns to control diseases, pests and weeds; conserve soil and moisture in an entire watershed, and study many different kinds of local, state and national problems. They help conduct fairs and teach good standards of production in agriculture and home economics by serving as judges at county and state fairs.

\section*{Extension Takes People to the University}

Extension agents acquaint many persons with the work of the University by organizing
and conducting groups to visit the University and its branch experiment stations and fields. Many state-wide organizations in agriculture, home economics and 4-H Club work are given assistance with their annual conferences at the University. Included in this type of educational work are the various breed, seed, and feed associations; the Kansas Home Economics Advisory Council, and the \(4-\mathrm{H}\) Round-up.

\section*{Extension Links Local People to State and National Programs}

The county Extension agents, as official representatives of the United States Department of Agriculture, are responsible for the educational program of the Department. The agents serve as the local source of information regarding programs of all other governmental agencies affecting agriculture, such as the Soil Conservation Service, Rural Electrification Administration, Farm Credit Administration, and Agricultural Stabilization and Conservation Service.

\section*{County Extension As Part of a State and National System}

While the county Extension offices constitute the principal means of contact between the people and the University, they are not isolated agencies. The county Extension offices are integrated with the state and national movements for the betterment of agriculture, home economics, and 4-H Club work by means of a highly trained staff of specialists and supervisors and administrative personnal, organized under several departments.

\section*{Extension Specialists}

Highly trained specialists are stationed at the University and in area offices throughout the State. These specialists assist the county Extension agents in solving problems for individuals that arise. They also train the county Extension agents in new developments in research.
The basic role of the Extension specialists is to interpret research developed by the state Agricultural Experiment Stations and the United States Department of Agriculture in a manner that the citizens of the State can use this complex technical information in solving their problems.

The specialists assist the county Extension agents in demonstrating the feasibility of applying new research by establishing practical demonstrations on farms, in homes and in agri-business firms.

The specialist has the responsibility of discovering problems confronting the people of the State on which further research in needed. Thus he serves as a liaison person between the technical research centers and the places where research is applied in a practical manner in the everyday operation of farms, firms and homes.

\section*{Extension Information}

KENNETH E. THOMAS, Head of Department
State Leader and Director, Division of University Information, Professor Thomas

The state leader of the Department of Extension Information is also the director of the Division of University Information. This department head coordinates and directs informational activities of the Division of Cooperative Extension with all other informational activities of Kansas State University. The Department of Extension Information is divided into two sections: Office of Extension Information and Office of Extension Radio-Television-Film.

\section*{Office of Extension Information}

\author{
E. D. WARNER, Extension Editor and Associate State Leader
}

> Professor Warner; Associate Professors Dexter, Graham, Parris and Unruh; Assistant Prof essors Cozart, Medlin, Peck and Tennant; Instructors Dierking and Peterson; Extension Assistants Bunting and Sullins; Emeritus: Associate Professor Shankland.

It is the objective of this department to acquaint the people of Kansas with the research findings of this land-grant University, its branch experiment stations and the United States Department of Agriculture, through the mass communications media. It also has the responsibility of reporting the progress being made, especially by rural people, in the adoption of recommended scientific methods of farming and home-making for an improved agricultural industry. All means of communication are utilized in the dissemination of information for the benefit of all Kansas residents.

Scientific information, as written in popular version by the departmental staff, is channeled through all practical means of communication, including newspapers, publications, circulars and posters, printed annual reports, exhibits, motion pictures, slides, radio and television.

The state's weekly and daily newspapers and various Kansas farm publications are provided periodically with news stories and pictures about research work of the Kansas Agricultural Experiment Station and program activities of the Kansas Cooperative Extension Service.

County Extension agents are provided a weekly press service and are given special training throughout the year in utilizing to the maximum a balanced information program. The department cooperates with all agents in the 105 organized County Extension Services, as well as central office staff workers, in planning and executing information programs.

Each year three million copies of timely, popular Extension Service, Experiment Station and USDA publications, and other materials are printed and distributed.

A limited library of motion pictures and slides for visual instruction is maintained for use by county agents, field workers, vocational education instructors, and personnel of cooperating agencies of government. Providing exhibits and other visual aids materials represents an important phase of work in the department.

\section*{Office of Extension Radio-Television-Film}

JACK M. BURKE, Manager, Radio Station KSAC and Associate State Leader
Associate Professors Burke and Titus; Assistant Professors Deweese, Springer, Stockard, and Webb; Instructors Brewer, Kuehn, Nagel and Wright; Assistant Instructor Frank; Extension Assistants Jones and Marrs.

Radio is divided into two phases: broadcasting programs over KSAC, an institutionowned, non-commercial, educational station; and broadcasting script and recorded services and live programs over more than 80 cooperating commercial radio stations in Kansas and close to our borders.

Station KSAC, the University radio station, is used exclusively for the dissemination of informative and cultural programs produced by this and other educational institutions.

Five hours a day are devoted to the broadcast of programs originating from within all colleges of the University and the Division of Cooperative Extension. Approximately 50 percent of the broadcast time is devoted to programs originating from within the Extension Service.

Daily scripts are mailed to cooperating commercial radio stations, and county agents are given assistance in planning local radio programs. Numerous live programs are arranged for Extension Service and other University staff members to braodcast over these stations when the personnel are in the field.
Television programs showing results of research work and demonstrations are prepared, directed, and presented on the several cooperative television stations in the state. Special television training is provided for Extension and other University staff members who participate from time to time on educational television shows.

Motion pictures for the University and offcampus groups with educational objectives are produced on a fee basis.

\section*{Agricultural Production Management, and National Resource Development}

The departments listed below and on following pages include those members of the Extension staff who conduct and supervise programs in agricultural production and management education throughout Kansas. The programs are developed in cooperation with the county Extension agents and the residents of the counties through their designated leaders.

\section*{Agricultural Economics}

\section*{Farm Management}

\footnotetext{
PAUL L. KELLEY, Head of Department
NORMAN V. WHITEHAIR, Assistant Head of Department
Professors Kelley and Whitehair; Associate Professors Schlender and Thomas; Assistant Professors Figurski, Langemeier, McReynolds, Overley, Treat and Whipps; Instructors Appleby, Collins, Delano, Dickson, Faidley, Frederick, Germann, Greene, Guy, Hackler, Herod, Kepley, McMinimy, Mullen, Olson, Parker, Pretzer, Reimer, Stielow, Trayer, and Urban. Emeritus: Professor Coolidge; Instructors Bartlett, Hagemen, McClelland and Means.
}

The Extension educational program in farm management is divided into two sections: Kansas Farm Management Association Programs and District Farm Management Programs.

In the Kansas Farm Management Association Programs, the twenty Extension economists, farm management (fieldmen) conduct an intensive educational program with 3,500 Kansas farm families via the County Agricultural Extension Councils in the six Farm Management Associations. Each fieldman conducts a person-to-person educational program in farm management with 150-160 farm units. Each farm family or farm unit is considered as an extension result and-or method demonstration. This educational program is administered via two 2-hour on-the-farm and home management counsel and advisory visits (additional visits are made to those units requesting special assistance on important or problem decisions) ; sub-total visit in November and December for tax management purposes; county summary and analysis meetings; county fall crops and livestock forward planning meetings; county special interests meetings; individual summary and analysis of the farm and household record; special field days or tours; publications and educational materials prepared for distribution via county Extension offices for the agricultural industry; and public tax management schools.

The Kansas Farm Management Association Program provides Kansas State University with a field laboratory on representative samples of many varied types of farms for obtaining data and information which is important in the conduct of viable research, training, and Extension educational programs.

This representative sample of Kansas farms provides the basic foundation for development of publications and educational materials for the entire agricultural industry in Kansas. In addition, each association farm family serves as an Extension leader in the dissemination of useful information in agriculture, home economics, and related subject matter areas.

The District Farm Management Programs: The five district Extension economists, farm management, conduct county in-depth educational programs in
cooperation with the county Extension agents and district home management specialists. The district specialists conduct in-depth workshops in farm business management with farm families, provide a nearby reference resource for agents and develop educational materials for agent use.
Special interest topics include estate planning, credit, land economics, machinery analysis, farm leases, farm records, corporation farming, farm supplies, etc. Indepth workshops are conducted in cooperation with the production specialists and county agents.
Special educational efforts include the educational needs of the agri-related businesses and persons, such as bankers, PCA managers, machinery dealers, feed and supply firms.

\section*{Extension Agronomy}
orville w. Bidwell, Acting Head of Department FRANK G. BIEBERLY, Section Leader

Professors Bidwell, Bieberly, and Jones; Associate Professors Edelblute, Harper, Hyde, Nilson, Peterson, Whitney, and Wilkins; Assistant Professors Dicken, Stiegler, and Tobin. Emeritus: Cleavinger and Lind.

The Extension Agronomy department conducts a state-wide educational program in agricultural crop production and resource conservation. The object of the program is to improve crop production efficiency, stabilize the agricultural economy through stable agricultural production, and conserve natural resources through the acceptance by the farm operators of proven production and conservation practices.

The responsibility of the agronomy specialists in this program is to interpret and disseminate the results of research conducted by the Agricultural Experiment Station and the United States Department of Agriculture, promote the adoption of proven practices, and inform the Agricultural Experiment Station of needed research. The agronomy specialists correlate their program with specialists in all other subject matter areas in order to insure the most effective overall Extension program.

The major teaching methods employed by the Extension specialists include county agent training schools, in-depth schools for
producers, dealer training, result demonstrations, public meetings and tours, Extension publications, radio, television and press.

\section*{Extension Animal Science and Industry}

DON L. GOOD, Head of Department
WENDELL A. MOYER, Section Leader
Professors Good and Moyer; Associate Professors Francis and Zoellner; Assistant Professors Ahlschwede, Clary, and Westmeyer. Emeritus: Professors Elling and McAdams.

Extension specialists in Animal Science and Industry provide leadership for state programs in beef, sheep, swine and meats. Programs are conducted in counties with producers (both adult and youth) and the allied industry in cooperation with and the support of county Extension personnel.

\section*{Extension Dairy and Poultry Science}

\author{
CHARLES L. NORTON, Head of Department
}

Professor Norton: Associate Professors Adams, Bonewitz, and Jackson; Assistant Professor Dunham.

\section*{Dairy Science}

The Extension specialists in dairy science provide educational dairy information to enable Kansas families to effectively participate in community, state, national and international affairs. Leadership and direction is provided for Extension dairy programs in Kansas counties based on changing social and economic conditions. The specialists supervise the National Dairy Herd Improvement Program in Kansas.

\section*{Poultry Science}

Extension education in poultry science is the development of practical information from research for the poultry industry. This involves working with all segments of the industry including producers, hatcheries, turkey producers, marketing organizations, feed companies and other interested organizations and groups. Extension programs are involved with developing projects that improve the opportunity for increased income to persons in the poultry industry.

\section*{Extension Entomology}

HERBERT C. KNUTSON, Head of Department
Professors Gates and Knutson; Assistant Professor Brooks.

Extension Entomology is concerned with practical insect control measures for Kansas citizens. The proper, safe use of insecticides is one of the methods used by Kansas producers to prevent insect damage. Extension entomology uses meetings, newsletters, and mass media to keep Kansas producers informed of populations of insects that may create problems. The \(4-\mathrm{H}\) entomology project is designed to teach the interrelation of insects and the environment, as well as the identification of insects.

\section*{Extension Horticulture and Forestry}

RONALD W. CAMPBELLL, Head of Department harold g. GAllaher, Assistant Head of Department

\section*{Extension Horticulture}

FRANK D. MORRISON, Section Leader
Professor Campbell; Associate Professor Morrison; Assistant Professors Marr, Nighswonger; Instructors Jones, Leuthold.

Programs in Extension Horticulture and Landscape Architecture are developed to serve persons interested in horticultural plants, including fruits, nuts, vegetables, flowers, turf, shrubs, and ornamental and shade trees. Special interests may include food products for commercial sales or personal use, the use of horticultural plants for therapeutic purposes, or for environmental improvement.

Assistance is available to suburban, urban and rural homeowners; and to commercial producers, such as florists, nurseries, greenhouse operators, fruit, vegetable and nut growers.

Programs are developed for public and private concerns, such as park departments, schools, cemeteries, municipalities, highway departments, industrial parks and golf clubs. Youth education programs also are developed relating to the understanding and use of horticultural plants.

Information developed includes selection, production, use and maintenance of the various horticultural plant materials. Assistance is available in every Kansas
county and is conducted in a variety of ways, including training schools, workshops, demonstrations, publications, slides and scripts, news releases, radio and television programs and personal contact.

\section*{State and Extension Forestry}
harold g. gallaher, State and Extension Forester
Professor Gallaher; Associate Professors Biswell, Grey and Strickler; Assistant Professors Deutsch, Gaylor, Moyer, Naughton, Pinkerton, and Rowland; Instructors Atchison, Biles, Bratton, Geisler, Gould, Loucks, and Shreve.
This section is responsible for all State and Extension Forestry programs in Kansas. The foresters provide direct technical assistance to landowners in all forestry and forestryrelated areas. Landowners receive assistance in management and marketing of their timber.
Assistance also is given in various types of conservation tree and shrub planting. A tree distribution program is operated, providing approximately one million low-cost seedlings each year for these conservation-type plantings.
A seed orchard for growing superior walnut and cottonwood planting stock is being established near Milford Reservoir.
Foresters work closely with wood-using industries in the State to improve efficiency and better utilization of the timber crop.
The section also operates a Cooperative Rural Fire Control program. Assistance is given to rural fire districts in organizing, planning, fire prevention, obtaining fire equipment, and training fire district personnel.
Through a contract with the Corps of Engineers, the section develops vegetative management plans for public use areas around Corps reservoirs. The section is also responsible for implementing these plans through tree planting, grass seeding and recreational timber stand improvement.
The forestry offices are located off the main campus. The Forestry Building, at 2610 Claflin Road in Manhattan, also houses the tree distribution, tree cold storage and shop facilities. Paneling of twelve Kansas hardwood species is on display in the building. District forestry offices are located in Chanute, Hiawatha, Hutchinson, and Hays.

\section*{Extension Plant Pathology}

JOHN F. SCHAFER, Head of Department
Professors King and Schafer; Associate Professor Willis.

The purpose of the work by Extension specialists in plant pathology is to keep the people of Kansas informed about the occurrence and nature of plant diseases and economic means for their control. This includes diseases of field crops, vegetables, fruits, trees, flowers, lawngrasses and shrubs.

The specialists, working with the county Extension agents, furnish plant disease information to rural and urban persons by news articles in local papers, radio, television, meetings, field and home visits and office and phone calls.

\section*{Extension Veterinary Medicine}

HOMER K. CALEY, Section Leader
Associate Professor Caley; Emeritus: Associate
Professor Osburn.
Extension veterinary medicine serves the livestock industry and veterinarians as a source of scientific material pertaining to the most recent information on disease prevention and control. Current research is evaluated and adapted for use in this area.

Field trials and surveys are implemented into the work program in order that our livestock interests can be provided with actual test results as they exist on Kansas farms and ranches.

\section*{Extension Wildlife Management}

\section*{Associate Professor Halazon}

The wildlife management section deals with enhancement of beneficial aspects of wildlife. Some of the projects covered include construction of farm ponds and development for multiple use; stressing recreation; habitat development for fish, game and nongame species; plans and development for commercial ventures such as shooting preserves, fish production, camping and recreation areas; special schools for the development of recreational skills and safety in hunting, fishing, camping, boating and water safety.
Emphasis is placed on the ecological impact of man's use of his environment. Training
schools are conducted for young adults and adult groups. Regular radio and television programs are produced for KSAC and the KState radio network and for KARD, KAKE, and KTVH television stations and their satellite networks.

\section*{Extension Wildlife Damage Control \\ Assistant Professor Henderson.}

The function of this section is to carry on an educational program throughout the state dealing with application of wildlife damage control methods that will minimize conflict between man and wildlife.

The work is based on attitudes that recognize that all species of wild animals are an important part of the environment in which we live, and that all species of wild animals have both negative and positive social and economic values. Encouragement is given to the use of techniques known to be of value in counteracting areas of conflict between man and wildlife. Lethal control, where and when employed, should be related to social and economic benefits and be the minimum necessary to bring damage within tolerable limits.

The specialist further encourages that animal damage control programs be thoroughly planned, justified, carried out and evaluated on the basis of total social benefits.

The work of this section is carried to every county in the state by conducting on-farm and ranch surveys immediately after loss of livestock from predators, giving control recommendations, demonstrations of equipment on an individual basis where damage has occurred.

Counsel is given on proper and up-to-date wildlife damage control procedures on animals and birds such as rats, mice, moles, gophers, coyotes, sparrows, starlings, pigeons or other non-game species. Information is disseminated by means of radio and television, and printed educational materials.

\section*{Extension Engineering}

LEO T. WENDLING, State Leader
Professors Herpich and Wendling; Associate Professors Holmes, Schindler, and Selby; Assistant Professors Jepsen and Shuyler; Instructor Horn. Emeritus: Professors Ferguson and Stover.

The function of the Department of Extension Engineering is to carry on an
educational program throughout the state dealing with application of engineering principles to various phases of agriculture. The work of this department is carried to every country in the state by means of demonstrations, institutes, training schools, publications, news releases, radio and television programs, and personal contacts.
The department conducts educational programs throughout the state in subject matter fields such as the control of soil erosion; the development, conservation and utilization of water resources; irrigation systems and water management; animal waste management and water pollution control; the location, layout and design of livestock production plants; selection, maintenance and operation of farm machinery; systems for handling, storing, conditioning, and processing grains and feeds; the selection, installation and use of the electrical power on the farm and in the home; the design and development of improved housing for all Kansas families; and minimizing the loss or hazard of natural or manmade disasters, such as floods, tornados, or nuclear attack.

The department conducts a safety program in all subject matter areas. The department also assists with the development and planning of \(4-\mathrm{H}\) club programs which relate to the engineering phases of agriculture.

Much of the work is conducted in cooperation with the county extension office in each county. The remaining work is done in cooperation with various governmental agencies, the manufacturers and distributors of supplies, equipment and machinery used on the farms, other groups or organizations which serve agriculture, electrical power suppliers, state officials, and regional and national professional groups.

\title{
Marketing and Utilization of Agricultural Products
}

\section*{Agricultural Economics}

PAUL L. KELLEY, Head of Department NORMAN V. WHITEHAIR, Assistant Head

Professors Coppersmith, Kelley, and Whitehair; Associate Professors Jackson and Walker; Assistant Professor Frederick.

The Extension Marketing program operates on the philosophy that all people in Kansas have a vested interest in the efficient distribution of food and fiber products. Thus, the educational program remains open to all ideas, interests, and approaches to marketing, and a team approach method is used to solve problems in the marketing field.

The main projects of marketing include marketing information, agri-business, and commodity marketing products. Marketing news releases, publications directed to the general public, and special information directed toward specific agricultural audiences are methods used in disseminating marketing information.

County public meetings are held where information covering price outlook, market systems, market structure, general economic trends in the nation, international trade, money and credit, bargaining power, balance of payment, and analysis of alternative farm policy proposals is presented.

Educational work is conducted with agricultural business firms handling food and fiber. Those firms are included which buy directly from the farmer, sell input products and retail products and services. Educational work is conducted in the fields of sales, cooperatives, business management, market expansion, personnel training, advertising, and public relations.

The commodity marketing educational program emphasizes livestock, grain, dairy and poultry marketing. Also included are market organization, supply-demand analysis, short-range price outlook, bargaining power, and transportation problems.

\section*{Extension Grain Science and Industry}
W. J. HOOVER, Head of Department ROBERT W. SCHOEFF, Section Leader
Professors Hoover, Schoeff, and Wilcox; Extension Assistant Balding.

Kansas State University has the only Formula Feed Extension program in the United States designed for the feed industry. This unique Extension program, established in 1962, has as its purpose to assist personnel in the formula feed and allied industries in (1) the adoption and use of the latest manufacturing techniques, safety equipment and practices; quality control procedures, marketing methods, and modern
management principles and tools, including plant feasibility; and (2) the proper use of drugs and feed additives in animals and manufacturing practices as required by state and federal laws and regulations.
The clientele served are feed manufacturers, retail feed dealers, ingredient and equipment supply firms, building contractors, commercial feedlots, and others involved in the manufacturing, custom mixing and marketing of commercial feeds.

\section*{Extension Home Economics}

NORMA J. REDEKER, Acting Head of Department
Associate Professors Anderson, Ellithorpe, Johnson and Wiggins; Assistant Professors Atkinson, Brill, Carlson, Guthrie, Howe, Wells, Miller, Patrick, Redeker, Spoon; Instructors Meyer, Slinkman and Schaaf. Emeritus: Professors Allen, Koenig, Myers, and Smurthwaite; Associate Professors Dickinson and Self; Assistant Professors Briggs and Starkey.

Educational programs designed to improve the quality of living are carried on in each Kansas County under the direction of Extension Home Economics.

Program emphases are in the areas of: Development of children and youth; adjustments in everyday living; adjustments in marital and parental roles; preparation for retirement years; changing roles of women; management in allocation of family resources; family financial security; money management; consumer performance in the market; nutrition and health; food safety and sanitation; health hazards in the home; community health hazards; home selection, building, buying, and remodeling (design, materials, finishes, lighting, etc.); housing costs and finance; community factors in housing decisions; furnishing and equipping the home; and developing community economic, social, cultural, human resources including understanding public concerns affecting families, expansion and improvement of cultural opportunities, employment and educational opportunities for women, and development of leadership abilities.

Each county tailors its home economics program according to its individual need.

Educational materials are prepared by Extension specialists and county Extension home economists. Educational programs are carried on through organized study groups,
public meetings, individual consultation, selfteaching materials and through the mass media of press, radio and television.

Extension Home Economics often works jointly with other agencies and organizations in carrying out educational programs.

\section*{4-H and Other Youth Programs}

\author{
GLENN M. BUSSET, Head of Department
}

Professors Apel and Busset; Associate Professors Borst, Eyestone, Hanna, Honstead, and Kasper; Assistant Professors Area, Bates, and Coen. Emeritus: Professors Johnson and Regnier

4-H work is the out-of-school youth educational program of the University, conducted in cooperation with County Agricultural Extension Councils and the United States Department of Agriculture. In 4-H work young people take part in agricultural, homemaking, community service, health, education, safety, recreation, and other activities. \(4-\mathrm{H}\) work is often explained by the slogan "Learning by Doing." Through projects, scientific information recommended by the University is applied to problems of home living and personal development.

Each local 4-H club elects its own officers who conduct club meetings with guidance of two or more volunteer adult leaders. Each club meets at least once monthly in a member's home or in a public building. The meetings have educational features, such as demonstrations, talks, and discussions. Adult leaders counsel with the \(4-\mathrm{H}\) members and give guidance to their club activities. Each member carries to completion at least one project of his own. Any boy or girl 8 to 19 years of age may be a \(4-\mathrm{H}\) member. The leaders and members work in cooperation with the county Extension agents.

In addition to approximately 34,000 boys and girls enrolled in 1,050 4-H Clubs, another 6,000 boys and girls have had one or more \(4-\mathrm{H}\) educational experiences as special \(4-\mathrm{H}\) members. The \(4-\mathrm{H}\) program nationally has more than 30 million alumni, and has been adopted per se or adapted into nearly 100 foreign countries.

4-H work began as the University sought to expand research developments to the farmers of Kansas. Children were organized into informal educational groups shortly after
1903. Corn, canning and poultry clubs were among the first educational groups that had affiliation with the University.

It became evident that the educational development of boys and girls was of greater importance than the spread of improved farm and home practices. So the \(4-\mathrm{H}\) program was broadened to include not only projects of a farm and home nature, but many other activities such as health, music, conservation of wildlife and natural resources, recreation, parliamentary practices and art.

The present \(4-\mathrm{H}\) program is designed to develop citizenship and leadership among rural young people and to provide opportunity for them to participate with their parents and friends in the adoption of better farm and home practices.

A later development, extending \(4-\mathrm{H}\) work around the world, is the \(4-\mathrm{H}\) International Farm Youth Exchange (IFYE). Kansas 4-H members have lived for periods of up to one year with farm families in foreign countries around the world. Youths from foreign countries have lived in Kansas host family homes. Kansas has sent and received more "IFYE's" than any other state, giving national leadership to the program for international understanding.

\section*{Development and Public Affairs Community and Resource}

\section*{Agricultural Economics}

PAUL L. KELLEY,Head of Department NORMAN V. WHITEHAIR, Assistant Head DONALD B. ERICKSON, Section Leader Professors Kelley and Whitehair; Associate Professor Erickson; Assistant Professors Baker, Flinchbaugh, Frazier, Olsen, and Vacin; Instructor Kingsley.
This section has two purposes. The first aim is to provide stimulus and educational guidance in developing and implementing county or area-wide resource development programs that will strengthen the local economy, and otherwise enhance the level of well-being of people. The second major ob-
jective is the optimum development and utilization of all local resources. The staff work with county Extension agents, local leaders, civic and governmental agencies, and lay organizations to improve agriculture, promote non-farm employment and strengthen community services.

Educational programs in public affairs and policies are conducted.

\section*{Extension Field Operations}

Professors Cox, Norby and Ross; Associate Professors Hoss, King, and Mann; Assistant Professors Appleby, Blankenhagen, Crist, Neufeld, and Schroeder. Emeritus: Professors Baird and Blecha; Associate Professors Glover and Hagans; Assistant Professor Meyer.

County Extension work is designed to take research information from the University to the people of Kansas to help them solve problems.
There are county Extension offices in each of the 105 counties. These offices are presently staffed with two or more county Extension agents. County Extension positions available in these offices include county Extension director, agricultural agent, home economist, \(4-\mathrm{H}\) agent, and horticultural agent. The professional persons holding these positions are members of the faculty of Kansas State University and hold the academic rank of instructor.
County Extension work is financed by federal, state and local tax funds. A local nine member executive board aids in directing the programs and activities of the county Extension professional staff.
In addition to the problem-solving responsibility, local Extension professionals assist local persons in organizing group action to help solve community problems.
Probably no greater opportunity exists for a professional person to express himself through working with local people. A tremendous amount of self-satisfaction is gained by the Extension professional as he views the results of his efforts as he helps people - individually and collectively - from all races and income levels - move from where they are to where they want to be.

\title{
OFFICERS OF ADMINISTRATION. INSTRUCTION \& RESEARCH
}

\section*{Includes only those with rank of instructor or above \\ (GF following name means the person is a member of the Graduate Faculty)}

\section*{Officers of Administration}

AKIN, JAMES N., Associate Director, Career Planning and Placement Center (1966). BS 1960, MS 1964, Kansas State University
ALLOWAY, JAY E., Instructor, Computing Center (1970). BS 1970, Kansas State University
AMEEL, HENRIETTA R., Assistant Professor, University Library (1960). AB 1930, Coe College, ABLS 1935, University of Michigan
ARHEART, KRISTOPHER L., Instructor, Computing Center (1970). BS 1970, Kansas State University
BAEHR, WILLIAM FREDERICK, Professor Emeritus, University Library (1943.1969) BS in LS 1927, MA 1930, University of Illinois

BAXTER, MABEL GERTRUDE, Instructor Emeritus, University Library (191647, 1957)
BEATTY, DANIEL D., Business Manager, Professor of Business Ad. ministration (1956, 1959). AB 1947, Hope College: MBA 1949, University of Michigan
BECK, GLENN H., Vice President for Agriculture (1936, 1965). BS 1936 University of Idaho: MS 1938, Kansas State University; PhD 1950, Cornell University. (GF)
BERGEN, GERALDR., Director, Aids, Awards and Veterans Service (1965, 1969) BS 1958, MS 1967, Kansas State University

BIEBER, IDAR., Instructor, University Library (1968). BA 1946, University of Kansas; MS 1963, University of Wisconsin
BLACKBURN, RICHARD D., Director, K.State Union (1963). BS 1950, Kansas Wesleyan University; MPS 1956, University of Colorado
BLOSSEY, MARJORIE J., Instructor, University Library (1970). BA 1953, West Virginia University.
BONEBRAKE, CASE A., Admınistrator of Physical Plant (1947, 1967). BS 1947, BS 1955, Kansas State University
BOOKER, JERELYN S., Instructor, Center for Student Development (1969). BA 1966, MA 1969, Howard University

BRETTELL, J. ALLAN, Foreign Student Adviser, Assistant Professor Center for student Development (1966). BA 1949, MS 1951, Westminster College
BROWN, ELVIN E., Instructor, Center for Student Development (1969). BS 1951, McPherson College, MS 1954, Ft Hays State College
BROWN, WILBUR E., Director, Student Publications, Assistant Professor (1970) BS 1949, Kansas State University.

BURTON, RUTH-ANN, Instructor, University Library (1969). BA 1964, Allegheny College; ML 1969, Kansas State Teachers College
BUTLER, NORVILLE L., Associate Professor, Student Health Center (1964). BA 1931, Nebraska Wesleyan University; MD 1940, College of Medicine, University of Nebraska
CAMP, MILDRED, Associate Professor Emeritus, University Library (1927, 1955). AB 1912, Eureka College; BLS 1924, University of Illinois.
CHALMERS, JOHN, Vice President for Academic Affairs, Professor of Economics, (1963, 1969). AB 1938, Middlebury College; PhD 1943, Cornell University (GF)
COOL, VINCENT J., Assistant Professor of Architecture; Assistant Vice President for Planning (1957, 1967). BS 1951, Kansas State University Registered Architect, 1952
COON, CAROLYN A., Residence Hall Director, Instructor \((1967,1968)\). BBA 1964, University of Iowa
DALLAM, JERALD, Assistant Director of Records, Instructor (1968). BS 1959, Northwest Missouri State College; MS 1964, Oklahoma State University
DANSKIN, DAVID G., Professor of Psychology and Education, Center for Student Development (1959, 1966, 1968). AB 1950, University of Redlands; MA 1951, PhD 1954, Ohio State University. (GF)
DE ORDIO, JOSEPH P., Instructor, Center for Student Development (1968) BA 1964, MEd 1968, University of Rochester, PhD 1971, Kansas State University.
DODGE, THEODORE O., Director, Budget Office, Assistant Professor (1946, 1957). BS 1940, Kansas State University; CPA 1954, Kansas
DOMITZ, GARY, Instructor, University Library (1967). BA 1966, ML 1967, Kansas State Teachers College
EDELMAN, SHELDON K., Office of Educational Resources, Associate Professor (1967). BA 1952, University of Illinois; MA 1956, Roosevelt University, PhD 1960, Purdue University. (GF)

EDWARDS, A. THORNTON, Director of Housing and Food Service Associate Professor of Psychology \((1945,1949)\). BS 1941, MS 1946, Kansas State University
ELKINS, RICHARDNELSON, Associate Director of Admissions, Instructor (1966, 1968) BS 1956, MS 1963, Kansas State University
FARLEY, RICHARD A., Director of Library, Professor (1966). BA 1940 Northland College; BLS 1941, University of Wisconsin; MS 1952, PhD 1967, University of Illinois. (GF)
FARRELL, FRANCIS DAVID, President Emeritus (1918, 1943). BS 1907 Utah State Agricultural College; AgrD 1925, University of Nebraska; LLD 1943. Washburn Municipal University. (GF)

FLOWERS, HENRY M., Instructor, Student Health (1966). BA 1948 Greenville College; MA 1957. Wichita Universitv
FORD, KENNEY LEE, Alumni Secretary Emeritus (1928). BS 1924, MS 1932, Kansas State University
FOSTER, DONALD E., Director of Records, Instructor (1965, 1968). BS 1960, MS 1961, Kansas State University
FRITH. THOMAS J., Residence Halls Program Director, Assistant Professor (1965). BA 1960, MA 1963, EdS 1965, University of Iowa
GALE, HENRIETTA A., instructor, Computer Science, Manager of User Services, Computing Center (1969, 1970). BS 1964, University of Missouri MS 1968. St Cloud State College.
GALLAGHER, TOM L., Director, Computing Center, Associate Professor of Computer Science (1970). BA 1953, MS 1954, North Texas State College DSC 1967, Washington University (GF)
GEISSLER, VERNON V., Assistant Director, Career Planning and Placement Center (1966) BS 1942, MS 1966, Kansas State University.
GERRITZ, ELLSWORTH M., Dean of Admissions and Records, Professor (1954, 1962). BE 1938, St Cloud State Teachers College; MS 1948, PhD 1951, University of Minnesota (GF)
GREGORY, MARGARET T., Instructor, University Library (1969). BS 1968, University of Kansas; ML 1969, Kansas State Teachers College
HAINES, RICHARD D., Director of University Publications, Assistant Professor (1967). BS 1953, Kansas State University
HAJDA, JOSEPH, Director of International Activities, Associate Professor of Political Science (1957, 1965, 1960). BPolSci 1948, Charles University. Prague (Czechoslovakia); AB 1951, MA 1952, Miami University, PhD 1955, Indiana University (GF)
HESS, H. DEAN, Executive Alumni Secretary (1961). BS 1950, Kansas State University
HEYWOOD, KENNETHM., Director, Endowment and Development (1956) BS 1938, Kansas State University; MA 1949, University of Wyoming
HONSTEAD, WILLIAM HENRY, Professor of Chemical Engineering, Director, Kansas Industrial Extension Service (1943, 1957, 1970). BS 1939, MS 1946, Kansas State University; PhD 1956, Iowa State University; Professional Engineer, 1948
HOYT, DONALD P., Director, Office of Educational Resources, Professor (1968). BS 1948, Üniversity of llinois; MA 1950. PhD 1954, University of Minnesota (GF)
HUGHES, DANA C., Instructor, Center for Student Development (1968). BS 1963, Kansas University, MS 1968, Kansas State University
JOHNSON, JOHN L., Instructor, University Library (1970). BA 1967, Kansas State University.
KASPER, EUGENE C., Director, Center for Student Development, Dean of Students, Associate Professor of Education (1968). BS 1956. MS 1956. Kansas State Teachers College; EdD 1963, University of North Dakota. (GF)
KAUPP, BEVERLY JANE, Instructor, Center for Student Development (1967). BS 1964, Fort Hays State College; MS 1967, Kansas State University.

KENNEDY, CARROLL E., Professor of Family \& Child Development, Center for Student Development (1954, 1970). AB 1949, Wheaton College; MS 1953, Kansas State University; EdD 1963, University of Maryland. (GF)
KEPPLE, MELVIN T., Director, Data Processing Center, Instructor (1967). BS 1950, Washburn University
KERR, WENDELL ROBERT, Assistant Director of Housing and Food Service, Assistant Professor of Education (1947, 1957). BS 1947, MS 1951 Kansas State University

KRUH, ROBERT F., Dean of Graduate School, Professor of Chemistry (1967). AB 1948, PhD 1951, Washington University (St. Louis). (GF)

LACY, JR., BURRITT S., Consulting Psychiatrist, Student Health Center (1964). BA 1941, Harvard University; MD 1944, Cornell University; 1951, American Board of Psychiatry and Neurology.
LAFENE, BENJAMIN WILLIAM, Director Emeritus, Student Health Center, Physician (1946, 1948, 1962). BS 1923, Michigan State University; MD 1931, Western Reserve University.
LAMBERT, JOHN P., Instructor, Radiation Safety Officer (1964). BS 1959, Lebanon Valley College; MPH 1963, University of Michigan.
LAUGHLIN, J. BRUCE, Director of Career Planning and Placement, Assistant Professor (1962, 1966). BS 1950, University of Kansas; MS 1961, Kansas State University; JD 1967, Washburn University.
LEWIS, JAMES J., Director of Admissions, Assistant Professor (1963). BS 1953, MS 1954, Kansas State University; EdD 1961, University of Kansas. LILLY, JERRY A., Administrative Assistant, Vice President for Student Alfairs, Instructor (1967). BSEd., 1964, Concord College.
LINDSAY, LORIN H., Instructor, University Library (1970). BA 1966, Kansas Wesleyan University: MSLS 1970, Wayne State University
LITCHFIELD, MEREDITH, Assistant Professor, University Library (1967, 1970). BS 1950, MS 1967, Kansas State Teachers College.

LU, JAMES Y., Instructor, University Library (1969). BA 1960, Tamkang College; MS 1965, MS 1970, Kansas State Teachers College.
MacMILLAN, WILLIAM, Instructor, Center for Student Development (1964). AB 1951, University of Michigan; BD 1961, Seabury-Western Theological Seminary.
MASON, CLAUDE T., Professor, Student Health Center, Physician (1966, 1969). BSC 1930, University of Nebraska; MD 1932, University of Nebraska College of Medicine.
MASTER, SEVAKLAL M., Instructor, University Library (1968). BA 1950, Wilson College; MLS 1965, Rutgers University
MCCAIN, JAMES ALLEN, President (1950). AB 1926, LLD 1951, Wofford College; MA 1929, Duke University; EdD 1948, Stanford University; LLD 1965, Montana State University; LLD 1965, Colorado State University; DSC 1967, Andhra Pradesh State University (India).
MCCOY, DONALDE., Associate Professor, Student Health Center (1970). BS 1937, MD 1945, University of Kansas.
MCKNIGHT, MARGARET L., Instructor, University Library (1970). BS 1942, Oklahoma State University; MSLS 1969, University of Oklahoma.
MILBOURN, MAX W., Assistant to the President, Associate Professor of Journalism (1949, 1957). AB 1938, University of 'Wichita.
MILLER, GERALD J., Consulting Radiologist, Student Health Center (1970). BS 1961, University of Minnesota; MD 1965, Marquette School of Medicine
MILLER, MICHAEL H., Assistant Professor of Mathematics (1960-65), Assistant Director, Computing Center (1964, 1966). BS 1958, MS 1960, Iowa State University
MITCHELL, SHARLENE K., Residence Hall Director, Instructor (1969). BS 1968, Kansas State University
NELSON, DE VERE V., Director of Sports Information, Assistant Professor (1966). BS 1949, Kansas State University.

NOONAN, JOHN P., ASSOCiate Dean of Graduate School (1947, 1966), Professor of English (1968). BS 1947, Rockhurst College; MS 1950, Kansas State University; PhD 1955, Denver University. (GF)
NORDIN, MARGARET N., Associate Director, Center for Student Development, Dean of Women, Associate Professor (1957). BS 1941, MA Development, Dean of Women, Associate
1953, PhD 1962, University of Minnesota.
NOVAK, MICHAEL A., Assistant Director, Aids, Awards and Veterans Service (1967, 1969). B'S 1966, MS 1969, Kansas State University.
OGG, WILLIAM D., Instructor, Center for Student Development (1964). BS 1956, MS 1964, Kansas State University
OWENS, RICHARD E., Office of Educational Resources, Associate Professor (1964, 1969). AB, BS 1949, Northwest Missouri State College; MA 1953: EdD 1964, Colorado State College. (GF)
OWSLEY, CAROL LEE, Instructor, University Library \((1942,1947)\). BS 1932, M' 1947, Kansas State University.
PAXMAN, JOHN S., Assistant Director, Health Education Section, In structor, Student Health Center(1968). B' 1967, MS 1968, Brigham Young Structor, St
University.
PEINE, CAROLINE F., Instructor, Center for Student Development (1961). AB 1947, Carleton College; MS 1951, Kansas State University.
PERRINE, LARRY G., University Publications Editor, Instructor (1970). BS 1967, Oklahoma State University.
PERRY, RALPH H., Comptroller, Assistant Professor (1946, 1953, 1962). BS 1946, Kansas State University.
PETERS, CHESTER E., Vice President for Student Affairs, Professor (1953, 1958, 1967). BS 1947, MS 1950, Kansas State University; PhD 1953, University of Wisconsin.
PETERSON, JACK TELLIN, Consulting Pathologist, Student Health Center (1965). AB, MD 1950, Kansas State University.

PHILLIPS, STEPHEN B., Assistant Director, Clinical Medicine, Associate Professor, Student Health Center (1967). AB 1942, University of Kansas; MD 1945, University of Kansas Medical School.
REYNOLDS, JAMES R., Assistant Director, K-State Union (1967, 1970). BA 1964, Southern Hlinois' University.
RICHARDS, ARNE H., Assistant Professor, University Library (1965). BA 1954, Yankton College; MSLS 1960, University of Illinois.
RIDGEWAY, EDITH M., Assistant Professor Emeritus, University Library ( 1943,1970 ). AB 1927, Kansas State Teachers College, BLS 1940, University of 111 inois, MS 1956, Kansas State University
RIGGS, JEAN M., Associate Director of Housing and Food Service, Associate Professor of Institutional Management (1960). BS 1939, MS 1956, lowa State University.
ROBERTSON, JOSEPHINE M., Instructor, University Library (1970). BS 1951, Kansas State University; ML 1970, Kansas State Teachers College.

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ROBERTS, MARY EILLEEN, Assistant Professor Emeritus, University Library (1938, 1970). BS 1930, Kansas State University; BLS 1938 University of illinois; AM 1949, University of Michigan.
ROCHAT, CARL ROBERT, Director, Office of University News, Associate Professor of Journalism (1953, 1954). BS 1940, Kansas State Úniversity; MS 1948, University of Illinois.
ROGERS, NORMA E., Instructor, University Library (1968). BS 1960, MLS 1963, East Texas State University.
ROHRER, RICHARD L., Instructor, University Library (1968). BS 1960, ML 1968, Kansas State Teachers College.
ROOF, DONALD B., Residence Hall Director, Instructor (1964). BS 1964, Kansas State University
ROSE, DONALD L., Director, Department of Intramurals and Recreation (1968). BS 1953, Kansas State University.

RUDY, MICHELLE MARGARET, Instructor, University Library (1970). BS 1964, University of Arizona; BA 1968, MLS 1970, University of Washington
SCHWAB, MERLE E., Instructor, Vice President for University Development (1970). BS 1949, Kansas State University; Registered Development (1970). BS
Professional Engineer, 1949.
SEATON, RICHARD H., Assistant Professor. University Attorney (1971). AB 1959, Harvard College; LLB 1963, Harvard Law School.
SEGO, WILBURN, Residence Hall Director, Instructor (1967). AB 1951, Western Kentucky University
SINCLAIR, ROBERT E., Director, Student Health Center, Physician (1970). BA 1948, MD 1952, Ohio State Úniversity.
SINNETT, E. R., Assistant Director, Mental Health Section, Student Health Center, Professor of Psychology (1962). AB 1948, University of Iowa; MA 1950, PhD 1953, University of Michigan.
SISTR UNK, JOAN N., Instructor, Center for Student Development (1969). BS 1951, Kansas State University: MA 1957, University of Minnesota.
SMITH, ROBERT W., Residence Hall Director, Instructor (1968). BS 1964, Kansas State University.
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SMITH, WALTER D., Associate Director, K.State Union (1957, 1966). BA 1950, Kansas Wesleyan University.
SODERHOLM, DOROTHY J., Instructor, University Library (1966). BA 1946, Kearney State Teachers College; MA 1956, Wheaton College; MS 1959, University of Illinois
SPRANG, JANET D., Assistant Alumni Secretary (1970). BS 1970, Kansas State University
STEFFEN, JOHN D., Assistant Professor of Education, Center for Student Development (1967). BA 1956, Hamline University; PhD 1968, University of Minnesota
STEHLEY, DONALDR., Associate Alumni Secretary (1961, 1966). BS 1950, Kansas State University
STRONG, MABEL B., Residence Hall Director, Instructor (1961, 1964). BS 1961, Kansas State University.
SWITZER, VERYL A., Assistant to Vice President for Student Affairs for University Human Relations, Instructor (1969). BS 1954, Kansas State University.
TADTMAN, EMERSON L., Director, Personnel Services (1964, 1969).
TARRANT, DONALD H., Office of Educational Resources, Instructor (1970). BS' 1948, Morningside College; MS 1959, lowa State University.

TAYLOR, ELLYN MARIE, Instructor, University Library (1957, 1958). BS 1938, Kansas State Teachers College.
THOMAS, KENNETH EUGENE, Director, Division of University In formation, Professor (1951, 1963). BA 1951, Southwestern College, MS 1952, Kansas State University; PhD 1961, University of Wisconsin. (GF)
TROTTER, MARILYN B., Instructor, Center for Student Development (1967). BS 1965, MS 1967,' Kansas State University.

UNGER, ELIZABETH A., Associate Director, Assistant Professor, Computing Center (1966, 1969). BS 1961, MS 1963, Michigan State University.
UPHAM, JAMES A., Associate Director, Aids, Awards and Veterans Ser vice (1967,1969). BS 1943, MS 1969, Kansas State University.
VAN DER VELDE, JOHN, Instructor, University Library (1968). BA 1967, ML 1968, Kansas State Teachers College.
WANCURA, ELDON N., Associate Professor, University Library (1962, 1970). BS 1957, Kansas State University; MA 1961, Denver University.

WEBER, ARTHUR D., Vice President Emeritus (1924, 1963). BS 1922, MS 1926, Kansas State University; PhD 1940, DSC 1950, Purdue Universify.
WHITE, NEVA L., Associate Professor, University Library (1966, 1970). AB 1944, Goshen College; AB in LS 1946, University of Michigan.
WILDE, LUCY, Instructor, University Library (1967). BA 1965, Avila College; MLS 1967, Rosary College.
WILLIAMS, EVAN W., Instructor, University Library (1964). AB 1955, Washington Universify; MLS 1956, University of Illinois
WINTER, DOROTHY M., Instructor, University Library (1970). BS 1946, Kansas State University; ML 1971, Kansas State Teachers College.
WORLEY, WILLIAM S., Instructor, Center for Student Development (1968). BA 1968, Kansas State University; MA 1971, Colgate-Rochester Divinty School.
YOUNG, PAUL M., Professor, Vice President for University Development (1970). AB 1937, Miami University; MA 1939, PhD 1941, Ohio State
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ZEIGLER, MERNA MILLER, Director of Food Service, K-State Union, Associate Professor of Institutional Management (1940, 1957). BS 1932, MS Associate Professor of Institutional M
1941, Kansas State University, (GF)

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ABLE, BILLY V., Assistant Professor of Animal Science and Industry (1970). BS 1962, Oklahoma State University; MS 1964, Mississippi State: PhD 1970, University of Kentucky.
ABMEYER, ERWIN, Assistant Professor of Horticulture and Forestry Assistant Pomologist, Northeast Kansas Experiment Field (1934, 1935). BS 1933, Kansas State University.
ADAMS, ALBERT W., Associate Professor of Dairy and Poultry Science, Associate Poultry Scientist, Agr. Exp. Sta. (1962, 1968). BS 1951, MS 1955, Kansas State University; PhD 1964, South Dakota State University. (GF)
AICHER, LOUIS CORNELIUS, Professor of Animal Science and Industry Emeritus (1921, 1957). BS 1910, Kansas State University.
ALLEE, GARY L., Assistant Professor of Animal Science and Industry (1970). BS 1966, MS 1967, University of Missouri; PhD 1970, University of lllinois. (GF)
ALLEN, DELORAN M., Associate Professor of Animal Science and In dustry; Associate Animal Scientist, Agr. Exp. Sta. (1966, 1970). BS 1961 Kansas State University; MS 1963, University of Idaho; PhD 1966, Michigan State University. (GF)
AMES, DAVIDR., Assistant Professor of Animal Science and Industry; Assistant Animal Scientist, Agr. Exp. Sta. (1969). BS 1964, MS 1966, Ohio State University; PhD 1968, Michigan State University. (GF)
ANDERSON, KLING L., Professor of Agronomy Emeritus (1936, 1967). BS 1936, University of California; MS 1938, Kansas State University; PhD 1951, Univeristy of Nebraska.
AREHART, JR., LAURENCE A., Assistant Professor; Assistant Animal Scientist, Colby Branch Agr. Exp. Sta. (1970). BS 1965, Virginia Polytechnic Institute; MS 1970, Kansas State University
ARMBRUST, DEAN VINCENT, Instructor of Agronomy; Research Soil Scientist, U.S.D.A., Agricultural Research Service (1967). BS 1961, MS Scientist, U.S.D.A., Agricultur
1962, Kansas State University.
ARNETT, DUDLY W., Associate Professor: Associate Animal Scientist Garden' City Branch Agr. Exp. Sta. (1967). BS 1959, Texas Tech College MS 1960, University of Kentucky; PhD 1963, Oklahoma State University
ATKINSON, C. HARRY. Associate Professor of Agronomy; Soil Scientist Soil Conservation Service, U.S.D.A., Agr. Exp. Sta. (1949). BS 1931, MS 1933, Pennsylvania State University.
AUBEL, CLIFF E., Protessor of Animal Science and Industry Emeritus (1915, 1961). BS 1915, Pennsylvania State University; MS 1917, Kansas State University; PhD 1931, University of Minnesota.
AXELTON, MILBURNE C., Assistant Professor of Agronomy Emeritus (1929, 1970). BS 1928, Kansas State University
BANBURY, EVANS E., Associate Professor; Superintendent in charge, Colby Branch Agr. Exp. Sta. (1946, 1955). BS 1940, Kansas State University.
BARLOW, W. MACK, Instructor of Biochemistry (1970). AB 1938, MA 1945, University of Kansas.
BARNETT, FRANCIS L., Associate Professor of Agronomy; Associate Agronomist, Agr. Exp. Sta. (1956, 1959). BS 1952, McGill University (Canada); MS 1954, PhD 1956, Pennsylvania State University. (GF)
BARTLEY, ERLE E., Professor of Dairy and Poultry Science; Dairy Nutritionist, Agr. Exp. Sta. (1949, 1958). BS 1944, Allahabad University (India): MS 1946, PhD 1949, Iowa State University. (GF)
BASSETTE, RICHARD, Associate Professor of Dairy and Poultry Science; Associate Dairy Scientist, Agr. Exp. Sta. (1958, 1964). BS 1952, MS 1955, PhD 1958, University of Maryland. (GF)
BAXTER, WILLIAM M., Assistant Professor and Assistant to the Superintendent, Fort Hays Agr. Exp. Sta. (1949, 1967). BS 1949, Kansas State University
BEASON, EDWIN J., Instructor; Assistant Agronomist, Southeast Kansas Branch Agr. Exp. Sta. (1966). BS 1965, MS 1966, Kansas State University.
BEAT, LARRY J., Instructor in Dairy and Poultry Science; Assistant in Dairy Improvement, Agr. Exp. Sta. (1970). BS 1967, Kansas State University
BIDWELL, ORVILLE W., Professor of Agronomy; Agronomist, Agr. Exp Sta. (1950, 1960). AB 1940, Oberlin College; BS 1942, PhD 1949, Ohio State University. (GF)
BIERE, ARLO WILLIAM, Assistant Professor of Agricultural Economics; Assistant Economist, Agr. Exp. Sta. (1968). BS 1963, University of Nebraska; MA 1964, PhD 1967, University of California.
BLOCKER, H. DERRICK, Associate Professor of Entomology; Associate Entomologist, Agr. Exp. Sta. (1965, 1971). BS 1954, MS 1958, Clemson University; PhD 1965, North Carolina State University. (GF)
BOLING, JOHNNY C., Assistant Professor of Entomology; Assistant En tomologist, Agr. Exp. Sta. (1970). BS 1965, Texas A and M; MS 1968, PhD 1970, Mississippi State Universitv. (GF)
BONNE, DONALD J., Instructor of Agronomy; Assistant Agronomist Irrigation Experiment Field (1969). BS 1967, MS 1969, University of Nebraska.
BOREN, FRED W., Professor and Superintendent in charge, Southeast Kansas Branch Agr. Exp. Sta. (1957, 1968). BS 1946, A and M College of Texas; MS 1950, Kansas State University; PhD 1965, Utah State Univer sity.
BRANDNER, LOWELL, Professor: Agricultural Editor (1947, 1961). AB 1937, BS 1937, Emporia State Teachers College; MS 1951, Kansas State University; PhD 1960, University of Wisconsin. (GF)
BRENT, BENNY E., Associate Professor of Animal Science and Industry; Associate Animal Scientist, Agr. Exp. Sta. (1966, 1969). BS 1959, MS 1960, Kansas State University; PhD 1966, Michigan State University. (GF)
BRETHOUR, JOHN R., Associate Professor: Associate Animal Scientist, Fort Hays Branch Agr. Exp. Sta. (1957, 1968). BS 1955, Kansas State University; MS 1956, Oklahoma State University.
BRINKMAN, GEORGEL., Assistant Professor of Agricultural Economics; Assistant Economist, Agr. Exp. Sta. (1969). BS 1964, MS 1965, Washington Assistant Economist, Agr. Exp. Sta. (1969). BS 1964, MS
State University; PhD 1969, Michigan State University.

BROWDER, LEWIS E., Assistant Protessor of Plant Pathology; Research Plant Pathologist, U.S.D.A., Agricultural Research Service (1958). AS 1952, Cameron State Agricultural College; BS 1954, MS 1956, Oklahoma State University; PhD 1965, Kansas State University. (GF)
BULLER, ORLAN H., Associate Professor of Agricultural Economics; Associate Economist, Agr. Exp. Sta. (1963, 1969). BS 1958, Kansas State University; MS 1959, PhD 1965, Michigan State University. (GF)
BURCHETT, LOWELL A., Instructor in Agronomy; Assistant Agronomist, North Central Kansas Experiment Field (1965). BS 1956, Oklahoma State University, MS 1969, Kansas State University
BURKHARD, RAYMOND KENNETH, Professor of Biochemistry; Biochemist, Agr. Exp. Sta. (1950, 1957). AB 1947, Arizona State College; PhD 1950, Northwestern University. (GF)
BURLEIGH, JAMESR., Assistant Professor of Plant Pathology; Research Plant Pathologist, U.S.D.A., Agricultural Research Service (1964). BS 1958. Fresno State College: MS 1962, PhD 1964, Washington State University. (GF)
CALL, EDWARD P., Associate Professor of Dairy and Poultry Science; Associate Dairy Scientist, Agr. Exp. Sta. (1963, 1968). BS 1951, Ohio State University; PhD 1967, Kansas State University
CAMPBELL, RONALD W., Protessor; Head, Department of Horticulture and Forestry; Horticulturist in charge, Agr. Exp. Sta. (1946, 1966). BS 1943, MS 1946, Kansas State University; PhD 1955, Michigan State University. (GF)
CARPENTER, FRANK R., Assistant Dean, College of Agriculture; Associate Professor (1961, 1969). BS 1948, MS 1951, Kansas State University; PhD 1967, University of Missouri.
CASADY, ALFRED J., Professor of Agronomy; Research Agronomist, U.S.D.A., Agricultural Research Service (1949, 1970). BS 1948, MS 1950, PhD 1962, Kansas State University. (GF)
CLAPP, ALFRED L., Professor of Agronomy Emeritus (1915, 1961). BS 1914, MS 1934, Kansas State University
CLAYDON, THOMAS J., Professor of Dairy and Poultry Science; Dairy Scientist, Agr. Exp. Sta (1946, 1965). BSA 1934, University of Saskat. chewan (Canada); MS 1936, PhD 1939, Iowa State University. (GF)
CLEGG, ROBERT E., Professor of Biochemistry; Biochemist, Agr. Exp. Sta (1948, 1954). BS 1936, Rhode Island State College; MS 1939, North Carolina State College; PhD 1948, lowa State University. (GF)
CONDRAY, JERRY L.. Assistant Professor ; Assistant Agronomist, Garden City Branch Agr. Exp. Sta. (1968). BS 1966, MS 1968, Kansas State University
COX, RUFUS F., Professor of Animal Science and Industry Emeritus, (1930, 1971). BS 1923. Oklahoma State University; MS 1925, Iowa State Univer. 1971). BS 1923, Oklahoma State Univ
sity; PhD 1941, Cornell University.

CRAIG, JAMES V., Professor of Dairy and Poultry Science; Poultry Geneticist, Agr. Exp. Sta. (1955, 1960). BS 1948, MS 1949, University of Illinois; PhD 1952, University of Wisconsin. (GF)
CROOK, RICHARD L., Instructor in Dairy and Poultry Science; Assistant in Dairy Improvement, Agr. Exp. Sta (1970). BS 1970, Kansas State University
CUNNINGHAM, BRYCE A., Assistant Professor of Biochemistry; Assistant Biochemist, Agr. Exp. Sta. (1963). BA 1955, BS 1958, PhD 1963, University of Minnesota. (GF)
CUNNINGHAM, FRANKLINE., Associate Professor of Dairy and Poultry Science; Associate Poultry Scientist, Agr. Exp. Sta. (1969). BS 1957 Kansas State University; MS 1959, PhD 1963, University of Missouri. (GF)
DAINELLO, FRANK J., Assistant Professor of Horticulture and Forestry; Sedgwick County Horticultural Field (1969). BS 1964, Southeastern Louisiana College; MS 1966, PhD 1969, Louisiana State University.
DEIBERT, EDWARD J., Instructor: Assistant Agronomist, Garden City Branch Agr. Exp. Sta. (1968). BS 1965, MS 1967, South Dakota State University
DePEW, LESTER J., Assistant Professor of Entomology; Assistant En tomologist (P.O. Garden City) (1954, 1959). BS 1949, Colorado A and M; MS 1954, University of Minnesota.
DEYOE, CHARLES W., Professor of Grain Science and Industry; Feed Technologist, Agr. Exp. Sta. (1962, 1968). BS 1955, Kansas State Úniver sity; MS 1957, PhD 1959, Texas A and M College. (GF)
DICKERSON, JERRY D., Instructor of Agronomy; Engineering Technician, U.S.D.A Agricultural Research Service (1963). BS 1957, MS 1964, Kansas State University
DICKERSON, OTTIE J., Associate Professor of Plant Pathology; Nematologist, Agr. Exp. Sta. (1961, 1966). AS 1953, Arkansas Polytechnic Nematologist, Agr. Exp. Sta. University of Arkansas; PhD 1961, University
College; BSA 1955, MS 1956, Univer College; BSA 1955, M
of Wisconsin. (GF)
DIKEMAN, MICHAEL E., Assistant Professor of Animal Science and In. dustry; Assistant Animal Scientist, Agr. Exp. Sta. (1970). BS 1966, Kansas State University; MS 1968, Michigan State University; PhD 1970, Kansas State University
DILLON, MERLIN A., Instructor: Assistant Agronomist, Tribune Branch Agr. Exp. Sta. (1971). BS 1967, Panhandle State College; MS 1970, Colorado State University
DISRUD, LOWELL A., Instructor of Agronomy; Engineering Technician U.S.D.A., Agricultural Research Service (1966). BS 1963, North Dakota State University.
DODGE, GILBERT R., Assistant Professor and Administrative Assistant, Agr. Exp. Sta. (1958). BS 1950, Kansas State University; CPA 1957, Kan. sas.
DRAKE, CALVINL., Associate Professor of Animal Science and Industry; Associate Animal Scientist, Agr. Exp. Sta. (1966). BS 1955, Kansas State Assoctate Animal Scientist, Agr. Exp. Sta. University; MS 1959, University of Arkansas; PhD 1964, Kansas State University: MS 1
University. (GF)
DUITSMAN, W. WILLIAM, Professor and Superintendent in charge, Fort Hays Branch Agr. Exp. Sta. (1941, 1970). BS 1940, Kansas State University.
EATON, BENNY J., Instructor of Agronomy; Assistant Agronomist, Agr. Exp. Sta. (1970). BS 1966, MS 1968, Oklahomá State University; PhD 1971, Kansas State University.

EDMUNDS, LEON K., Associate Professor of Plant Pathology; Research Plant Pathologist, U.S.D.A., Agricultural Research Service (1960, 1968). BS 1953, PhD 1958, University of Wisconsin

ELLIS, JR., ROSCOE, Professor of Agronomy; Agronomist, Agr. Exp. Sta. (1948, 1960). BS 1948, MS 1950, Kansas State University; PhD 1952, University of Wisconsin. (GF)
ELMER, OTTO HERMAN, Professor of Plant Pathology Emeritus (1927, 1961). BS 1911, MS 1917, Oregon State College; PhD 1924, Iowa State University.
ELZINGA, RICHARD J., Associate Professor of Entomology, Associate Entomologist, Agr. Exp. Sta. (1961, 1966). BS 1955, MS 1956, PhD 1960, University of Utah. (GF)
ERHART, ANDREW B., Professor and Superintendent in charge, Garden City Branch Agr. Exp. Sta. (1931, 1952). BS 1933, Kansas State University.
ESHBAUGH, ELBERT L., Assistant Professor of Entomology; Assistant Entomologist, Agr. Exp. Sta. (1945, 1952). BS 1936, MS 1951, Kansas State University.
EVERSMEYER, MERLE G.. Instructor of Plant Pathology; Research Technician, U.S.D.A., Agricultural Research Service (1965). BS 1965, Kansas State University
FARMER, EARL L., Professor of Dairy and Poultry Science; Dairy Scientist, Agr. Exp. Sta. (1949, 1968). BS 1948, University of Missouri; MS 1957, Kansas State University; PhD 1963, University of Wisconsin. (GF)
FARRELL, EUGENE PATRICK, Professor of Grain Science and Industry; Milling Technologist, Agr. Exp. Sta. \((1949,1967)\). BS 1935, MS 1952, Kansas State University. (GF)
FELTNER, KURT C., Professor of Agronomy; Agronomist, Agr. Exp. Sta. (1965, 1969). BS 1956, MS 1958, University of Wyoming; PhD 1963. University of Arizona. (GF)
FILINGER, GEORGE A., Professor of Horticulture and Forestry, Emeritus (1931, 1966). BS 1924, MS 1925, Kansas State University; PhD 1931, Ohio State University.
FINNEY, KARL FREDERICK, Professor of Grain Science and Industry; Chemist, U.S.D.A., Agricultural Research Service (1938, 1948). AB 1935, Kansas Weslevan University; BS 1936, MS 1937, Kansas State University. (GF)
FUNSCH, ROBERT W., Assistant Professor of Horticulture and Forestry; Assistant Forester, Agr. Exp. Sta. (1968). BS 1958, Rutgers University; MŚ 1959, Yale University.
GEHRT, AL J., Administrative Assistant, U.S.D.A., Agricultural Research Service (1958).
GEYER, WAYNE A., Assistant Professor of Horticulture and Forestry; Assistant Forester, Agr. Exp Sta. (1966). BS 1955, Iowa State University; MS 1962, Purdue University.
GOOD, DON L., Professor, Head of Department of Animal Science and Industry; Animal Scientist in charge, Agr. Exp. Sta. (1947, 1966). BS 1947, Ohio State University; MS 1950, Kansas State University; PhD 1956, University of Minnesota. (GF)
GREIG, JR.. JAMES K., Professor of Horticulture and Forestry; Olericulturist, Agr. Exp. Sta. (1952, 1969). BS 1949, MS 1950, University of Arkansas; PhD 1960, Kansas State University. (GF)
GRONAU, DON M., Instructor of Agronomy; Assistant Agronomist, Newton Experiment Field (1965). BS 1962. Kansas State IInivercitv
GRUVER, CLIFFORD N., Instructor of Agronomy; Assistant Agronomist, East Central Experiment Field (1967). BS 1962, Kansas State University.
GWIN, JR., ROY E., Assistant Professor and Superintendent in charge, Tribune Branch Agr. Exp. Sta. (1957, 1966). BS 1943, MS 1963, Kansas State Tribune Br
University
HACKEROTT, HAROLD LEROY, Professor: Agronomist, Fort Hays Branch Agr. Exp. Sta. (1954, 1970). BS 1945, MS 1946, Kansas State University.
HADLE, FRED BENTON, Assistant Professor of Horticulture and Forestry; Assistant Pomologist, Agr. Exp. Sia. (1951). BS 1951, MS 1958, Kansas State University.
HAGEN, LAWRENCE J., Instructor of Agronomy; Soil Scientist, U.S.D.A., Agricultural Research Service (1967). BS 1962, MS 1967, North Dakota State University.
HALL, CHARLES V., Professor of Horticulture and Forestry; Olericulturist, Agr. Exp. Sta. \((1953,1969)\). BS 1950, MS 1953, University of Arkansas; PhD 1960, Kansas State University. (GF)
HANSING, EARL DAHL, Professor of Plant Pathology; Plant Pathologist, Agr. Exp. Sta. (1935, 1947). BS 1933, University of Minnesota; MS 1937, Kansas State University; PhD 1941, Cornell University. (GF)
HARBERS, LENIEL H., Associate Professor of Animal Science and In. dustry: Associate Animal Scientist, Agr. Exp. Sta. (1964). BS 1957, MS 1958, Texas \(A\) and \(M\) College; PhD 1961, Oklahoma State University. (GF)
HARVEY, T. L., Professor of Entomology; Entomologist, Agr. Exp. Sta. (1954, 1970). BS 1950, MS 1951, Kansas State University: PhD 1963, Oklahoma State University (P. O. Hays). (GF)
HEDGCOTH, JR., CHARLES, Associate Professor of Biochemistry; Associate Biochemist, Agr. Exp. Sta. (1965, 1968). BS 1961, PhD 1965, University of Texas. (GF)
HELMER, LYLE G., Assistant Professor; Dairy Scientist, Southeast Kansas Branch Agr. Exp. Sta. (1969). BS 1963, MS 1965, PhD 1969, Kansas State University.
HERRON, GEORGE M., Associate Professor: Associate in Soils, Garden City Branch Agr. Exp. Sta. (1956, 1971). BS 1949, MS 1950, Oklahoma State City Branch Agr. Exp. Sta. (1956, 1971). BS 1949,
University; PhD 1968, University of Nebraska.
HESS, CARROLLV., Dean, College of Agriculture; Associate Director, Agr. Exp. Sta. (1966). BS 1947, Pennsylvania State University; MS 1948, PhD 1953, Iowa State University. (GF)
HEYNE, ELMER GEORGE, Professor of Agronomy; Agronomist, Agr. Exp. Sta. (1936, 1947). BS 1935, Univeristy of Nebraska; MS 1938, Kansas State University; PhD 1952, University of Minnesota. (GF)
HINES, ROBERT H., Associate Professor of Animal Science and Industry; Associate Animal Scientist, Agr. Exp Sta. (1966, 1969). BS 1957, Purdue
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HOBBS, JAMES A., Professor of Agronomy; Agronomist, Agr. Exp. Sta (1950, 1958). BS 1935, MS 1940, University of Manitoba (Winnipeg); PhD 1948, Purdue University. (GF)
HOOVER, JAMES D., Instructor in Animal Science and Industry; Assistant Animal Scientist, Agr. Exp. Sta. (1966). BS 1961, Kansas State University.
HOOVER, WILLIAM J., Professor; Head, Department of Grain Science and Industry, Director, Food and Feed Grains Institute (1966). BS 1950, MS 1954, PhD 1961, University of Illinois. (GF)
HOPKINS, THEODORE L., Professor of Entomology; Entomologist, Agr. Exp Sta. (1960, 1970). BS 1951, MS 1956, Oregon State University; PhD 1960, Kansas State University. (GF)
HORBER, ERNST K., Professor of Entomology; Entomologist, Agr. Exp. Sta. (1970). BS 1945, DSc 1951, Swiss Federal Institute of Technology; PhD 1954, Kansas State University. (GF)
HOSENEY, R. CARL, Associate Professor of Grain Science and Industry, Cereal Chemist, Agr. Exp. Sta. (1971). BS 1957, MS 1960, PhD 1968, Kansás Cereal Chemist, Agr. Ex
State University. (GF)
HOWE, HAROLD, Dean of Graduate School Emeritus; Professor of Aqricultural Economics Emeritus (1925, 1964). BS 1922, Kansas State University: MS 1923, University of Maryland; PhD 1937, University of Wisconsin; LLD 1950, St. Benedict's College.
HUMBURG, NEIL E., Assistant Professor of Agronomy; Assistant Agronomist, Kansas River Valley Irrigation Experiment Field (1970). BS 1955, MS 1965, Colorado State University; PhD 1970, University of Wisconsin.
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JOHNSON, JOHN A., Professor of Grain Science and Industry; Milling and Baking Research, Agr. Exp. Sta. (1940, 1955). BS 1940, North Dakota Agricultural College, MS 1942, Kansas State University; PhD 1954 University of Minnesota. (GF)
JOHNSON, LOWELL B., Associate Professor of Plant Pathology; Associate Plant Pathologist, Agr. Exp. Sta. (1968, 1971). BS 1957, University of lllinois; MS 1962, PhD 1964, Purdue University. (GF)
KADOUM, AHMED M., Assistant Professor of Entomology; Assistant Entomologist, Agr. Exp. Sta. (1966). BS 1958, Alexandria University; MS 1963, PinD 1966, University of Nebraska.
KAHRS, AMOS J., Instructor in Dairy and Poultry Science; Assistant Poultry Scientist, Agr. Exp. Sta. (1956, 1958). BS 1953, Kansas State University
KANEMASU, EDWARD T., Assistant Professor of Agronomy; Assistant Agronomist, Agr. Exp. Sta. (1969). BS 1962, MS 1964, Montana State University; PhD 1969, University of Wisconsin. (GF)
KEEN, RAY A., Professor of Horticulture and Forestry; Ornamental Horticulturist. Agr. Exp. Sta. (1947, 1956). BS 1942, Kansas State University; M'S 1947, PhD 1956, Ohio State University. (GF)
KELLEY, PAUL LEO, Professor: Head, Department of Agricultural Economics: Agricultural Economist, Agr. Exp. Sta. (1943, 1968). BS 1943 MS 1946, Kansas State University; PhD 1956, Iowa State University. (GF)
KILGORE, GARY L., Assistant Professor; Assistant Agronomist, Southeast Kansas Branch Agr. Exp. Sta. (1966, 1969). BS 1964, MS 1966, Kansas State University.
KIRACOFE, GUY H., Associate Professor of Animal Science and Industry; Associate Animal Scientist, Agr. Exp. Sta. (1966, 1969). BS 1958, MS 1960 Virginia Polytechnic College; PhD 1965, Kansas State University. (GF) KLOPFENSTEIN, WILLIAM E., Assistant Professor of Biochemistry; Assistant Biochemist, Agr. Exp. Sta. (1964). BS 1958, MS 1961, PhD 1964, Pennsylvania State Úniversity. (GF)
KNIGHT, DALE A., Associate Professor of Agricultural Economics: Associate Agricultural Economist, Agr. Exp. Sta. (1948, 1957). BS 1945, Kansas State University; MS 1946, Cornell University; AM 1948, PhD 1952, University of Chicago. (GF)
KNUTSON, HERBERT, Professor; Head, Department of Entomology, Entomologist in charge, Agr. Exp. Sta. (1953). AB 1936, Iowa Wesleyan College; MS 1937, Southern Methodist University; PhD 1941, University of Minnesota. (GF)
KOCH, BERL A., Professor of Animal Science and Industry: Animal Scientist, Agr. Exp. Sta. (1956, 1963). BS 1949, Iowa State University; MS 1951, Cornell University; PhD 1955, University of California. (GF)
KOPP, FRED A., Instructor in Dairy and Poultry Science; Assistant in Dairy Improvement, Agr. Exp. Sta. (1970). BS 1969, Kansas State University.
KOUDELE, JOSEPH WENDELL, Associate Professor of Agricultural Economics; Associate Agricultural Economist, Agr. Exp. Sta. (1947, 1958). BS 1943, University of Nebraska; MS 1947. University of Minnesota; PhD 1956, Michigan State University. (GF)
KROPF, DONALD HARRIS, Associate Professor of Animal Science and Industry: Associate Animal Scientist, Agr. Exp. Sta. (1962). BS 1952, University of Wisconsin, MS 1953, University of Florida; PhD 1956, University of Wisconsin. (GF)
KYLE, JACK H., Assistant Professor ; Assistant Horticulturist, Garden City Branch Agr. Exp. Sta. (1968). BS 1953, Kansas State University; MS 1955, University of Idaho: PhD 1959, Washington State University.
LARSON, VERNON C., Professor; Chief of Party, India (1962, 1970). BS 1947, MS 1950, PhD 1954, Michigan State University.
LAUNCHBAUGH, JR., JOHN L., Professor; Agronomist, Fort Hays Branch Agr. Exp. Sta. (1955, 1967). AB 1947, MS 1948, Fort Hays Kansas State College; PhD 1952, Texas A \& \(M\) College.
LAWLESS, JOHN R., Assistant Professor; Assistant Agronomist, Colby Branch Agr. Exp. Sta. (1960, 1965). BS 1958, University of Nebraska; MS 1960, Washington State University.
LIANG, GEORGE H. L., Associate Professor of Agronomy; Associate Agronomist, Agr. Exp. Sta. (1964, 1969). BS 1956, Taiwan Provincial

College: MS 1961, University of Wyoming; PhD 1964, University of Wisconsin. (GF)
LINEBACK, DAVIDR.. Associate Professor of Grain Science and Industry; Cereal Chemist, Agr. Exp. Sta. (1969). BS 1956, Purdue University; PhD 1962, Ohio State University. (GF)
LIVERS, RONALD W., Professor: Agronomist, Fort Hays Branch Agr. Exp. Sta. (1962, 1966). BS 1948, MS 1949, Kansas State University; PhD 1957, University of Minnesota
LONG, CHARLES E., Instructor in Horticulture and Forestry; Ornamental Horticulturist, Agr. Exp. Sta. (1965). BS 1964, MS 1965. Oklahoma State University.
LUNDQUIST, MARVIN C.. Assistant Protessor of Agronomy; Assistant Agronomist, Sandyland Experiment Fields (1951, 1965). BS 1950, MS 1952, Kansas State University
LYLES, LEON, Insiructor of Agronomy; Research Agricultural Engineer, U.S.D.A., Agricultural Research Service (1957). BS 1955. Oklahoma State University; MS 1959, Kansas State University
MACKINTOSH, DAVID L., Professor of Animal Science and Industry Emeritus (1921, 1965). BS 1920, University of Minnesota; MS 1925, Kansas State University
MacMASTERS, MAJEL M.. Professor of Grain Science and Industry Emeritus; Cereal Chemist, Agr. Exp. Sta. (1960). BS 1926, MS 1928, PhD 1934, University of Massachusetts.
MADER, ERNEST LEE, Professor of Agronomy; Agronomist, Agr. Exp. Sta. (1948, 1968). BS 1936, MS 1944, Oklahoma State University; PhD 1948, University of Nebraska. (GF)
MANUEL, MILTON LLOYD, Professor of Agricultural Economics, Agricultural Economist, Agr. Exp. Sta. (1945, 1959). BS 1941, MS 1948, Kansas State University; PhD 1952, University of Minnesota. (GF)
MARTIN, WILLARD HUNGATE, Professor of Dairy Science Emeritus (1925, 1928). BS 1918, Purdue University; MS 1922, Pennsylvania State University
MATTSON, RICHARD H.. Assistant Professor of Horticulture and Forestry; Assistant Floriculturist, Agr. Exp. Sta. (1969). BS 1964, University of Nebraska; PhD 1969, University of Minnesola. (GF)
McCOLLOUGH, RICHARD A., Insiructor, Animal Science and Industry (1970). BS 1968, MS 1970, Kansas State University.

MCCORMICK, DEWEY Z.. Assistant Professor of Animal Science and In. dustry Emeritus; International Agricultural Programs (1960, 1968). BS 1921. Kansas State University

MCCOY, JOHN HENRY, Professor of Agricultural Economics; Agricultural Economist, Agr. Exp. Sta. (1940, 1960). BS 1940, MS 1942, Kansas State University; PhD 1955, University of Wisconsin. (GF)
McKEE, R. MILES, Associate Professor of Animal Science and Indusiry; Associate Animal Scientist, Agr. Exp. Sta. (1959, 1969). BS 1951, MS 1963, Kansas State University: PhD 1967, University of Kentucky
MELCHERS, LEO EDWARD, Professor of Plant Pathology Emeritus (1913, 1956) BS 1912, MS 1913, Ohio State University

MICHAELS, CHARLES L., Assistant Professor in Dairy and Poultry Science; Ássistant in Dairy Improvement, Agr. Exp. Sta. \((1965,1970)\). BS 1959, Kansas State University
MICKELSEN, ROSS, Assistant Professor of Dairy and Poultry Science; Assistant Dairy Scientist, Agr. Exp. Sta. (1957, 1963). BS 1953, MS 1957. Utah State University; PhD 1971, University of Wisconsin. (GF)
MILES, NEIL W., Assistant Professor of Horticulture and Forestry; Assistant Pomologist, Agr. Exp. Sta. (1966). BS 1959, MS 1964, PhD 1965, University of Minnesota (GF)
MILLER, GERALD DALE, Assistanf Professor of Grain Science and In. dustry; Assistant Cereal Chemist, Agr. Exp. S!a. (1946, 1947). BS 1924, University of Nebraska; MS 1953, Kansas State University. (GF)
MILLS, ROBERT B., Associate Professor of Entomology; Associate En. tomologist, Agr Exp. Sta. (1963, 1970). BS 1949, Kansas State University; MEd 1953. University of Colorado: PhD 1963, Kansas State University. (GF)
MITCHELL, HOWARD LEE, Professor of Biochemistry, Biochemist, Agr. Exp. Sta. (1946, 1961). BS 1938, Oklahoma State University; PhD 1946, Purdue Universily. (GF)
MONTGOMERY, GEORGE, Professor of Agricultural Economics; Agricultural Economist, Agr. Exp. Sta. (1925, 1947). BS 1925, MS 1927, Agricultural Economist, Agr. Exp. Sta. (1925, 1947). BS 1925, MS
Kansas State Univeristy; PhD 1954, University of Minnesota. (GF)
MOORE, WALTER ASHTON, Assistant Professor of Agronomy; Assistant Agronomist, South Central Kansas Experiment Field (1943, 1951). BS 1944, Kansas State Universify.
MORRILL, JR., JAMES L., Associate Professor of Dairy and Poultry Science; Associate Dairy Scientist, Agr. Exp. Sta. (1962, 1969). BS 1958, Murray State College; MS 1959, University of Kentucky; PhD 1963, Iowa State University. (GF)
MUELLER, DELBERT D., Assistant Professor of Biochemistry; Assistant Biochemist, Agr. Exp. Sta. (1968). BS 1962, PhD 1966, University of Oklahoma. (GF)
MUGLER, DAVID J., Assistant Professor of Dairy and Poultry Science; Assistant Poultry Scientist, Agr. Exp. Sta. (1965). BS 1959, Kansas State University; MS 1962, University of Wisconsin; PhD 1969, Kansas State University.
MUILENBURG, GRACE E., Assistant Professor; Assistant Agricultural Editor (1969). BS 1947, University of Kansas; MA 1969, University of Missouri.Columbia
MULLEN, CLYDE WILLIAM, Assistant Dean Emeritus \((1937,1961)\). BS 1915, Oklahoma State University; MS 1917, Kansas State University.
MURPHY, LARRY S., Associate Professor of Agronomy; Associate Agronomist, Agr. Exp. Sta. (1965, 1968). BS 1959, MS 1960, PhD 1965, University of Missouri. (GF)
NAUHEIM, CHARLES W., Agricultural Economist, U.S.D.A., Agricultural Research Service, Production Economics Research Branch (1954). BS 1932, MS 1934, Kansas State University
NIBLETT, CHARLES L., Assistant Professor of Plant Pathology; Assistant Plant Pathologist, Agr. Exp. Sta. (1969). BS 1965, University of New Hampshire; PhD 1969, University of California. (GF)

NICKELL, CECIL D., Assistant Professor of Agronomy; Assistant Agronomist, Agr. Exp. Sta. (1967). BS 1963, Purdue University; MS 1965, PhD 1967, Michigan State University. (GF)
NIERNBERGER, FLOYD F., Agricultural Economist, U.S.D.A., (1970). BS 1965, MS 1966, PhD 1969, Kansas State University.
NORDIN, PHILIP, Professor of Biochemistry; Biochemist, Agr. Exp. Sta. (1954, 1969). BS 1949, MS 1950, University of Saskatchewan (Canada); PhD 1953, lowa State University. (GF)
NORMAN, DAVID W., Associate Professor of Agricultural Economics (1968, 1971). BS 1961, Wye College; MS 1963, PhD 1965. Oregon State University
NORTON, CHARLES L., Professor; Head, Department of Dairy and Poultry Science; Dairy and Poultry Scientist in Charge, Agr. Exp. Sta. (1958, 1964). BS 1940, University of Illinois; PhD 1944, Cornell University. (GF)
ODOM, RICHARD E., Associate Professor of Horticulture and Forestry; Associate Floriculturist, Agr. Exp. Sta. (1965, 1969). BS 1951, Texas A and M College: MS 1953, Colorado State University; PhD 1965, Kansas State University. (GF)
OLSON, RAYMOND V., Professor; Campus Coordinator, International Agricultural Programs (1947, 1970). A B 1939, North Dakota School of Forestry; BS 1941, North Dakota State College; MS 1942. PhD 1947. University of Wisconsin.
ORAZEM, FRANK, Professor of Agricultural Economics; Agricultural Economist, Agr. Exp. Sta. (1956, 1966). Cand. Rer. Pol., Dr. Rer. Pol., 1947, Karl Franzen University (Graz. Austria): MS 1953, Kansas State University; PhD 1956, Iowa State University. (GF)
OTTO, MERTON L., Associate Professor of Agricultural Economics Emeritus (1939, 1967). BS 1921, MS 1942, Kansas State University.
OVERLEY, CARL BENJAMIN, Associate Professor of Agronomy; Associate Agronomist, Agr. Exp. Sta. (1946, 1971). BS 1946, Kansas State Universily.
OWENSBY, CLENTON E., Assistani Professor of Agronomy; Assistant Agronomist, Agr. Exp. Sta. (1964, 1970). BS 1964, New Mexico State University; PhD 1969, Kansas State University. (GF)
PAIR, JOHN C., Instructor: Horticulture and Forestry; Sedgwick County Horticultural Field (1971). BS 1959. New Mexico State University; MS 1961. PhD 1971, Kansas State University.

PARRISH, DONALD BAKER, Professor of Biochemistry; Biochemist and Nutritionist, Agr. Exp. Sta. (1943, 1952). BS 1935, MS 1938, PhD 1949. Kansas Siate University. (GF)

PARTIDA, JR., GREGORY J., Assistant Professor of Entomology, Assistant Entomologist, Agr. Exp. Sta. (1971). BS 1965, California State Polytechnic College: MS 1969, PhD 1970, University of California.

PAULSEN, GARY M., Associate Professor of Agronomy; Associate Agronomist, Agr. Exp. Sta (1965, 1968). BS 1961, MS 1963, PhD 1965, University of Wisconsin. (GF)
PEDERSON, JOHNR., Instructor of Entomology; Assistant Entomologist, Agr. Exp. Sta. (1968). BS 1954, MS 1959, Kansas State University.
PENAS, PAUL E., Assistant Professor: Assistant Agronomist, Garden City Branch Agr. Exp. Sta. (1967). BS 1959, MS 1967, University of Nebraska.
PERRY, H. BRUCE, Assistant Professor: Animal Scientist, Southeast Kansas Branch Agr Exp. Sta. (1967, 1970). BS 1965, MS 1967, Kansas State Universily.
PFOST, HARRY B.. Professor of Grain Science and Industry; Feed Technologist. Agr. Exp. Sta. (1959). BS 1940, University of Missouri; MS 1948, Alabama Polytechnic Institute; PhD 1959, Michigan State University. (GF)
PHILLIPS, RICHARD. Professor of Agriculfural Economics; Agricultural Economist, Agr. Exp. Sta. (1970). BS 1948, MS 1949, PhD 1952, Iowa State Universily. (GF)
PHILLIPS, WILLIAM M., Associate Professor; Associate Agronomist, Weed Investigations, U.S.D.A., Agricultural Research Service, Fort Hays Branch Agr. Exp. Sta. (1952, 1966). BS 1947, MS 1949, Kansas State Universify.
PICKETT, WILLIAM F., Professor of Horticulture and Forestry Emeritus (1918, 1965). BS 1917, MS 1923, Kansas State University; PhD 1935, Michigan State University
PINE, WILFRED HAROLD, Professor of Agriculfural Economics; Agricultural Economist, Agr. Exp. Sta. (1934, 1949). BS 1934, MS 1938, Kansas State University; PhD 1948, University of Minnesota. (GF)
PITTENGER, THAD H., Professor of Agronomy: Agronomist, Agr. Exp. Sta. (1959). BS 1947, PhD 1951, University of Nebraska. (GF)
PITTS, CHARLES W., Associate Professor of Entomology; Associate En. tomologist, Agr. Exp. Sta. (1962, 1969). BS 1960, Mississippi State College; MS 1962, PhD 1965, Kansas State University. (GF)
POWERS, WILLIAM L.. Associate Professor of Agronomy; Associate Agronomist. Agr. Exp. Sta. (1966, 1970). BS 1958, Colorado State University; MS 1962, PhD 1966, lowa State University. (GF)
QUINLAN, LEON REED. Professor of Landscape Architecture Emeritus (1927, 1965). BS 1921, Colorado State University; MLA 1925, Harvard Universily.
RANEY, ROBERT J., Assistant Protessor of Agronomy; Assistant Agronomist. Irrigation Experiment Field (1953, 1965). BS 1952, MS 1954, Kansas State University.
RETTENMEYER, CARL W., Associate Professor of Entomology; Associate Entomologist, Agr. Exp. Sta. (1960, 1965). AB 1953, Swarthmore College: PhD 1962, University of Kansas. (GF)
RICHARDSON, DRAYTFORD, Professor of Animal Science and Industry; Animal Scientist, Agr. Exp. Sta (1951). BS 1938, Clemson Agricultural College; MS 1950, PhD 1951, lowa State University. (GF)
ROBERTS, HAROLD A., Assistant Professor in Dairy and Poultry Science; Assistant Dairy Scientist, Agr. Exp. Sta. (1963, 1969). BS 1959, MS 1967 Kansas State University.

ROBINSON, ROBERT J., Associate Professor of Grain Science and industry; Associate Cereal Chemist, Agr. Exp. Sta. (1957, 1970). BS 1939, Shaw University; HA 1949, Cornell University: MA 1950, New York University; PhD 1957, Kansas State University. (GF)
RULIFFSON, WILLARD S., Professor of Biochemistry; Biochemist, Agr. Exp. Sta. (1953, 1968). BS 1940, Buena Vista College; MS 1948, PhD 1953, State University of Iowa. (GF)
RUSS, OLIVER G., Associate Professor of Agronomy; Associate Agronomist, Agr. Exp. Sta. (1949, 1965). BS 1950, MS 1953, Kansas State University. (GF)
SANCHEZ, CARLOS R., Instructor of Grain Science and Industry, Agr. Exp. Sta. (1970). BS 1970, Kansas State University.
SANFORD, PAUL EVERETT, Professor of Dairy and Poultry Science; Poultry Scientist, Agr. Exp. Sta. (1949, 1960). BS 1941, Kansas State University; MS 1942, PhD 1949, Iowa State University. (GF)
SAUER, DAVID B., Assistant Professor of Plant Pathology; Research Plant Pathologist, U.S.D.A., Agricultural Research Service (1967). BA 1961, Kent State University; MS 1964, PhD 1967, University of Minnesota. (GF)
SCHAFER, JOHN F., Professor; Head, Department of Plant Pathology; Plant Pathologist in charge, Agr. Exp. Sta. (1968). BS 1942, Washington Plant Pathologist in charge, Agr. Exp. Sta. (1968). BS 1942,
State University; PhD 1950, University of Wisconsin. (GF)
SCHALLES, ROBERT R., Associate Professor of Animal Science and Industry; Associate Animal Scientist, Agr. Exp. Sta. (1966, 1970). BS 1963, Colorado State University; MS 1966, PhD 1966, Virginia Polytechnic In. stitute. (GF)
SCHRUBEN, LEONARD WILLIAM, Professor of Agricultural Economics; Agricultural Economist, Agr. Exp. Sta. (1949, 1951). BS 1939, Kansas State University; MS 1940, University of Illinois; MPA 1948, MA 1949, PhD 1949, Harvard University. (GF)
SCHWENK, FRED W., Assistant Professor of Plant Pathology; Assistant Plant Pathologist, Agr. Exp. Sta. (1969). BS 1960, MS 1964, North Dakota State University; PhD 1969, Univeristy of California
SCOVILLE, ORLIN J., Professor of Agricultural Economics (1966). BS 1931, MS 1933, Colorado State University: PhD 1949, Harvard University. (GF)
SEIB, PAUL A., Associate Professor of Grain Science and Industry, Cereal Chemist, Agr. Exp. Sta. (1970). BS 1958, PhD 1965, Purdue University.
SHELLENBERGER, JOHN A., Distinguished University Professor of Grain Science and Industry Emeritus (1944, 1970). BS 1928, University of Washington; MS 1930, Kansas State University; PhD 1934, University of Minnesota.
SJO, JOHN B., Professor of Agricultural Economics; Agricultural Economist, Agr. Exp. Sta. (1948, 1967). BS 1949, MS 1952, Kansas State University; PhD 1960, Michigan State Unlversity. (GF)
SKIDMORE, EDWARD L., Assistant Professor of Agronomy; Soil Scientist, U.S.D.A., Agricultural Research Service (1963). BS 1958, Utah State University; PhD 1963, Oklahoma State University. (GF)
SLOAN, ROBERT F., Associate Professor of Agronomy; Associate Agronomist, Cornbelt Agricultural Experiment Field (1936, 1967). BS 1938, MS 1941, Kansas State University.
SMITH, EDGAR FITZHUGH, Professor of Animal Science and Industry; Animal Scientist, Agr. Exp. Sta. (1946, 1961). BS 1941, Texas \(A\) and \(M\) College: \(M S\) 1947, Kansas State University; PhD 1956, Texas \(A\) and \(M\) College: MS 19
College. (GF)
SMITH, FLOYD W., Director, Agr. Exp. Sta. (1946, 1965). BS 1942, Kansas State University; MS 1946, PhD 1949, Michigan State University. (GF)
SMITH, ROGER CLETUS, Professor of Entomology Emeritus (1920, 1958). AB 1911, Miami University; AM 1915, Ohio State University; PhD 1917, Cornell University.
SMITH, WALTER H., Associate Professor of Animal Science and Industry; Associate Animal Scientist, Agr. Exp. Sta. (1948, 1965). BS 1943, MS 1949, Kansas State University. (GF)
SORENSEN, EDGAR LAVELL, Professor of Agronomy; Research Agronomist, U.S.D.A., Agricultural Research Service (1955, 1970). BS 1941, MS 1952,
Wisconsin. (GF)
SORENSON, LEONARD ORLO, Professor of Agricultural Economics; Agricultural Economist, Agr. Exp. Sta. (1955, 1968). BA 1951, MS 1953, Agricultural Economist, Agr. Exp. Sta. (
PhD 1963, University of Minnesota. (GF)
STEGMEIER, WILLIAM D., Associate Professor; Associate Agronomist, Fort Havs Branch Agr. Exp. Sta. (1958, 1971). BS 1956, MS 1959, Colorado State University; PhD 1971, South Dakota State University.
STINSON, T. BRUCE, Assistant Professor Emeritus, Tribune Branch Agr. Exp. Sta. (1924, 1970). BS 1924, Kansas State University.
STUTEVILLE, DONALD L.. Associate Professor of Plant Pathology; Associate Plant Pathologist', Agr. Exp. Sta. (1964, 1969). BS 1959, MS 1961, Kansas State University; PhD 1964, University of Wisconsin. (GF)
SWALLOW, CLARENCE W., Assistant Professor of Agronomy; Assistant Agronomist, Agr. Exp. Sta. (1954, 1964). BS 1951, MS 1955, Kansas State University.
TEARE, IWAN D., Associate Professor of Agronomy; Associate Agronomist, Agr. Exp. Sta. (1969). BS 1953, University of Idaho; MS 1959, Washington State University; PhD 1963, Purdue University. (GF)
THIEN, STEPHEN J., Assistant Professor of Agronomy; Assistant Agronomist, Agr. Exp. Sta. (1970). BS 1966, lowa State University; MS 1968, PhD 1971, Purdue University.
THOMPSON, CARLYLE A., Assistant Professor; Assistant Agronomist, Fort Hays Branch Agr. Exp. Sta. (1964). BS 1958, MS 1959, Kansas State Fort Hays
THOMPSON, HUGH E., Associate Professor of Entomology; Associate Entomologist, Agr. Exp. Sta. (1956, 1963). BS 1941, University of Rhode Island; PhD 1953, Cornell University. (GF)
THROCKMORTON, RAY IAMS, Dean and Director Emeritus, Agriculture (1911, 1952). BS 1911, Pennsylvania State University; MS 1922, Kansas State University. (GF)
TSEN, CHO C., Professor of Grain Science and Industry; Cereal Chemist, Agr. Exp. Sta. (1969). BS 1944, MS 1946, National Chekiang University; Agr. Exp. Sta. (1969). BS 1944, MS 1946,
PhD 1956, University of California. (GF)

TUMA, HAROLD J., Associate Professor of Animal Science and Industry, Associate Animal Scientist, Agr. Exp. Sta. (1965). BS 1955, MS 1958, Kansas State University; PhD 1961, Oklahoma State University. (GF)
VANDERLIP, RICHARD L., Associate Professor of Agronomy, Associate Agronomist, Agr. Exp. Sta. (1964, 1969). BS 1960, Kansas State University; MS 1962, PhD 1965, Iowa State University. (GF)
VESECKY, JOHN E., Instructor of Agronomy (1969). BS 1967, Kansas State University: MS 1968, Oregon State University.
WALTER. TED L.. Assistant Professor of Agronomy; Assistant Agronomist, Agr. Exp. Sta. (1951). BS 1949, University of Nebraska; MS 1951, Colorado State University.
WARD, ARLIN B., Professor of Grain Science and Industry; Milling Technologist; Agr. Exp. Sta. (1961, 1967). BS 1942, MS 1951, Kan'sas State Technologist; Agr
University. (GF)
WARD, GEORGE M., Professor of Dairy and Poultry Science; Dairy Scientist, Agr. Exp. Sta. (1955, 1966). BS 1941, University of Vermont; MS 1947, Rutgers University; PhD 1950, Michigan State University. (GF)
WARRINGTON, GORDON E., Assistant Professor ; Assistant Agronomist, Colby Branch Agr. Exp. Sta. (1970). BS 1963, MS 1967, Montana State University; PhD 1970, Utah State University.
WASSOM, CLYDE E., Associate Professor of Agronomy; Associate Agronomist, Agr. Exp. Sta. (1954, 1962). BS 1949, MS 1951, PhD 1953, lowa State University. (GF)
WATSON, CLIFFORD A., Professor of Grain Science and Industry; Investigations Leader, U.S.D.A. (1968). BS 1956, Montana State University; MS 1958, PhD 1963, Kansas State University. (GF)
WHEAT, JOHN D., Professor of Animal Science and Industry; Animal Scientist, Agr. Exp. Sta. (1954, 1969). BS 1942, MS 1951, Texas A and M College; PhD 1954, lowa State University. (GF)
WHITNAH, CARRELL HENRY, Professor of Biochemistry Emeritus (1929, 1962). BA 1913, University of Nebraska; MS 1917, Uṇiversity of Chicago: 1962). BA 1913, University of Nebras
PhD 1925, University of Nebraska.

WILBUR, DONALD A., Professor of Entomology Emeritus (1928, 1970). BS 1925, Oregon State College; AM 1928, Ohio State University. (GF)
WILDE, GERALD E., Assistant Professor of Entomology; Assistant Entomologist, Agr. Exp. Sta. (1966). BS 1962, Texas Technological College; PhD 1966, Cornell University. (GF)
WILKINS, HOWARD D., Associate Professor of Agronomy; Secretary, Kansas Crop Improvement Association (1954, 1968). BS 1953, MS 1954, Kansas State University.
WILLIS, WILLIAM WAYNE, Assistant Professor of Horticulture and Forestry Emeritus (1944, 1961). AB 1912, College of Emporia.
WINZER, JACK W., Assistant Professor of Horticulture and Forestry; Southeast Kansas Experiment Field \((1963,1966)\). BS 1957, MS 1959, Texas \(A\) and \(M\) College.
WITHEE, LAURESTON VAN, Associate Professor of Agronomy ; Associate Agronomist, Agr. Exp. Sta. (1953, 1965). BS 1947, Kansas State University; MS 1952, University of Nebraska; PhD 1963, Kansas State University. (GF)
WITT, MERLE D., Assistant Professor: Assistant Agronomist, Garden City Branch Agr. Exp. Sta. (1969). BS 1967, Fort Hays State College; MS 1969, Branch Agr. Exp. Sta.
Kansas State University.
WOODRUFF, NEIL PARKER, Professor of Agronomy; Research In vestigations Leader, U.S.D.A., Agricultural Research Service'(1949, 1970). BS 1949, MS 1953, Kansas State University.
ZAHNLEY, JAMES WALTER, Professor of Agronomy Emeritus (1915, 1954). BS 1909, BS in Agric 1918, MS 1926, Kansas State University.

\section*{College of Architecture and Design}

BELL, KEITH L.: Assistant Professor (temporary) (1970). BS 1959. Professional Engineer - Kansas; Registered Land Surveyor - Kansas.
BISSEY, CHARLES R., Associate Professor of Construction Science. BS 1957, Colorado State University; MS (Architecture) 1961, Kansas State University. (GF)
BLACKMAN, MERRILL EMMETT, Associate Professor of Construction Science (1965). BS 1949, Kansas State University. Registered Architect, 1955. Professional Engineer, 1949.

BURTON, CHARLES L., Instructor of Construction Science (1970). BS 1963, Kansas State University. Registered Professional Engineer.
BUTKE, WALTER J., Assistant Professor of Architecture (1966, 1970). BArch 1963, Columbiá University; MArch 1970, Kansas State University.
CHADWICK, THEODORE AVERY, Professor of Architecture (1927, 1947). BS 1927, North Dakota Agricultural College; MArch 1954, Massachusetts Institute of Technology. Registered Architect in New York, 1936; in Institute of Techno
Kansas, 1953. (GF)
CHANG, AMOS I. T., Associate Professor of Architecture (1966). BS Civil Engg 1939, National Chung King University; MFA in Arch 1949, PhD in Arch 1951, Princeton University. Registered Architect. (GF)
CHRISTENSEN, KEITH H., Associate Professor of Architecture (1966). BArch 1950, University of Nebraska; MArch 1957, University of Michigan. Registered Architect, 1960. (GF)
DAY, DENNIS J., Assistant Professor of Landscape Architecture (1966). BS 1964, Michigan State University; MLA 1966, University of Michigan. 1964, Michigan State University; MLA
Registered Landscape Architect. (GF)
DEINES, VERNON PHILIP, Professor of Planning (1957, 1966, 1970) ; Head, Department of Regional and Community Planning (1969); Director of the Center for Community Planning (1969); 1952, MRP 1961, Kansas State University, PhD 1971, University of Pittsburgh, Registered Professional Engineer, 1952. (GF)'
DURGAN, JACK CLYDE, Professor of Interior Architecture (1954, 1962, 1967): Head, Department of Interior Architecture (1969). BArch 1951, Oklahoma State University; MS 1958, Kansas State University. Registered Archltect in Texas, 1951; in Kansas, 1954. (GF)

EALY, ROBERT P., Professor of Landscape Architecture; Associate Dean of College of Architecture and Design (1967): Head, Department of Landscape Architecture (1969); Director of the Curriculum in Landscape Architecture (1961). BS 1941, Oklahoma State University; MS 1946, Kansas State University; PhD 1955, Louisiana State University. Registered Landscape Architect. (GF)
EDMONDS, LELAND R., Associate Professor of Planning (1967, 1969), BA 1949, University of Kansas; MA 1952, University of Kansas. (GF)
ERNST, F. GENE, Assistant Professor and Head, Department of ArChitecture (1971). BArch 1953, Kansas State University, MArch (Urban Design) 1971, University of Washington; Registered Architect in Kansas, 1953; in Louisiana, 1957.
FISCHER, EMIL C., Professor: Architect (1955, 1963). AB 1930, Columbia College; BS 1932, MS 1933, Columbia University. Registered Architect in New Jersey, 1935; In Ohio, 1946; in Kansas, 1955. (GF)
FOERSTER, BERND, Professor, Dean, College of Architecture and Design (1971). BS in Arch 1954, University of Cincinnati; MArch 1957, Rensselaer Polytechnic Institute.
HALL, CHARLES L., Associate Professor of Architecture (1964, 1968). BArch 1953, Pennsylvania State University; MArch 1967, Kansas University Registered Architect in Kansas, 1953; in Minnesota, 1961; in North Dakota, 1962; in South Dakota, 1962. NCARB, 1961. (GF)
HEINTZELMAN, JOHN CRANSTON, Professor of Architecture (1947, 1954): Associate, Institute of Environmental Research. BArch 1938, Massachusetts Institute of Technology; MArch 1941, Columbia University Registered Architect, 1953. (GF)
HELM, JR., JOHN FREDERICK, Professor of Architecture Emeritus (1924, 1938). BD 1924, Syracuse Úniversity; DFA 1951. Bethany College (GF)
JAHNKE, WILLIAM R., Associate Professor of Architecture (1968). Assistant Dean, College of Architecture and Design (1970). BS 1948, Duke University. Registered Professional Engineer in Missouri, Pennsylvania, Ohio, Nevada, Puerto Rico. West Virginia, 1951. (GF)
KEITHLEY, CLAUDE A., Instructor in Planning (1970). BArch 1965, MRCP 1971, Kansas State University.
KRIDER, ALDEN, Professor of Architecture (1949, 1962). BS 1933, MS 1955, Kansas State University. Registered Architect in Missouri, 1945; in Kansas, 1949. (GF)
LIPPENBERGER, RAY E., Assistant Professor of Architecture (1964). BS 1936, Kansas State University. Registered Architect in Kansas, 1949; in Nebraska, 1955
MCGRAW, EUGENE THOMAS, Associate Professor of Planning (1958, 1964, 1968). BArch 1957, Oklahoma State University; MRP 1963, Kansas State University. (GF)
MILES, FREDERICK D., Professor of Architecture (1967); BS 1936, University of lllinois. Registered Architect in lllinois, 1952; in Arizona, 1965. (GF)

MURPHY, STEPHEN M., Instructor in Interior Architecture (1968). BS 1968, Kansas State University.
OBLINGER, WARREN J., Associate Professor of Landscape Architecture (1969, 1970). BSLA 1950, Iowa State University. Registered Landscape Architect. (GF)
PAGE, ROBERT L.. Assistant Professor of Landscape Architecture (1971). BSLA 1963, Kansas State University; MLA 1965, Harvard University Registered Landscape Architect.
PARKS, CHARLES ELWOOD, Professor of Landscape Architecture (1949 1965). Extension Specialist in Landscape Architecture (1949, 1950). BS 1949, University of Illinois; MS 1957, Kansas State University. Registered Landscape Architect. (GF)
QUINLAN, LEON REED, Professor of Landscape Architecture Emeritus; Ornamental Horticulturist and Landscape Architect, Agr. Exp. Sta. (1927,
1931, 1964). BS 1921, Colorado State University; MLA 1925, Harvard 1931, 1964). BS 1921, Colorado State University;
University. Registered Landscape Architect. (GF)
REID, RON ALD L.., Assistant Professor in Architecture (1969). BArch 1962, Kansas State University; March 1968, University of California Registered Architect, 1965. (GF)
SANNER, ALBERT E., Associate Professor of Architecture (1963). BSArch 1947, BSArch Engg 1948, University of Illinois; M Arch 1966, University of Nebraska. Registered Architect in lllinois, 1950; in Indiana, 1959. (GF)
SELFRIDGE, O. JOHN, Assistant Professor in Architecture (1969). BArch 1959, Kansás University; MCP 1964, Yale University.
SHEPARD, JIM B.. Assistant Professor (1967). BA 1959, Kansas State University. Registered Architect in Kansas, Missouri and Nebraska.
SLACK, EARL REX, Associate Professor of Architecture (1965, 1969). B Arch 1952, University Of Oklahoma. Registered Architect in Oklahoma, 1957.

THORSON, INGOLF EUGENE, Professor of Architectural Engineering (1948, 1951, 1966). Head, Department of Construction Science (1969). BS 1940, University of Washington, Professional Engineer in Washington, 1947; in Kansas. (GF)
WEIGEL, PAUL, Professor of Architecture Emeritus (1921, 1924, 1959). B Arch 1912, Cornell University. Registered Architect in New York, 1917; in Kansas, 1950. (GF)
WEISENBURGER, RAY B., Associate Professor of Planning (1964, 1970). BArch 1959, University of Illinois; MCP 1971, Cornell University. Registered Árchitect, 1962.
WENDT, EUGENE G.. Assistant Professor of Architecture (1962, 1969). B Arch 1959, Kansas State University

\section*{College of Arts and Sciences}

ABERLE, NELLIE, Professor of English Emerita (1921, 1959). BS 1912, MS 1914, Kansas State University. (GF)
ABRAHAM, JUDY, Instructor of Art (1970). A of A 1961, Cottey College; BFA 1964, Kansas City Art Institute; MFA 1967, University of Nebraska.

ADAMS, MARJORIE, Assistant Dean; Associate Professor of English (1954 1961). BA 1941, Louisiana Polytechnic; MA 1948, PhD 1951, University of Texas (GF)
ALEXANDER, LOREN R., Assistant Professor of Modern Languages (1965). BM 1951, Southwestern College; MA 1954, Colorado State College of Education; MA 1965, Michigan State University
ALSOP, INEZ, Associate Professor of History Emerita (1923, 1960). BS 1916 Kansas State Teachers College (Emporia); MS 1920, University of Kan. sas. (GF)
ALTHOFF, PHILLIP STANLEY, Assistant Professor of Political Science (1970). BA 1963, Illinois State University; MA 1966, The University of lowa; PhD 1970 (in preparation)
AMEEL, DONALD JULES, Professor of Biology (1937, 1945). AB 1928, Wayne University; MA 1930, DSC 1933, University of Michigan. (GF)
AMOS, EDGAR MCCALL, ASsociate Professor of Technical Journalism Emeritus (1921, 1950). BS 1902, Kansas State University.
ANDERSON, JR., CHARLES C., Professor and Head of Department of Aerospace Studies (1968), AB 1951, MA 1953, Sacramento State College; 1954, Air Command and Staff School
ANDERSON, LORAN C., Associate Professor of Biology; Plant Anatomist, Agr Exp. Sta (1963, 1970). BS 1958, MS 1959, Utah State University; PhD 1962, Claremont Graduate School. (GF)
ANDREWS, ARTHUR CLINTON, Professor of Chemistry Emeritus (1926, 1970). BS 1924, University of Wisconsin; MS 1929, Kansas State University; PhD 1938, University of Wisconsin. (GF)
ANSDELL, ORA JOYE, Associate Professor of English (1946, 1957). BS 1932, Kansas State University; MA 1939, University of Michigan; BLS 1946, University of Chicago, PhD 1956, University of Colorado. (GF)
APPLEGATE,ROBERTAG., Assistant Professor of Journalism (1964). AB 1940, Michigan State University; MS 1942, Northwestern University.
ARNOLD, LINDBERG, Instructor in Military Science (1969). BA 1956, Tougaloo College.
ASENETA, LYDIA, instructor in Speech (1967). BS 1949, MA 1958, The National Teachers' College of the Philippines; MA 1968, Kansas State University.
AVERY, MADALYN, Associate Professor of Physics Emerita (1924, 1946). BS 1924, MS 1932, Kansas State University.
BABCOCK, RODNEY WHITTEMORE, Professor of Mathematics Emeritus; Dean Emeritus (1930, 1960). AB 1912, University of Missouri; MA 1915, PhD 1924, University of Wisconsin. (GF)
BAGLEY, EDGAR SIDNEY, Professor; Assistant Head of Economics, Teaching and Graduate Studies; Economist, Agr. Exp. Sta. (1940, 1950). BA 1935, MA 1936, University of California at Los Angeles; PhD 1950, State University of lowa. (GF)
BARFOOT, DOROTHY, Professor of Art Emerita (1930, 1962). BA, State University of lowa, MA 1928, Columbia University. (GF)
BARK, LAURENCE DEAN, Professor of Climatology: Associate Meteorologist, Agr. Exp. Sta (1956, 1967). BS 1948, MS 1950, University of Chicago; PhD 1954, Rutgers University. (GF)
BARKLEY, THEODORE M., Associate Professor and Associate Director, Division of Biology; Curator of the Herbarium; Taxonomist, Agr. Exp.
Sta (1961, 1967). BS 1955, Kansas State University; MS 1957, Oregon State Sta (1961, 1967). BS 1955, Kansas State University; M
BARNES, VERNON L., Instructor of Speech (1969). BA 1957, Ottawa University: MA 1964, Kansas State University.
BARRETT, ERNIE D., Athletic Director (1969). BS 1951, MS 1956, Kansas State University.
BARTON, BEVERLY S., Insiructor of Music (1969). BM 1966, Indiana University: Master of Music in Piano, 1968.
BASS, LOUIS R., Assistant Professor of Military Science (1969). BS 1961, Kansas State University; 1969, Infantry Officers Career Course.
BAYSDEN, MARTHA ROSS, Insiructor in Modern Languages (1968). BS 1964, MA 1966, Appalachian State University
BECK, HENRY VOORHEES, Professor of Geology (1946, 1961). BS 1946, MS 1949, Kansas State University: PhD 1951, University of Kansas. (GF)
BEESON, MARGARET E., Associate Professor of Modern Languages (1960, 1968). AB 1948, Wesleyan College; MA 1949, Emory University; PhD 1954, University of Texas. (GF)
BHALLA, CHANDER P., Associate Professor of Physics (1966). BS 1952, BSC 1954, MS 1955, Puniab University; PhD 1960, University of Tennessee. (GF)
BODE, VERNON C., Professor of Biology; (1970). BS 1955, University of Missouri; PhD 1961, University of Illinois.
BOLAN, JOHN ELDON, Instructor in Physical Education (1967). BA 1952, Ottawa University.
BONTRAGER, ROBERT D., Associate Professor of Journalism (1970). BA 1945, Taylor University; STB 1948, New York Theological Seminary; BS 1950, Taylor University: MA 1950, Syracuse University; PhD 1969, Syracuse University. (GF)
BOUR SAW, JON E., Assistant Professor of Aerospace Studies (1968). BBA 1961, Washburn University
BRADLEY, DOROTHY GOUGH, Instructor in Economics (1947). BS 1932, Northwestern University; MS 1950, Kansas State University.
BRADY, DAVID WILLIAM, Assistant Professor of Political Science (1969). BSE 1963, Western Illinois University; MA 1967, University of Iowa.
BRANCH, JESSE O., Assistant Football Coach (1967). BSE 1963, University of Arkansas
BRANN, SYLVIA J., Assistant Professor of Modern Languages (1968). BS 1959, Kansas State Teachers College at Pittsburg; MA 1963, PhD 1969, University of Illinois.
BRASHER, BOB, Instructor in Athletics and Head Baseball Coach (1965). BS 1950, Bradley University; MS 1963, University of Colorado.
BREWER, RICHARD KEMP, Assistant Professor of Computer Science (1970). BS 1959, University of Wisconsin; MS 1964, University of Wisconsin

BRONDELL, WILLIAM JOHN, Assistant Professor of English (1964). AB 1959, MA 1964, PhD 1964, University of Missouri. (GF)

BROOKINS, DOUGLAS G., Associate Professor of Geology (1962, 1966). AA 1956, Santa Rosa Junior College; AB 1958, University of California; PhD 1963. Massachusetts Institute of Technology. (GF)

BROWN, MERLE, Assistant Professor of Physics (1964) (State Climatologist). BS 1942, Kansas State College at Pittsburg.
BROWN, SAM C.. Professor in Psychology (1963. 1967). BBA 1957, City College of New York; MA 1961, PhD 1963, University of Virginia. (GF)
BROWN, WILBUR E., Assistant Professor of Journalism (1970). BS 1949, Kansas State University.
BUCK, CLAYTON A., Associate Professor of Biology; Virologist, Agr. Exp. Sta (1970) BS 1959, Kansas State University; PhD 1964, Montana State University
BUNTON, NORMA D., Professor: Head, Department of Speech (1954, 1960). BS 1939, Southwest Texas State College; MEd 1947, University of Texas; PhD 1954, State University of lowa. (GF)
BURKE, WILLIAM L., Associate Professor of Speech (1964). BS 1959, MA 1960, PhD 1965, Northwestern University. (GF)
BUSSING, CHARLES EARL, Assistant Professor of Geography (1954, 1966). AB 1959, Colorado State College; MA 1961, University of Colorado; PhD 1968, University of Nebraska.
BYRNE, PHILIP, Instructor in Military Science (1970). BS 1969, University of Omaha
CAINE, HOMER D., Assistant Professor of Music and Education (1966). BM 1940, Drake University; MS 1957, Kansas State University. (GF)
CARDWELL, ALVIN BOYD, Professor of Physics (1936, 1955). Physicist in Charge, Agr. Exp. Sta.; Physicist in Charge, Eng. Exp. Sta., BS 1925, DSc 1961, University of Chattanooga; MS 1927, PhD 1930, University of Wisconsin (GF)
CAREY, JAMES CHARLES, Professor of History (1948, 1954). BA 1937, Nebraska State Teachers College (Wayne); MA 1940, PhD 1948, University of Colorado. (GF)
CARLSON, NANCY B., Assistant Professor of Speech (1968). BA 1953, MS 1950, West Michigan University
CENTER, MELVIN S., Assistant Professor of Biology (1970). BS 1962, University of Georgia; MS 1964, PhD 1967, Medical College of Georgia
CHAPIN, ERNEST KNIGHT, Associate Professor of Physics Emeritus (1923, 1968). AB 1918, MS 1923, University of Michigan. (GF)
CHAUDHURI, SAMBHUDAS, Assistant Professor of Geology (1966). BS 1956, Calcutta University, India; MS 1958, Jadavpur University, India; MS 1961, University of Indiana; PhD 1966, Ohio State University. (GF)
CHAWLA, LAL M., Professor of Mathematics; (1970). BA 1937, MS 1939, Panjab University, Lahore; PhD 1955, Oxford University. (GF)
CHELIKOWSKY, JOSEPH RUDOLPH, Professor of Geology (1937, 1955). BA 1931, MA 1932, PhD 1935, Cornell University. (GF)
CLARK, WILLIAM KLINE, Instructor in Geology (1949, 1956). BS 1947, University of Notre Dame; MS 1950, Kansas State University.
CLEARY, ELIZABETH, Assistant Professor of Speech (1961, 1968). BS 1934, Boston University; MS 1961, Kansas State University.
CLELAND, MARJORIE V., Instructor; Assistant to the Dean (1970). BA 1968, Kansas State University; MS 1970, Kansas State University
CLIMENHAGA, JOEL, Associate Professor of Speech (1968). BA 1953, MA 1958. University of California at Los Angeles. (GF)

CLORE, ROBERT ALVIN, Instructor of Art (1970). AA 1966, Casper College; BA 1968, University of Nor thern Colorado; MA 1970, University of Northern Colorado.
COATES, WILLIAM A., Associate Professor of Modern Languages (1966). BA 1937, Harvard College; MA 1939, PhD 1950, Harvard University. (GF)
COCKE, CHARLES L., Assistant Protessor of Physics (1969). AB 1962. Haveford College; Ph'D 1967. California Institute of Technology. (GF)
COHEN, PETER Z., Instructor in English (1961). BS 1953, MA 1961, University of Wyoming.
CONOVER, DARLINE, Instructor in English (1963). BS 1927, Kansas State University
CONOVER, WILLIAM JAY, Associate Professor of Statistics; Statistical Consultant, Agr. Exp. Sta. (1964, 1967). BS 1958, Lowa State University; MA 1962, PhD 1964, The Catholic University of America. (GF)
CONRAD, ABIGAIL H., Instructor of Biology (1970). BA 1963, Wheaton College; MS 1965, PhD 1969, Yale University
CONRAD, GARY W., Assistant Professor of Biology (1970). BS 1963, Union College: MS 1965, PhD 1968, Yale University.
CONROW, KENNETH, Associate Professor of Chemistry (1961, 1964). BA 1954, Swarthmore College; MA 1955, PhD 1962, University of Illinois. (GF) CONROW, MARGARET E., Assistant Professor of English (1964, 1969). BA, Swarthmore College; MA 1955, PhD 1962, University of Illinois.
CONSIGLI, RICHARD ALBERT, Professor of Biology (1963, 1969). BS 1954, Brooklyn College; MA 1956, PhD 1960, University of Kansas. (GF)
COON, ROBERT L., Professor and Head of Modern Languages (1971). BA 1951, Dartmouth College; MA 1953, PhD 1961, Princeton University.
COPELAND, JAMES L., Associate Professor of Chemistry (1962, 1968). BS 1952. University of lllinois; PhD 1962, Indiana University. (GF)

CORBIN, CHARLES B., Professor and Head of Physical Education (1971). BS 1960, University of New Mexico; MS 1962, University of Illinois; PhD 1965, University of New Mexico.
COWAN, THADDEUS M., Associate Professor of Psychology (1970). BA 1957, Centre College of Kentucky; MS 1959, University of Connecticut; Ph D 1964, University of Connecticut. (GF)
CRAIGIE, BARBARA, Assistant Professor of Art (1954, 1963). BA 1932, University of Minnesota; MA 1942, University of Missouri.
CRAWFORD, FRANCIS W., Associate Professor of Physics (1960). AB 1924, Phillips University; MS 1929, PhD 1934, University of Oklahoma.
CRAWFORD, GOLDA MILDRED, Associate Professor of History (1946, 1964). BS 1928, MS 1940, Kansas State University: PhD 1963, Syracuse University. (GF)

CURNUTTE, JR., BASIL, Professor of Physics; Associate Physicist, Agr. Exp. Sta. (1954, 1964). BS 1945, U. S. Naval Academy; PhD 1953, Ohio State University. (GF)
CURTIS, W. D., Assistant Professor of Mathematics; (1970). BA 1966, University of Florida; PhD 1970, University of Massachusetts.
DAANE, ADRIAN H., Professor and Head of Chemistry Department (1963). BS 1941, University of Florida; PhD 1950, lowa State University. (GF)
DACE, WALLACE, Professor of Speech (1963, 1968). AB 1943, Illinois Wesleyan University; MFA 1948, Yale University; PhD 1952, Denver University. (GF)
DALE, E. BROCK, Professor of Physics (1957, 1967). BS.1940, MS 1944, University of Oklahoma; PhD 1953, Ohio State University. (GF)
DANEN, WAYNE C., Assistant Professor of Chemistry (1967). BA 1964, St. Norbert College; PhD 1967, lowa State University. (GF)
DAVIS, EARLE ROSCO, Professor of English (1949, 1950). AB 1927, BM 1929, Monmouth College; MA 1928, University of lllinois; PhD 1935, Princeton University. (GF)
DAVIS, RICHARD D., Instructor of Biology (1970). BS 1957, Colorado State University; MS 1962, PhD 1970, Kansas State University.
DAYTON, ARTHUR D., Associate Professor of Statistics; Consultant, Agr. Exp. Sta. (1966). BS 1960, Berea College; MS 1964, PhD 1967, Michigan State University. (GF)
DeCOU, DONALD FRANK, Associate Professor of Economics (1947). BS 1929, Kansas State Teachers College of Pittsburg; MBA 1934, Northwestern University; 1966, University of Wisconsin. (GF)
DEIBLER, GERALD WILLIAM, Associate Professor of Drawing and Painting (1956, 1963). BA 1951, University of Nebraska; MFA 1955, University of Colorado.
DELEHANTY, JOHN A., Associate Professor of Economics (1966). BBA 1952, MA 1956, University of Miami ; PhD 1962, Indiana University.
DENNIS, JR., EVERETTE E., Assistant Professor of Journalism (1968). BS 1964, University of Oregon; MA 1966, Syracuse University.
DesMARTEAU, DARRYL D., Assistant Professor of Chemistry (1971). BS 1963. Washington State University; PhD 1966, University of Washington. DILLMAN, LARRY E., Associate Professor of Aerospace Studies (1970). BS 1957, Brigham Young; MS 1968, University of Oklahoma.
DIXON, LYLE J., Professor of Mathematics (1963). BS 1948, MS 1950, Oklahoma State University; PhD 1963, University of Kansas. (GF)
DODDS, DARRELL DeLOSS, Assistant Professor of Athletics (1963). BS 1959. MS 1960, Kansas State University

DOEZEMA, C. PHILIP, Assistant Professor of Biology (1970). BS 1961, Michigan State University; PhD 1967, Stanford University. (GF)
DONOVAN, ROBERT KENT, Assistant Professor of History (1964). BA 1954, Harvard University; BA 1958, MA 1963, Cambridge University; PhD 1965, Harvard University. (GF)
DOUGLAS, LOUIS HARTWELL, Professor of Political Science (1949). AB 1931, Hastings College: MA 1937, PhD 1949, University of Nebraska. (GF)
DRAGSDORF, R. DEAN, Professor of Physics (1948, 1956). SB 1944, PhD 1948, Massachusetts Institute of Technology. (GF)
DRESSLER, ROBERT E., Assistant Professor of Mathematics; (1970). BA 1965, University of Rochester; MA 1966. University of Oregon; PhD 1969. University of Oregon. (GF)
DRISS, ANN, Instructor in Modern Languages (1927). AB 1952, Washburn University; MS 1966, Kansas State Teachers College.
DUSHKIN, LELAH, Assistant Professor of Sociology (1968). AB 1953, Smith College; MS 1956, University of Pennsylvania.
EASTWOOD, BR UCE S., Associate Professor of History (1970). AB 1959, MA 1960, Emory University ; PhD 1964, University of Wisconsin. (GF)
EATON, GEORGE R., Assistant Professor of Journalism (1955). BS 1947, South Dakota State College.
EBBERTS, GEORGE ORVAL, Assistant Dean; Assistant Professor (1946, 1956). BS 1949, MS 1951, Kansas State University.

ECK, JOHN S., Assistant Professor of Physics (1969). BS 1962; PhD 1967, The Johns Hopkins University. (GF)
EISENSTARK, ABRAHAM, Professor of Biology; Virologist, Agr. Exp. Sta. (1951, 1959). AB 1940, MA 1942, PhD 1948, University of Illinois. (GF)
EITNER, WALTER HUGO, Associate Professor of English (1954, 1959). AB 1948, University of Denver: AM 1949, University of Michigan; PhD 1959, University of Denver. (GF)
ELLIOTT, GERALD F., Assistant Football Coach (1967). Ind. Mgt., 1957, Auburn University
ELLIS, BYRON ELBRIDGE, Professor of Technical Journalism Emeritus (1949, 1950). AB 1927, Pacific Union College; AM in Ed 1933, University of Southern California. (GF)
ELLSWORTH, LOUIS DANIEL, Professor of Physics (1946, 1954). BS 1937, Case Institute of Technology; MS 1938, PhD 1941, Ohio State University. (GF)
EMERSON, M. JARVIN, Professor of Economics (1962, 1969). BA 1957, Luther College; MA 1960, PhD 1963, State University of Iowa. (GF)
ENGLER, LEO F., Professor of Speech (1962). BA 1952, University of Iowa, MA 1953, PhD 1962, University of Texas. (GF)
EVANS, JOHN C., Assistant Professor of Physics (1966). BS 1960, University of Oklahoma; MS 1962, Rensselaer Polytechnic Institute; MS 1964, PhD 1966, University of Michigan. (GF)
EVANS, THOMAS MARION, Professor of Physical Education (1942, 1950). BS 1930, Kansas State University: MS
PEDir 1958, Indiana University. (GF)
EVANS, WILLIAM E., Assistant Professor of English (1969). BA 1963, Wayne State University; MA 1965, University of Michigan.
FAULKNER, JACOB OLIN, Professor of English Emeritus (1922, 1955). BA 1907, Washington and Lee University; MA 1920, Pennsylvania State University. (GF)
FEDDER, NORMAN J., Associate Professor of Speech (1970). BA 1955, MA 1956, PhD 1962, New York University. (GF)

FERGUSON, CLYDE RANDOLPH, Assistant Professor of History (1960, 1963). BA 1955, University of Óklahoma; MA 1957, PhD 1960, Duke University. (GF)
FERGUSON, GARY W., Assistant Professor of Biology (1969). BS 1963, Tulane University; MS 1965, Texas Technological College; PhD 1968, University of Michigan. (GF)
FEYERHERM, ARLIN M., Professor of Statistics; Statistical Consultant, Agr. Exp. Sta. (1953, 1964). BS 1946, University of Minnesota; MS 1948, University of lowa; PhD 1952, lowa State University.
FIELDEN, LARRY E., Assistant Professor of Military Science (1970). BS 1965, Southwestern Missouri State College; 1968, Air Defense Officers Career Course.
FINA, LOUIS R., Professor of Biology; Microbiologist, Agr. Exp. Sta. (1954, 1962). AB 1942, MS 1948, PhD 1950, University of Illinois. (GF)

FISHER, PAUL S., Assistant Professor of Computer Science; Consultant, Agr. Exp. Sta. (1967). BA 1963, MA 1964, University of Utah; PhD 1969, Arizona State University.
FLANAGAN, BRUCE, Professor of Speech (1966). BS 1953, Western Michigan University; MS 1958, Southern Illinois University; PhD 1966, University of Florida. (GF)
FLOYD, LON KEITH, Assistant Track Coach (1969). BS 1967, Kansas State University.
FLORA, CORNELIA BUTLER, Assistant Professor of Sociology (1970). BA 1965, University of California; MS 1966, PhD 1970, Cornell University. (GF)
FLORA, JAN L., Assistant Professor of Sociology (1970). BA, University of Kansas; MS 1967, PhD 1970, Cornell University. (GF)
FOLLAND, NATHAN O., Assistant Professor of Physics (1966). BA 1959, Concordia College; PhD 1965, Iowa State University. (GF)
FRANKLIN, ALBERT B., Director, South Asia Cent : ; Professor Political Science (1968). AB 1930, University of Miami; AM 1936, PhD 1938, Harvard University. (GF)
FRAZIER, JOHN CARROLL, Professor of Biology Emeritus (1926, 1970). AB 1925, DePauw University; MA 1926, University of Nebraska; PhD 1939, AB 1925, DePauw University;
University of Chicago. (GF)
FRAZIER, ROBERT H., Assistant Football Coach (1967). BS 1965, University of Tennessee
FRETWELL, STEPHEN D., Assistant Professor of Biology (1969). BS 1964, Bucknell University; PhD 1968, North Carolina State University. (GF)
FRIEDMANN, EUGENE ALVIN, Professor, Head, Department of Sociology and Anthropology (1965). AB 1947, MA 1949, PhD 1953, University of Chicago. (GF)
FRIEMAN, JEROME, Assistant Professor of Psychology (1968). BA 1963, MS 1965, Western Reserve University
FROILAND, THOMAS G.. Instructor of Biology (1970). BA 1965, Augustana College: MS 1967, PhD 1970, University of Nebraska
FRYER, HOLLY CLAIRE, Professor: Head, Department of Statistics; Director, Statistical Laboratory, Agr. Exp. Sta. (1940, 1959). BS 1931, University of Oregon; MS 1933, Oregon State University; PhD 1940, Iowa State University. (GF)
FULLER, LEONARDEUGENE, Professor of Mathematics (1952, 1959). BA 1941, University of Wyoming; MS 1947, PhD 1950, University of Wisconsin. (GF)
GAINEY, PERCY LEIGH, Professor of Biology Emeritus (1914, 1957). BS 1908, MS 1910, North Carolina State University; PhD 1926, Washington University. (GF)
GALE, HENRIETTA ANN, Instructor of Computer Science (1970). BS 1964, University of Missouri; MS 1968, St. Cloud State College.
GARRETT, CHARLES ROY, Assistant Basketball Coach (1970). BA 1965, MCKendree College; MS 1969, Southern Illinois University.
GARZ10, ANGELO C., Professor of Art (1957). BA 1949, BS 1949, Syracuse University: Diploma di Profitto, 1950, University of Florence, Italy: MA 1954, MFA 1955, State University of Iowa. (GF)
GEIGER, ALICE LOUISE, Assistant Professor of Art Emerita (1945). AB 1922, BFA 1933, University of Kansas; MA 1939, Colorado State College of Education. (GF)
GEISSLER, WINNIFRED J., Instructor in English (1954). B Music Ed 1940, Bethany College; MS 1954, Kansas State University.
GENCH, BARBARA E., Assistant Professor in Physical Education (1968, 1970). BS 1963, MS 1967, Kansas State University.

GEYER, KATHERINE, Professor of Physical Education (1927, 1945). BS 1927; Ohio State University; MA 1934, Columbia University. (GF)
GIBSON, HAROLD VINCE, Head Football Coach (1967). BS 1955, MA 1956, Florida State University.
GIER, HERSCHEL THOMAS, Professor of Biology; Embryologist, Agr. Exp. Sta. (1947, 1960). AB 1931, Kansas State College of Pittsburg; PhD 1936, Indiana Úniversity. (GF)
GILLESPIE, VINCENT E., Assistant Professor of English (1966). BA 1952, Sterling College; MA 1956, University of Kansas.
GIVEN, CHARLES H., Associate Professor of Aerospace Studies (1968). BS 1950, Wesleyan College: BS 1958, Texas A \& M; MS 1965, University of Michigan.
GIVEN, KINGSLEY WALTON, Professor of Speech Emeritus (1920, 1950). BS 1926, Park College; MA 1929, State University of Iowa. (GF)
GLENN, ESTHER BEACHEL, Assistant Professor of English (1948, 1954). AB 1930, Kansas Wesleyan University; MS 1938, Kansas State University. (GF)
GOLIN, STEPHEN J., Assistant Professor of History (1967). BA 1960, Wesleyan University; MA 1964, PhD 1968, Brandeis University. (GF)
GOODRICH, ARTHUR LEONARD, Professor of Biology Emeritus (1929, 1970). BS 1928, College of Idaho; MS 1929, University of Idaho; PhD 1938, Cornell University. (GF)
GORMELY, PATRICK JOSEPH, Assistant Professor of Economics (1967). AB 1963, Catholic University of America; PhD 1967, Duke University.
(GF)

GOSS, JAMES ARTHUR, Associate Professor of Biology; Plant Physiologist, Agr. Exp. Sta. (1956, 1967). BS 1951, Utah State University; PhD 1957, University of California at Los Angeles. (GF)
GRAY, JR., MARION WILSON, Assistant Professor of History (1969). BA 1964, Texas Christian University; MA 1966, University of Wisconsin.
GREECHIE, RICHARD J., Associate Professor of Mathematics (1967, 1970). BS 1962, Boston College; PhD 1966, University of Florida. (GF)

GREEN, RALPH EMERSON, Instructor in Physics (1961). BS 1939, Tri. State College; MS 1954, University of Alabama.
HAMMAKER, GENEVA, Lecturer in Physics (1961, 1969). AB 1957, Drury College; PhD 1961, Northwestern University.
GREENBERG, ARTHUR R., Assistant Professor of Philosophy (1969). BS 1969, Lehigh University.
GREENWOOD, MICHAEL JAMES, Associate Professor of Economics (1965). BS 1962, DePaul University; MA 1965, PhD 1967, Northwestern University. (GF)
GRIFFITT, COYE ANNETTE, Instructor of Computer Science (1970). BS 1964, Kansas State University.
GRIFFITT, WILLIAM, Associate Professor of Psychology (1968). BA 1964, Kansas State University; PhD 1967, University of Texas.
GRILLET, MIREILLE P., Assistant Professor of Mathematics (1969). Licence, 1961, University of Paris, PhD 1968, Kansas State University. (GF)
GRILLET, PIERRE ANTOINE, Associate Professor of Mathematics (1967, 1970). Licence, 1960, PhD 1965, University of Paris. (GF)

GUHL, ALPHAEUS MATTHEW, Professor of Biology Emeritus (1943, 1968). AB 1922, North Central College; MS 1939, PhD 1943, University of Chicago. (GF)
GUSTAFSON, MERLIN DWAYNE, Associate Professor of Political Science (1960, 1968). BS 1943, MS 1947, Kansas State University; PhD 1956, University of Nebraska. (GF)
GUTANA, ALBERTO M., Assistant Professor of Music (1967). Artist Diploma, 1951, University of Philippines, AB 1957, Central Philippines University: \(M M\) 1960, University of Rochester; DMA in progress.
HAGAN, KENNETH JAMES, Assistant Professor of History (1969). AB 1955, MA 1964, University of California, Berkeley
HAJDA, JOSEPH, Director, International Activities (1965), Associate Professor of Political Science (1960). AB 1951, Miami University; MA, Ph. D 1955, Indiana University. (GF)
HAMMAKER, ROBERT M., Associate Professor of Chemistry (1961, 1967). BS 1956, Trinity College; PhD 1960, Northwestern University. (GF)
HANSEN, MERLE FREDERICK, Professor of Biology: Parasitologist, Agr Exp. Sta. (1950, 1963). AB 1939, MA 1941, University of Minnesota; PhD 1948, University of Nebraska. (GF)
HARRIS, JOHN ORVILLE, Professor of Biology; Bacterial Physiologist, Agr. Exp. Sta. (1941, 1952). BS 1939, Kansas State University; MS 1941, University of Hawaii; PhD 1943, Kansas State University. (GF)
HARRIS, OSCAR L., Instructor in Aerospace Studies (1970).
HARRIS, VIDA AGNES, Associate Professor of Art Emerita (1924, 1963). BS 1914, Kansas State University; AM 1927, University of Chicago. (GF)
HARTMAN, JOHN HOWARD, Head Basketball Coach (1970). BS 1950, Oklahoma State University; MS 1954, Oklahoma State University.
HATHAWAY, CHARLES, Associate Professor and Head of Physics (1964, 1969). BS 1958, Texas A \& M College; PhD, 1964, University of Oklahoma. (GF)
HAWLEY, M. DALE, Associate Professor of Chemistry (1966, 1970). BA 1960. MA 1962, University of Northern Iowa; PhD 1965, University of Kansas. (GF)
HAZLETT, EMERSON L., instructor of Economics (1969). BS 1949, MS 1964, University of Kansas.
HEAD, EDWARD. C., Administrative Assistant, Athletics (1967). BS 1952, MS 1954, Kansas State University.
HERMAN, LOUIS M., Assistant Professor of Mathematics, (1970). BS 1963, University of Florida; MS 1965, University of Florida; PhD 1970, University of Massachusetts
HERZON, FREDERICK DAVID, Assistant Professor of Political Science (1968). BA 1964, University of Illinois.

HEWETT, PHILLIP WILLIAM, Assistant Professor of Music (1969). BME 1959. Texas Christian University.

HIEBERT, PAUL G., Associate Professor of Anthropology (1966). BA 1954, Tabor College; MA 1958, PhD 1967, University of Minnesota. (GF)
HIGGINSON, FRED H., Professor and Head of English (1950, 1969). AB 1942, MA 1947, University of Wichita; PhD 1953, University of Minnesota. (GF)
HIGHAM, ROBIN DAVID STEWARD, Professor of History (1963, 1966). AB 1950, Harvard College; MA, Claremont Graduate School; PhD 1957, Harvard University. (GF)
HILL, OPAL BROWN, Associate Professor of Art Emerita (1944, 1954). BS 1944, MS 1950, Kansas State University. (GF)
HILL, RANDALL CONRAD, Professor of Sociology Emeritus (1929, 1970). BS 1924, MS 1927, Kansas State University; PhD 1929, University of Missouri. (GF)
HINRICHS, CARL, Assistant Professor of Speech (1964). AB 1959, MA 1960, University of North Carolina. (GF)
HOLEMAN, FLOYD A., Instructor in Aerospace Studies (1968).
HOOK, PATRICIA W., Instructor of Biology (1970). BA 1963, MS 1965, Kansas State University; PhD 1970, Oregon State University.
HOPKINS, H. GLYNN, Instructor of Biology (1970). BS 1965, MS 1967, Arkansas State University: PhD 1970, Kansas State University.
HOSTETTER, HELEN PANSY, Professor of Technical Journalism Emerita (1926, 1964). AB 1917, University of Nebraska; BS 1940, Kansas State University: MS 1926, Northwestern University. (GF)
HOUSER, DAVID J., Assistant Professor of English (1969). BS 1964, Iowa State University; M'S 1966, PhD 1970, University of Wisconsin. (GF)
HOWARD, DAN, Protessor and Head of Art Department (1971). BA 1953, MFA 1958, University of Iowa.

HOWE, F. VIRGINIA, Professor of Radio Television (1947, 1959). AB 1935, Elmira College; MS 1949, EdD 1958, Boston University. (GF)
HSU, CHEN-JUNG, Professor of Mathematics (1965). BS 1937, DS 1961, Tohoku University (Japan). (GF)
HULBERT, LLOYD C., Associate Professor of Biology; Ecologist, Agr. Exp. Sta. (1955, 1964). BS 1940, Michigan State University; PhD 1953, Washington State University. (GF)
HUMMEL, WILLIAM CASTLE, Professor of English (1950). AB 1939, Allegheny College; MA 1940, PhD 1946, University of Pittsburgh. (GF)
HYLE, ARCHIER., Professor of Military Science (1970). BS 1943, Kansas State University; 1957, Command and General Staff College; MBA 1960, University of Alabama; MS 1965, George Washington University; 1965, National War College; 1966, Stanford Research Institute.
IANDOLO, JOHN J., Assistant Professor of Biology; Microbiologist, Agr. Exp. Sta. (1967). BS 1961, Loyola University (Chicago); MS 1963, PhD 1965, University of llinois. (GF)
ILES, IVOR VICTOR, Professor of Political Science Emeritus (1911, 1949). BA 1904. MA 1905, University of Kansas. (GF)
IMAN, RONALD L., Instructor of Statistics (1970). BS 1962, Kansas State University; MA 1965, Kansas State Teachers College (Emporia).
JACKSON, ROBERT L., Assistant Football Coach (1970). BS 1963, Howard College of Stanford University; MA 1963, George Peabody College.
JACKSON, T. HANLEY, Assistant Professor of Music (1968). BA 1965, San Fernando Valley State College; MA 1968, California State College at Long Beach.
JANES, ROBERT, Instructor of Computer Science (1971). BS 1968, Rose Polytechnic Institute.
JANES, WILLIAM CHARLES, Associate Professor of Mathematics Emeritus (1922, 1968). BS 1919, Northwestern University; MA 1922, University of Nebraska.
JOHNSON, GEORGE DANA, Associate Professor of Chemistry (1952, 1967). AB 1940, MA 1941, Oberlin College: PhD 1946, University of Michigan.
(GF) (GF)
JOHNSTON, KENNETH GORDON, Assistant Professor of English (1966). BA 1948, University of California, Berkeley; MA 1951, University of California, Los Angeles; PhD 1966, Úniversity of Minnesota. (GF)
JONES, DALE VINCENT, Associate Professor of English (1946, 1951). BS 1931, MS 1941, Kansas State University. (GF)
JONES, KENNETH W., Associate Professor of History (1965, 1970). AB 1958, MA 1959, PhD 1966, University of California. (GF)
JUSSILA, CLYDE, Associate Professor of Music (1949, 1968). BM 1949, University of Washington; MS 1951, Kansas State University. (GF)
JUSTICE, DONALD H., Assistant Professor of Aerospace Studies (1969). BS 1961, Oklahoma State University.
KEMP, KENNETH E., Associate Professor of Computer Science: Consultant, Agr. Exp. Sta. (1968). BS 1963, MS 1965, PhD 1967, Michigan State University. (GF)
KLAASSEN, HAROLD E., Assistant Professor of Biology (1967). AB 1957, Tabor College; MS 1959, Kansas State University; PhD 1967, University of Washington.
KNORR, FRITZ GUSTAVE, Head Wrestling Coach, Assistant Professor of Athletics (1942, 1952). BS 1932, MS 1945, Kansas State University.
KOCH, WILLIAM E., Assistant Professor of English (1946, 1947), BS 1938, North Dakota State Teachers College; MS 1949, Kansas State University.
(GF)
KNOWLES, HAROLD R., Instructor of Speech (1970). BS 1967, MS 1970, Kansas State University.
KRAMER, CHARLES LAWRENCE, Associate Professor of Biology, Mycologist, Agr. Exp. Sta. (1958, 1966). AB 1950, MA 1953, PhD 1957, University of Kansas. (GF)
KREGAR, MITJA, Lecturer in Physics (1969). BS 1959, PhD 1965, University of Liubliana.
KREN, GEORGE M., Associate Professor of History (1965). BA 1948, Colby College; MA 1949, PhD 1960, University of Wisconsin. (GF)
KROMM, DAVID, Associate Professor of Geography (1966). BS 1960, Eastern Michigan University; MA 1964, PhD 1966, Michigan Staté University. (GF)
LAMAN, RUSSELL, Assistant Professor of English (1935, 1946). BS 1932, Kansas State University; MA 1933, State University of Iowa. (GF)
LAMBERT, JACK L., Professor of Chemistry (1950, 1958). AB 1947, MS 1947, Kansas State College of Pittsburg; PhD 1950, Oklahoma State University. (GF)
LANGENKAMP, JERRY REESE, Associate Professor; BM 1953,
University of OkIahoma; MM 1958, University of Michigan; A Music University of Oklahoma; MM 1958, University of Michigan; A Music D
1970, University of Michigan. (GF) 1970, University of Michigan. (GF)
LANGFORD, ROY CLINTON, Professor of Psychology (1925, 1941). BS 1925, MS, Kansas State University; PhD 1934, Leland Stanford Iunior
LANNING, FRANCIS C.. Associate Professor of Chemistry (1942, 1961). BS
1930, MS 1931, University of Denver; PhD 1936, University of Minnesota. 1930, MS 1931, University of Denver; PhD 1936, University of Minnesota. (GF)
LARMER, OSCAR VANCE, Professor of Drawing and Painting (1950, 1970). BFA 1949, University of Kansas; MFA 1955, Wichita University.
LASH, MENDEL ELMER, Professor of Chemistry Emeritus (1922, 1966). AB 1920, MS 1922, PhD 1928, Ohio State University. (GF)
LASHBROOK, RALPH RICHARD, Professor: Head, Department of
Technical Journalism Emeritus (1934, 1944). BS 1929, Kansas State Technical Journalism Emeritus (1934, 1944). BS 1929, Kansas State
University; MS 1942, University of Wisconsin. (GF) University; MS 1942, University of Wisconsin. (GF)
LAURIE, DAVID R., Instructor in Physical Education (1968). BS 1963, MS 1966, Kansas State University.
LEACHMAN, ROBERT B., Professor of Physics; Director, Nuclear Science Laboratories (1967). BS 1942, Case Institute of Technology; PhD 1950, lowa State University. (GF)
LEAVENGOOD, LUTHER OMAR, Professor; BM 1929, University of Kansas; MM 1936, University of Michigan. (GF)
LEE, KENNETH, Instructor in Aerospace Studies (1970).

LEE, RONALD S., Assistant Professor of Physics (1967). BA 1961, Luther College; PhD 1967, Iowa State University. (GF)
LEE, YU-LEE, Associate Professor of Mathematics (1967). BS 1955, MA 1959, National Taiwan University; PhD 1964, University of Oregon. (GF)
LEGG, JAMES C., Associate Professor of Physics (1967). BS 1958, Indiana University; MA 1960, PhD 1962, Princeton University. (GF)
LEWIS, JOHN TIMOTHY, Assistant Professor of English (1970). AB 1962,
AM 1968, University of Texas.
LIGHTFOOT, MICHAEL F., Assistant Professor of Military Science (1970). BS 1965, Seattle University; 1969 Armor Officers Career Course.
LINFORD, ORMA, Assistant Professor of Political Science (1966). BS 1956, Utah State University; MS 1958, PhD 1964, University of Wisconsin. (GF)
LENHERT, ANNE G.' Assistant Professor of Chemistry (1967). BA 1958,
Hollins College; MS 1963, PhD 1965, The University of New Mexico. (GF) Hollins College; MS 1963, PhD 1965, The University of New Mexico. (GF)
LIM'PER, LOUIS HENRY, Professor of Modern Languages Emeritus (1914, 1944). AB 1907, Baldwin-Wallace College; \(A M\) 1914, University of Wisconsin; PhD 1931, State University of Iowa. (GF)
LINDER, ROBERT D., Associate Professor of History (1965, 1967). BS 1956, Kansas State Teachers College; BDMRE 1958, Central Baptist Theological Seminary; MA 1960, PhD 1963, University of lowa. (GF)
LOCKHART, CHARLES HOWARD, Assistant Professor of Biology (1940, 1947). BS 1934, MS 1938, Kansas State University. (GF)

LONG, GLENN WESLEY, Assistant Professor of Sociology Emeritus (1938, 1970). AB 1926, Baker University; MS 1940, Kansas State University. (GF)

LONGHURST, THOMAS M., Assistant Professor of Speech (1971). BS 1966, MS 1968, PhD 1970, University of Minnesota.
LOWE, JOHN III, Assistant Professor of Speech (1969). BS in Ed 1964, Eastern Illinois University; MA 1966, PhD 1969, University of Illinois.
LYNN, NAOMI B., Assistant Professor of Political Science (1970). BA 1954, Maryville College; MA 1958, University of Illinois; PhD 1970, University of Kansas.
MacDONALD, JAMES ROBERT, Associate Professor of Physics (1968). BA 1958, University of Toronto: MS 1964, PhD 1966, McMaster University. (GF)
MACY, ELBERT BONEBRAKE, Associate Professor of Technical Journalism (1946, 1951). BS 1930, MS 1939, Kansas State University.
MALONE, JOSEPH J., Professor and Head of History (1971). BA 1949, MA 1950, University of Washington; PhD 1956, University of London.
MARCHIN, GEORGE L., Assistant Professor of Biology (1970). BA 1962, Rockhurst College; PhD 1967, University of Kansas.
MARR, JOHN MAURICE, Professor of Mathematics (1953, 1958). BS 1941, Central Missouri State College; MA 1949, University of Missouri; PhD 1953, University of Tennessee. (GF)
MARSDEN, JR., EDWIN L., Assistant Professor of Mathematics (1968). BS 1960, MA 1901, PhD 1968, University of Massachusetts. (GF)
MARZOLF, G. RICHARD, Associate Professor of Biology (1962, 1968). AB 1957, Wittenberg University; PhD 1962, University of Michigan. (GF)
MAXFIELD, JOHN E., Professor and Head, Department of Mathematics and Professor of Applied Mechanics (1967). BS 1947, Massachusetts Insitute of Technology: MS 1949, University of Wisconsin; PhD 1951, University of Oregon. (GF)
MAXWELL, GEORGE WILLARD, Assistant Professor of Physics Emeritus (1927, 1960). AB 1912, MS 1920, University of Michigan.
MCCAIN, JOHN ROBERT, Instructor in Modern Languages (1967). AB 1958, Murray State College; MA 1967, University of Oklahoma.
MCCARTHY, MICHAEL, Instructor in Speech (1967). BA 1964, California State College; MA 1966, Kansas State University
MCCARTHY, PAUL E., Associate Professor of English (1967). BA 1948, MFA 1951, State University of Iowa; PhD 1958, University of Texas. (GF)
MCCRACKEN, ELIZABETH UNGER, Associate Professor of Biology Emerita (1938, 1970). AB 1929, MA 1932, Wellesley College; PhD 1937, University of California. (GF)
MCDEVITT, ALFRED J., Associate Professor of Aerospace Studies (1969). BS 1961, University of Nebraska at Omaha; MBA 1965, University of BS 1961, University of Nebry
California at Los Angeles.
MCDONALD, RICHARD N., Professor of Chemistry (1960, 1968). BS 1954, MS 1955, Wayne State University; PhD 1957, University of Washington. (GF)
MCDOWELL, EPHRIAM E., Assistant Football Coach (1970). BS 1963. Florida State University.
MCDOWELL, MAYNARD LEE, Associate Professor of Chemistry Emeritus (1926, 1970). AB 1924, Central College of Missouri; AM 1926, University of Missouri; PhD 1934, State University of lowa. (GF)
MCGHEE, RICHARD D., Associate Professor of English (1967). BA 1962, University of Missouri at Kansas City; MA 1964, PhD 1967, University of Oklahoma. (GF)
McGRAW, BETTY R., Assistant Professor in Modern Languages (1963, 1970). Licence es Lettres, 1961, De l'Universite de Paris, La Sorbonne.

MCKINNEY, KATHERYN ANN, Assistant Professor of Physical Education (1946). BS 1934, Kansas State University; MA 1935, George Peabody College for Teachers.
McMAHON, ADRIAN MICHAL, Assistant Professor of History (1968, 1969). BA 1964, Southern Methodist University; PhD 1970, University of Texas.
MEARES, STANLEY H., Instructor in Aerospace Studies. (1968).
MELOAN, CLIFTON E., Professor of Chemistry (1959, 1968). BS 1953, Lowa State University; PhD 1959, Purdue University. (GF)
MERRIMAN, JOHN W., Assistant Professor in Physical Education (1968). BS 1957, University of Kansas; MA 1967, Colorado State College.
MILEY, JAMES D., Assistant Professor of Sociology (1970). BA 1959, Millsaps College; MA 1963, Louisiana State University; PhD 1970, Tulane University. (GF)
MILLER, CAROL LYNN, Assistant Professor of Modern Languages (1968). BA 1958, MA 1959, Vanderbilt University; PhD 1963, Washington University. (GF)
MILLER, CECIL H., Professor of Philosophy (1945, 1951). AB 1930, University of Kansas; MA 1939, University of California. (GF)

MILLER, FORREST R., Assistant Professor of Mathematics (1968). BS 1962. University of Oklahoma; MA 1968, PhD 1968, University of Massachusetts. (GF)
MILLER, MARGARET, Instructor in Modern Languages (1966). BA 1936 Bethany College; MA 1955, The Hartford Seminary Foundation.
MILLIKEN, GEORGE A., Assistant Professor of Statistics; Consultant, Agr. Exp. Sta. (1969). BS 1965, MS 1968, PhD 1969, Colorado State University. (GF)
MITCHELL, JAMES C., Associate Professor of Psychology (1966). BS 1957, MA 1959, PhD 1962, Ohio State University. (GF)
MONTGOMERY, LEROY, Assistant Football Coach (1967). BS 1950, MA 1960. Midwestern University.

MOORE, FRITZ, Professor of Modern Languages Emeritus (1934, 1971). AB 1927, University of Akron; MA 1930, PhD 1932, University of Illinois. (GF) MORGAN, LAURENCE, Instructor in Athletics, Athletic Trainer (195), 1957). BS 1949, St. Ambrose College.

MORGAN, RONALD, Instructor of Computer Science (1970). BS 1969 University of Delaware.
MORRIS, JIM R., Assistant Professor of Journalism (1968). AA 1957 Kilgore College; B Journ. 1959, University of Texas; MA 1964, University of Georgia; EdD 1969, North Texas State University.
MOSER, HERBERT CHARLES, Professor of Chemistry (1957, 1967). BA 1952, San Jose State College; PhD 1957, Iowa State University. (GF)
MOSES, WILLIAMR., Professor of English (1950, 1954). BA 1932, MA 1933, PhD 1939, Vanderbilt University. (GF)
MOSSMAN, THIRZA ADELINE, ASsociate Professor of Mathematics Emerita (1922, 1965). BA 1916, University of Nebraska; MA 1922, University of Chicago. (GF)
MROZINSKI, KENNETH F., Assistant Professor of Radio-Television (1967). BS 1963, Kent State University; MA 1965, West Virginia University. MULHOLLAN, PAIGE E., Associate Dean: Associate Professor of History (1970). BA: BS 1956. Texas Christian University and University of Arkansas; MA 1961, University of Arkansas; PhD 1966, University of Texas.
MUNRO, DONALD FARNHAM, Associate Professor of Modern Languages Emeritus (1940). BS 1926, MA 1927, Acadia University (Canada); PhD 1933, University of lllinois. (GF)
NAFZIGER, ESTEL WAYNE, Assistant Professor of Economics (1966). BA 1960, Goshen College; MA 1962, University of Michigan; PhD 1967, University of lllinois. (GF)
NASSAR, RAJAF., Associate Professor of Statistics; Consultant, Agr. Exp. Sta. (1966, 1968). BS 1958, American University, Beirut, Lebanon; MS 1960, University of Idaho; PhD 1963, University of California, Davis. (GF)
NELSON, BRADLEY W., Instructor of Computer Science (1970). BA 1966, Parsons College (lowa); MS 1970, Washington State University
NELSON, DEVERE V.., Assistant Professor of Athletics (1966). BS 1949, Kansas State University.
NEWCOMB, MARGARET ALICE, Associate Professor of Biology Emerita (1925, 1970). BS 1925, MS 1927, Kansas State University. (GF)
NICHOLS, DUANE, Associate Professor of English \((1964,1969)\). BS 1952, ME 1957, University of South Dakota; PhD 1964, University of Kansas. (GF)
NOONAN, JOHN P., Associate Dean of Graduate School; Associate Professor of English (1947, 1966). BS 1947, Rockhurst College; MS 1950, Kansas State University; PhD 1955, Denver University. (GF)
NORDIN, JOHN A., Professor of Economics (1961). BA 1935, MA 1937, PhD 1941, University of Minnesota. (GF)
NUSHAWG, MICHAEL A., Instructor of Art (1970). BFA 1966, Miami University; MA 1969, Onio University; MFA 1970.
NYBERG, BENJAMIN M., Assistant Professor of English (1965). BA 1955, University of Wichita; MA 1958, University of Arizona; PhD 1965, University of Colorado. (GF)
O'BRIEN, PATRICIA J., Assistant Professor of Anthropology (1967). BA 1962, BMA 1966, PhD 1969, University of Illinois. (GF)
OGG, ROSELLA A., Instructor of Art (1965). BA 1958, Kansas State University; MA 1963, Kansas State University.
OLLINGTON, MARCUS H., Assistant Professor of Speech and Auditorium Manager (1969). Diploma, 1940, Conservatorium of Music; BA 1964, MA 1967. University of North Carolina.

OLSON, EDWIN G., Assistant Professor of Economics (1969). BA 1956, MA 1960, PhD 1971. UUniversity of Washington.
ORBACH, HAROLD L., Lecturer in Sociology (1969). BSS 1959, The City College of New York; PhD 1970, The University of Minnesota.
O'SHEA, JOHN WILLIAM, Assistant Professor of Art (1956, 1968). BFA 1954, Denver University; MFA 1956, State University of Iowa.
OTTENHEIMER, HARRIET J., Assistant Professor of Anthropology (1969). BA 1962, Bennington College.

OTTENHEIMER, MARTIN, Assistant Professor of Anthropology (1969). BS 1962, Rensselaer Polytechnic Institute; MA 1965. Tulane University.
OUKROP, CAROL E., Assistant Professor of Journalism (1969). BA 1956, University of North' Dakota; MA 1965, PhD 1969, University of lowa. (GF)
PADY, STUART MCGREGOR, Professor of Biology; Mycologist, Agr. Exp. Sta. (1945, 1952). AB 1928, MA 1929, MCMaster University; PhD 1932 University of Toronto. (GF)
PAGE, LEROY EARL, Associate Professor of History (1969). BS 1951, University of Arkansas; BS 1955, M Chem Eng 1958, PhD 1963, University of Oklahoma. (GF)
PARKER, S. THOMAS, Professor of Mathematics (1947, 1951, 1963). BA 1931. MA 1934, University of British Columbia (Canada): PhD 1947 University of Cincinnati. (GF)
PARKER, WILLARD A., Assistant Professor of Mathematics (1970). BA 1960, University of Oregon; BD 1964, Fuller Theological Seminary; MA 1966, University of Oregon; PhD 1970, University of Oregon.
PARRISH, FRED LOUIS, Professor of History Emeritus (1927, 1963). AB 1917, MA 1927, Northwestern University; BD 1920, Garnett Biblical In stitute; PhD 1927, Yale University. (GF)

PAUKSTELIS, JOSEPH V., Assistant Professor of Chemistry (1966). BS 1960, University of Wisconsin; PhD 1964, University of Illinois. (GF)
PELISCHEK, MILTON Z., instructor in English (1965). BS 1948, MA 1950, Kansas State University.
PELTON, MARION HERFORT, Associate Professor of Music (1928, 1958). \(B M\) 1927, University of Wisconsin; BS 1932, Kansas State University; MA 1957, Columbia University. (GF)
PENNEL, CHARLES A., Associate Professor of English \((1962,1967)\). BS 1955, MA 1956, Memphis State College; PhD 1962, University of Illinois. (GF)
PERKINS, JR., CHARLES C., Professor of Psychology (1969). BA 1941, Harvard; MA 1942, PhD 1946, State University of lowa. (GF)
PERNG, SHIAN-KOONG, Assistant Professor of Statistics (1968). BS, Chung Hsien University, Taiwan; MS 1961, Virginia Polytechnic Institute; PhD 1967. Michigan State University. (GF)
PETERS, GEORGE R., Assistan \(\uparrow\) Professor of Sociology; Associate, In stitute for Environmental Research (1967, 1970). BA 1962, MA 1964, PhD 1968, University of Nebraska (GF)
PETTIS, DOROTHY BRADFORD, Associate Professor of Modern Languages Emerita (1927, 1966). BA 1919, MA 1924, University of Nebraska: 1922, Middlebury College: Certificate, 1939, University of Paris. (GF)
PHARES, E. JERRY, Professor and Head, Department of Psychology (1955, 1964). BA 1951, University of Cincinnati; MA 1953, PhD 1955, Ohio State University. (GF)
PIGNO, LOUIS, Assistant Professor of Mathematics (1969). BS 1961, Polytechnic Institute of Brooklyn: MA 1965, University of Connecticut; PhD 1969, SUNY at Stony Brook.
POLICH, GERALD, Assistant Professor of Music and Education (1966). BME 1961, University of Colorado. MME 1966, University of Colorado.
POOLE, MIRIAM PICK, Instructor in Physical Education (1961). BS 1943, Savage School for Physical Education and Columbia University; MA 1945, Columbia University
POWELL, DONALD G., Assistant Football Coach (1967). BS 1956, MS 1958, Florida State University
PRE5S, ALLAN N., Assistant Professor of Psychology (1970). BS 1964, Massachusetts Institute of Technology; MA 1967, Clark University; PhD 1971, Clark University
PSILOS, PAUL D., Assistant Professor of English (1970). BA 1966, Boston University: MA 1967, PhD 1970, Northwestern University.
PURCELL, KEITH F., Associate Professor of Chemistry (1967, 1970). BA 1961, Central College; PhD 1965, University of Illinois. (GF)
RAINBOLT, HARRY R., Associate Professor of Speech (1966). BS 1960, Southern Illinois University; MS 1962, PhD 1965, University of Indiana. (GF)
RAO, T. V. S., Assistant Professor of Economics (1968). BS 1961, Andhra University; MS 1963, Indiana Statistical Institute; PhD 1967, University of Southern California, Los Angeles. (GF)
RAPPOPORT, LEON H., Associate Professor of PSychology (1964, 1968). BA 1953. New York University; MA 1962, PhD 1963, University of Colorado (GF)
RATCLIFFE, LAMAR CECIL, Instructor in Mathematics (1964). BS 1933, United States Military Academy; MAT 1964, Duke University.
REAGAN, CHARLESE., Assistant Professor of Philosophy (1967). AB 1964, Holy Cross College; MA 1966, PhD 1967, University of Kansas. (GF)
REES, JOHN O., Assistant Professor of English (1965). BA 1947, Dartmouth College: PhD 1965, State University of lowa. (GF)
REPLOGLE, RENATA JULIA, Instructor in Art Education (1966). BA 1963, MA 1964, Colorado State College.
REPLOGLE, REX WAYNE, Assistant Professor in Art \((1966,1970)\). BFA 1964. MFA 1967. University of Kansas. (GF)

RICHTER, WILLIAM LOUIS, Assistant Professor of Political Science (1966). BA 1961, Willamette Úniversity; MA 1964, University of Chicago; PhD 1967, University of Hawaii. (GF)
RILEY, PATRICK E., Assistant Professor of Military Science (1969). BS 1962, Boston University: 1967. Armor Officers Career Course.
RINGGENBERG, ARCHIE, Assistant Professor of Military Science (1970). BS 1962, Kansas State College of Pittsburg; 1968, Infantry Officers Career Course.
RISEMAN, LOUIS, Assistant Professor of Geology (1946, 1947). BS 1934, MS 1936, Tufts College. (GF)
ROBEL, ROBERT JOSEPH, Professor of Biology; Wildlife Conservationist, Agr. Exp. Sta. (1961, 1966). BS 1956, Michigan State University; MS 1959, University of Idaho; PhD 1961, Utah State University. (GF)
ROBERTSON, JR., CHARLES W., Research Associate in Department of Physics (1970). BS 1965. Southwestern at Memphis; PhD 1969, Florida State University.
ROBERTSON, SAMUEL A., Assistant Football Coach (1967). BS 1966, University of Tennessee.
ROBY, PAUL E., Assistant Professor of Music (1966). BM 1958, Oberlin Conservatory: MM 1961, Catholic University of America. (GF)
RODKEY, L. SCOTT, Assistant Professor of Biology; Immunologist, Agr. Exp. Sta. (1970). BA 1964, PhD 1968, University of Kansas.
ROGERSON, BREWSTER, Professor of English (1953, 1967). AB 1941, University of North Carolina; PhD 1946, Princeton University. (GF)
ROHLES, FREDERICK H., Professor of PSychology (1963, 1966). BS 1942, Roosevelt University; MA 1950, PhD 1956, University of Texas. (GF)
ROHRER, WAYNE C.. Professor of Sociology; Rural Sociologist, Agr. Exp. Sta. (1959, 1965). BS 1946, MS 1948, Texas A and \(M\) College; PhD 1955, Michigan State University. (GF)
RON, JOHN Assistant Professor of Modern Languages (1968). BA 1956, University College at London; MA 1963, Middlebury College, Vermont. (GF)
ROSENKILDE, CARL EDWARD, Assistant Professor of Physics (1970). BS 1959. Washington State University; MS 1960, University of Chicago; PhD 1966, University of Chicago.

ROTH, L. EVANS, Protessor and Director of the Division of Biology (1967). AB 1950, Indiana University; MS 1955, Northwestern University; PhD 1957, University of Chicago. (GF)
RUDY, JR., CLIFFORDR., Postdoctoral Research Associate in Depart ment of Physics (1970). BS 1964, University of Arizona; PhD 1970, University of Washington.
RUSH, RAMONA R., Assistant Professor of Journalism and Assistant Director, Mental Health Mass Communications Program (1969). BS 1959, MS 1963, University of Kansas; PhD 1969, University of Wisconsin. (GF)
RUSSELL, MARY J., Assistant Professor of Mathematics (1969). BS 1964, University of Tennessee; MA 1967, PhD 1969, Emory University.
SACKMAN, HAROLD, Professor and Head of Computer Science (1971). BS 1948, City College of New York; MA 1949, Columbia University; PhD 1953, Fordham University.
SAGESER, ADELBERT BOWER, Professor of History (1938, 1941). AB 1925, Nebraska State Teachers College (Wayne); MA 1930, PhD 1934, University of Nebraska. (GF)
SAMELSON, FRANZ, Professor of Psychology (1957, 1969). Diploma in Psychology, 1952, University of Munich (Germany); PhD 1956, University of Michigan. (GF)
SCHEER, RICHARD K., Associate Professor of Philosophy (1968). AB 1950, University of Nebraska; MA 1951, University of Florida; PhD 1958, University of Nebraska. (GF)
SCHNEIDER, HAROLD WILLIAM, Assistant Professor of English (1961, 1969). BA 1950, University of Minnesota.

SCHNEIDER, MARY W., Assistant Professor of English (1966). BA 1949, MA 1952, State University of lowa; PhD 1964, University of Minnesota. (GF)
SCHNUR, ALFRED C., Professor of Sociology (1970). BA 1941, University of Pittsburgh; PhM 1944, PhD 1949, University of Wisconsin. (GF)
SCHRENK, WILLIAM G., Professor of Chemistry (1938, 1951). AB 1932, Westmar College; MS 1936, PhD 1945, Kansas State University. (GF)
SEAMAN, GREGORY, Associate Professor of Physics (1968, 1969). BA 1958, College of Wooster: MS 1960, PhD 1965, Yale University. (GF)
SECHER, HERBERT PIERRE, Professor and Head of Political Science (1969). BA 1947, MA 1949, PhD 1954, University of Wisconsin. (GF)

SELF, HUBER, Assistant Professor of Geography (1947, 1953). BS 1941, Central Oklahoma State College; MS 1947, Oklahoma State University. (GF)
SETSER, DONALD W., Professor of Chemistry (1963, 1970). BS 1956, MS 1958, Kansas State University; PhD 1961, University of Washington. (GF)
SEYLER,H.L., Assistant Professor of Geography (1970). BA 1963, MA 1967, Kansas State University
SHANLINE, RIX D., Lecturer in Sociology (1969). BS 1951, MSW 1953, University of Kansas
SHENKEL, JR., CLAUDE WESLEY, Professor of Geology (1949, 1958). BS 1941, Kansas State University; MS 1947, PhD 1952, University of Colorado. (GF)
SHOPMAKER, STANTON N., Instructor in Modern Languages (1967). BS 1960, University of Kansas; MA 1964, University of Southern California.
SHORE, BR UCEW., Associate Protessor of Physics (1968). BS 1956, College of Pacific: PhD 1960, M.I.T. (GF)
SHULL, PAUL, Associate Professor of Music (1960). BME 1950, MME 1951, University of Colorado; DMA 1966, Eastman School of Music (University of Rochester).
SIDDALL, WILLIAM R., Associate Professor of Geography; Head, Department of Geography (1962, 1965). AB 1950, Harvard University; MA 1955. PhD 1959, University of Washington. (GF)

SIDORFSKY, FRANK M., Assistant Professor of Music (1965). BME 1952, Kansas State Teachers College of Emporia; MM 1957, Eastman Conservatory of Music (University of Rochester).
SiLKER, RALPH, Professor of Chemistry Emeritus (1941, 1970). BA 1927, University of Dubuque; MS 1931, PhD 1934, State University of Iowa. (GF)
SINCOVEC, R. F., Assistant Professor of Computer Science (1970). BS 1964, University of Colorado: MS 1967, Iowa State University; PhD 1968, Iowa State University
SIOTANI, MINURO, Professor of Statistics (1971). BA 1950, University of Tokyo: DSc 1962, Kyushu University
SLISHMAN, ILSE, Assistant Professor of Modern Languages (1959, 1969). BS 1958, Kansas State University; MA 1963, University of Kansas
SLOAT, FLOYD B., Associate Professor of Mathematics (1946, 1947). BA 1938, Ouachita College; MA 1941, University of Arkansas.
SLOOP, JEAN C., Assistant Professor of Music (1959). BA 1953, Gettysburg College; MA 1956, Eastman School of Music (University of Rochester).
SMITH, CHRISTOPHER C., Associate Professor of Biology: (1970). BA 1960, University of Colorado: MA 1963, PhD 1965, University of Washington.
SNYDER, VERYLE E.. Assistant Professor of Physical Education (1954). BS 1942, MS 1950, Kansas State University. (GF)
SOCOLOFSKY, HOMER E., Professor of History (1946, 1963). BS 1944, MS 1947, Kansas State University; PhD 1954, University of Missouri. (GF)
SPANGLER, JOHN D., Associate Professor of Physcis \((1965,1969)\). BS 1958, Kansas State University; PhD 1961, Duke University. (GF)
SPEARS, JANINA L., Assistant Professor of Mathematics (1970). BS 1961, University of Florida; MA 1964, University of Florida; PhD 1970, Kansas State University. (GF)
SPEARS, WILLIAM, Assistant Professor of Mathematics (1968). BS 1964, MS 1966, University of Florida. (GF)
SPERRY, ARTHUR BRADLEY, Professor of Geology Emeritus (192), 1953). BS 1919, University of Chichago. (GF)

SPIKER, STEVEN L., Instructor of Biology (1970). BS 1964, MS 1967, PhD 1970, University of Iowa
STACEY, KARL, Professor of Geography (1943, 1959). BA 1936, MA 1937, University of Colorado: PhD 1955, Clark University. (GF)

STAMEY, WILLIAM L., Dean; Professor of Mathematics; Acting Director of Bureau of General Research (1953, 1970). AB 1947, Colorado State College: MA 1949, PhD 1952, University of Missouri. (GF)
STEINBAUER, ROBERT ANDRUS, Professor and Chairman, Department of Music (1970). BM 1950, University of Michigan; MM 1951, University of Of Music (1970). BM 1950, University of Michigan; MM 195
Michigan: Doc of Music 1959, Indiana University. (GF)
STEUNENBERG, THOMAS BERNARD, Professor of Music (1947). BME 1933, Northwestern University; MM 1938, University of Michigan; PhD 1947, Eastman School of Music (University of Rochester). (GF)
STEWART, DONALDC., Assistant Professor of English (1968). BA 1952, MA 1955. University of Kansas; PhD 1962, University of Wisconsin. (GF)

STOVER, STEPHEN L., Associate Professor of Geography (1964, 1969). AB 1940, McPherson College; MA 1941, University of Kansas; MS 1955, PhD 1960, University of Wisconsin. (GF)
STROMBERG, KARL ROBERT, Professor of Mathematics (1968). BA 1953, MA 1954, University of Oregon ; PhD 1959, University of Washington.
SULEIMAN, MICHAEL WADIE, Associate Professor of Political Science (1965, 1968). BA 1960, Bradley University; MS 1962, PhD 1965, University of Wisconsin. (GF)
SWEEDLUN, VERNE SEBASTIAN, Professor of History Emeritus (1941, 1970). AB 1923, Bethany College; MA 1928, University of Kansas ; PhD 1940, University of Nebraska. (GF)
SWIETLICKI, ALAIN, Instructor in Modern Languages (1968). BA 1962, Kansas State University; MA 1965, University of Texas.
SWILER, JAMES P., Instructor of Art (1970). BSE 1966, Kansas State Teachers College; MFA 1970, Wichita State University.
TATSCHL, ANNEHARAK., Instructor of Biology (1970). BS 1964, MS 1966, University of New Mexico; PhD 1970, University of Kansas.
TAYLOR, ROBERT BARTLEY, Associate Professor of Anthropology (1957 1969). BS 1949. Wheaton College; MA 1956, PhD 1960, University of Oregon. (GF)
TERRILL, HAROLD JAMES, Assistant Professor in Modern Languages (1967, 1970). BA 1953, Kansas University; MA 1960, Phillips University (Germany); PhD 1969, University of California.
THOMAS, LLOYDB., Assistant Professor of Economics (1968). AB 1963, AM 1964, University of Missouri; PhD 1971, Northwestern University.
THOMPSON, CHARLES P., Associate Professor of PSychology (1965, 1967). BS 1958, Wisconsin State College: MS 1960. PhD 1962, University of Wisconsin. (GF)
THOMPSON, FRANK JAMES, Assistant Professor of Physical Education (1937, 1949). BEd 1934, Minnesota State Teachers College (Mankato), MEd 1936, Springfield College (Massachusetts). (GF)
THOMS, JANICE L., Instructor of Speech (1969). BA 1964, Augustana College; MA 1969, Kansas State University.
TIDD, CHARLES KIM, Assistant Athletic Director and Business Manager of Athletics (1969). BS 1954, lowa State University.
TIEMEIER, OTTO WILLIAM, Professor of Biology; Wildlife Conservationist, Agr. Exp. Sta. (1947, 1964). AB 1937, MA 1939, University of Kansas; PhD 1947, University of lllinois. (GF)
TILGHMAN, BENJAMIN R., Professor of Philosophy and Head of Department of Philosophy (1967). AB 1950, MA 1954, Washington University; PhD 1959, University of Washington. (GF)
TOMASCH, ELMER JOHN, Associate Professor of Drawing and Painting (1947, 1959). BS 1935, Western Reserve University; MS 1956, Kansas State (1947, 1959). BS 1935 ,
University. (GF)
TRUMP, THOMAS N., Assistant Professor, Computer Science (1970). AB 1964, Rice University; MS 1966, Purdue University.
TUBBS, LEVARD, Instructor in Aerospace Studies (1970). (GF)
TUMOLILLO, THOMAS A., Assistant Professor of Physics (1969). BS 1963, MS 1964, PhD 1969, University of llinois.
TWISS, PAGE CHARLES, Professor and Head of Geology (1953, 1969). BS 1950, MS 1955, K.ansas State University: PhD 1959, University of Texas. (GF)
UHLARIK, JOHN JEFFERY, Assistant Professor of Psychology (1970). BS 1965, University of Wisconsin; MS 1967, University of Washington; PhD 1970, University of Washington. (GF)
UNGER, ELIZABETH A., Assistant Professor of Computer Science; Associate Director, Computing Center (1966, 1969). BS 1961, MS 1963, Michigan State University.
URBAN, JAMES E., Assistant Professor of Biology (1970). BA 1965, PhD 1968, University of Texas.
VAN SWAAY, MAARTEN, ASsociate Professor of Chemistry (1963, 1968). BS 1951, Leiden University, Netherlands; PhD 1956, Princeton University: "Drs"' 1956, Leiden University, Netherlands. (GF)
VAN TASSEL, WESLEY HARVEY, Assistant Professor of Speech (1969). BS 1960, Moorhead State College; MA 1963, University of North Carolina; PhD 1969, University of Denver. (GF)
VAZQUEZ, BURNEY L., Assistant Professor of Modern Languages (1965). BA 1950. Washburn University; MS 1953, Kansas State Teachers College; PhD 1964, University of Kansas. (GF)
VILCOV, NICOLAE, Research Associate in Department of Physics (1970) Certif. 58023, 1953, Buchares \(\uparrow\) Polytechnical Institute; MD 1969, Buchares \(t\) University; PhD 1959, Bucharest Polytechnical Institute.
VOGT, JOHN L., Associate Professor of Art (1963). BFA 1960, Kansas City Art Institute; MFA 1963, University of Illinois. (GF)
WALKER, RODNEY G., Assistant Professor of Music (1966). BME 1959, University of Nebraska; MME 1961, Wichita State University.
WALKER, WARREN VINCENT, Professor of Music (1948, 1959). BA 1946, University of Washington; MM 1948, Cincinnati Conservatory of Music. (GF)
WALL, HINDMAN P., Administrative Assistant, Athletics (1967). BS 1958, Auburn University.
WALL, JR., ROBERT A., Instructor in Aerospace Studies (1968).
WALLER, RAY A., Associate Professor of Statistics; Consultant, Agr. Exp. Sta. (1967). BA 1959, Southwestern College; MS 1963, Kansas State University; PhD 1967. The Johns Hopkins University. (GF)

WALTERS, CHARLES P., Associate Professor of Geology (1936, 1958). BS 1936, MS 1937, Kansas State University; PhD 1957, Cornell University. (GF)
WAMPLER, RICHARD S., Assistant Professor of Psychology (1969). AB 1964, Indiana University: PhD 1970, University of Pennsylvania.
WARDELL, DAVID B., Instructor in Physical Education (1969). BS 1963, University of Colorado.
WAUTHIER, RAYMOND AUGUST, Associate Professor of Physical Education (1949). BS 1945, Albion College; MS 1947, Drake University (GF)
WEAVER, OLIVER LAURENCE, Assistant Professor of Physics (1970). BS 1965, California Institute of Technology; PhD 1970, Duke University.
WEBER, HARRY OSBORN, Assistant Professor of English (1970). AB 1959, University of Minnesota. (GF)
WEIGEL, LAWRENCE N., Assistant Coach of Athletics (1969). BS 1967, BS 1968, MS 1968, Kansas State University.
WEINBERG, ROGER, Associate Professor of Computer Science (1970). BS 1951, Tulane University; PhD 1954, University of Texas; PhD 1970, University of Michigan. (GF)
WEIS, JERRY S., Assistant Professor and Assistant Director, Division of Biology; Plant Physiologist, Agr. Exp. Sta. (1966). AB 1958, Kansas Wesleyán University; MA 1960, PhD 1964, University of Kansas. (GF)
WEST, RONALD R., Assistant Professor of Geology (1969). AA 1955, Cen tralia Junior College; BS 1958, University of Missouri at Rolla; MS 1962 University of Kansas; PhD 1970, University of Oklahoma. (GF)
WHITE, ALFRED EVERETT, Professor of Mathematics Emeritus (1909, 1950). BS 1904, MS 1909, Purdue University. (GF)

WHITE, MARY FRANCES, Associate Professor of English (1947, 1951). BS 1928, MS 1930, Kansas State University; PhD 1955, Denver Úniversity (GF)
WILCOXON, GEORGE DENT, Professor of History (1946, 1948). AB 1936, MA 1938, PhD 1941, University of California at Los Angeles. (GF)
WILLIAMS, DUDLEY, Distinguished Regents Protessor of Physics (1964) AB 1933, MA 1934, PhD 1936, University of North Carolina. (GF)
WILLIAMS, LARRY G.. Assistant Professor of Biology (1970). BS 1961, MS 1963, University of Nebraska; PhD 1968, California Institute of Technology.
WILLIAMS, NETA C., Instructor of Speech (1970). BA 1958, MA 1970, Kansas State University.
WILLIAMS, ROBERT E., Assistant Professor of Mathematics (1965). BS 1959, MA 1961, PhD 1965, University of Missouri. (GF)
WILLIAMS, TIMOTHY ALDEN, Associate Professor of Political Science (1967). AB 1954, Davidson College; PhD 1964, University of North Carolina. (GF)
WILLMING, EDWARD A., Associate Professor of Aerospace Studies (1968). BA 1954, Coe College; MA 1967, Inter.American University.
WILSON, FRED E., Associate Professor of Biology; Physiologist, Agr. Exp. Sta. (1965). AB 1958, MA 1960, University of Kansas; PhD 1965, Washington State University. (GF)
WIMMER, EDWARD JOSEPH, Professor of Biology (1928, 1941). AB 1925, MA 1927, PhD 1928, University of Wisconsin. (GF)
WINEGAR DNER, CARROLL, Instructor in Art (1966). BFA 1960, Kansas City Art Institute; MFA 1963, University of Oklahoma.
WISTRAND, LILAMAY, Assistant Professor of Speech (1969). BA 1966, MA 1968, PhD 1969, University of Texas. (GF)
WOLDT, GRACE S., Instructor in Mathematics Emerita (1946). AB 1927, Ohio Weslevan University.
YEE, KANE, Associate Professor of Mathematics (1968). BS 1957, MS 1958, PhD 1963, University of California, Berkeley. (GF)
YOUNG, PAUL M., Professor of Mathematics, Vice President for University Development (1970). AB 1937, Miami University; MA 1939, Ohio State University: PhD 1941, Ohio State University.
ZIMMERMAN, JOHN L., Associate Professor of Biology (1963, 1968). BS 1953, MS 1958, Michigan State University; PhD 1963, University of Illinois. (GF)
ZOLLMAN, DEAN ALVIN, Assistant Professor of Physics (1970). BS 1964, Indiana University: MS 1965, Indiana University; PhD 1970, University of Maryland

\section*{College of Business Administration}

ALLEN, JR., A. DALE, Associate Professor of Business Administration (1967, 1968). BS 1959, MBA 1960, Indiana University; DBA 1966, University of Colorado. (GF)
BARTON-DOBENIN, JOSEPH, Director of Management Services, Associate Professor of Business Administration (1958, 1967). BS 1956, MA 1958,PhD 1966, University of Nebraska. (GF)
BUZENBERG, MILDRED E., Assistant Dean; Assistant Professor of Business Administration (1964, 1968). BA 1938, Michigan State University; MS 1951, Kansas State University.
CLARK, WILLIAM J., Professor of Business Administration (1946, 1961). BS 1929, Kansas State Teachers College (Pittsburg); MA 1940, State University of Iowa; CPA 1954, Kansas. (GF)
COLEMAN, RAYMOND J., Associate Professor of Business Administration (1965, 1969). BS 1948, University of Kansas; MA 1963, Central Missouri State College; PhD 1967, University of Arkansas. (GF)
FOX, KENNETH L., Associate Professor of Busniess Administration (1969) BA 1953, MA 1960, Baylor University; CPA 1958, Texas and Louisiana; Ph D 1966, University of Illinois. (GF)
GILKISON, PAUL D., Associate Professor of Business Administration (1962, 1967). BS 1959, MBA 1960, University of Kansas; DBA 1964, University of Colorado. (GF)

GRAHAM, JOHN, Assistant Professor of Business Administration (1970). BA 1967, Kansas State University: MBA 1968, PhD 1970, University of Arkansas.
GUDGELL, DOROTHY B., Assistant Professor of Business Administration (1943,1954) BS 1938, MS 1946, Kansas State University.
GUGLER, MERLE E., Associate Professor of Business Administration (1947, 1959). BS 1940, Kansas State Teachers College (Emporia); MS 1948, Kansas State University; CPA 1956, Kansas. (GF)
HATHAWAY, WANDA J., Instructor (Temp.) in Business Administration (1970). AA 1960, Graceland College; BS 1902, Kansas State College of Pittsburg: MS 1968, Kansas State Teachers College (Emporia).
HOLLINGER, ROBERT D., Instructor in Business Administration (1966). BS 1964, MS 1968, Kansas State University.
HUBBARD, CHARLES W., Assistant Professor of Business Administration (1970). BA 1963, MBA 1965, University of Houston; PhD 1970, University of Arkansas. (GF)
JONES, C. CLYDE, Professor of Business Administration (1960). AB 1944, Marshall University; MA 1950, PhD 1954, Northwestern University. (GF)
KING, ALBERT S., Assistant Professor of Business Administration (1969). BBA 1962, MBA 1966, West Texas State University; DBA 1970, Texas Technological University.
LAUGHLIN, EUGENE J., Associate Dean; Professor of Business Ad ministration (1955, 1970). BS 1951. Rockhurst College; MS 1959, Kansas State University; CPA 1980, Kansas; PhD 1965, University of Illinois. (GF)
LYNN, ROBERT A., Dean, Professor of Business Administration (1968). BS 1951, Maryville College; MS 1955, University of Tennessee; PhD 1958, University of Illinois. (GF)
McMANIS, DONALD L., Assistant Professor of Business Administration (1970). BS 1949, MBA 1968, University of lowa

MULANAX, ALVIN E., Associate Professor of Business Administration (1947, 1966). BS 1946, ḾS 1951, Kansas State University. (GF)
RAPP, CHARLES W., Assistant Professor of Business Administration (1955, 1968). BS 1931, MS 1946, Kansas State Teachers College (Emporia)

RICHARDS, VERLYN D., Associate Professor of Business Administration (1965, 1969). BS 1956, MS 1960, Kansas State University; CPA 1961, Kan sas; PhD 1967, University of Illinois.
RILEY, MERRILL J., Assistant Professor of Business Administration (1966) BS 1951, John Brown University; MBA 1955, University of Arkansas.
THIESSEN, EMIL A., Assistant Professor of Business Administration (1968) AB 1948, Tabor College; MS 1951, Kansas State Teachers College (Emporia): EdD 1959, Colorado State College.
TUXBURY, WILLIAM D., Assistant Professor of Business Administration (1961) BBA 1946, Southern Methodist University: MBA 1949, Nor thwestern University: CPA 1954, Texas.
VADEN, RICHARD E., Assistant Professor of Business Administration (1969) BBA 1960, The University of Texas at Austin; MBA 1965, DBA 1970. Texas Technological University. (GF)

\section*{College of Education}

AGAN, RAYMOND JOHN Professor of Education (1958, 1963). BS 1940, MS 1950, Iowa State University; EdD 1955, University of Missouri. (GF)
ALBRACHT, JAMES J., Associate Professor of Education (1966, 1970). BS 1948, MS 1954, University of Nebraska; PhD 1966, Michigan Słate University (GF)
ALFORD, HAROLD J., Professor and Director, Continuing Education (1970). BA 1938, MA 1951, University of Washington; PhD 1966, University of Chicago
APEL, J. DALE, Associate Professor: Associate State Club Leader (1962 1967). BS 1950, Kansas State University; MS 1961, The American University; PhD 1966, University of Chicago. (GF)
BAKER, HARRY LEIGH, Professor of Education Emeritus (1946, 1963). AB 1920. LLD 1951, Baker University; BS 1922, Kansas State University; AM 1928, University of Chicago; PhD 1934, Yale University. (GF)
BARTEL, ROY A., Associate Professor of Education and Coordinator of Student Teaching \((1963,1970)\). AB 1942, Bethel College; MSE 1949, EdD 1959, University of Kansas. (GF)
BLOOMQUIST, MARGARET CHRISTINE, Instructor in Education and Director of Student Personnel Services (1967). AB 1941, Bethany College; MBA 1949, University of Denver.
BOYER, JAMES BUCHANAN, Associate Professor of Education (1971). BS 1956, Bethune Cookman College, Daytona Beach, Florida; MEd 1964, Florida A \& M University; PhD 1969, Ohio State University.

BRADLEY, HOWARD RALEY, Associate Professor of Education (195), 1963). BS 1930, MS 1937, Kansas State University. (GF)

BYARS, JACKSON A., Assistant Professor (1969). BA 1959, Municipal University of Omaha; MA 1964, Colorado State College, 1970; EdD 1970, University of Nebraska.
CAINE, HOMER D., Assistant Professor of Education and Music (1966). BM 1940, Drake University; MS 1957, Kansas State University. (GF)
CAMPBELL, ALBERT B., Assistant Professor (1970). BS 1956, Fort Hays Kansas State College; MA 1963, Western State (Colorado); EdD 1970, Kansas State College; MA 1963
Arizona State University. (GF)
CLORE, ROBERT, Instructor (1970). BA 1968, MA 1970, University of Northern Colorado.
CRAIG, M. DOROTHY, Assistant Professor of Education (1959). BM 1931, Bethany College; BS 1941, Kansas State Teachers College (Emporia); MA 1944, Columbia University.
DANSKIN, DAVID G., Professor of PSychology (1959, 1966). AB 1950, University of Redlands; MA 1951, PhD 1954, Ohio State University. (GF)
DE MAND, JOHN WESLEY, Professor of Education (1940, 1959). AB 1937, University of Kansas; MS 1940, Kansas State University; EdD 1953, University of Colorado. (GF)

DICKINSON, JAY, Assistant Professor (1970). BS 1966, Southern Illinois University; MS 1970, Indiana University.
DIXON, LYLE, Professor of Mathematics (1963, 1969). BS 1948, MS 1950, Oklahoma State University; PhD 1963, University of Kansas. (GF)
DRISS, ANN NASH, Instructor in Education (1967). AB 1952, Washburn University; MS 1968, Kansas State Teachers College (Emporia).
ERPELDING, JR., LARRY H., Instructor (1970). BS 1965, MS 1969, Kansas State University.
FLANAGAN, BRUCE, Associate Professor of Speech (1966). BS 1953 Western Míchigan University; MS 1958, Southern Illinois University; PhD 1966, University of Florida. (GF)
GILDSETH, BRUCE L., Assistant Dean of Students, Assistant Professor (1968). BA 1962, Augsburg College: MA 1966, PhD 1968, University of Minnesota. (GF)
GILLUND, RODNEY C., Instructor in Education (1971). BS 1967, State Teachers College of Minot, N.D.: MA, University of Northern Colorado (Greeley)
GOODENOW, PHILIPE., Assistant Instructor in Education (1967). BA 1953. Kansas Wesleyan (Salina).
GREEN, FINIS MCGRADY, Professor of Education Emeritus (1948, 1967). BS 1922, Kansas State Teachers College (Pittsburg); MS 1929, University of Kansas; EdD 1949, University of Colorado. (GF)
GRIFFITH, MARY EVAN, Associate Professor (1969). BS 1950, Kansas State University; MS 1957, Iowa State University; PhD 1966, Ohio State University
HALL, LAWRENCE FENOR, Associate Professor of Education Emeritus (1926, 1966). BS 1923, MS 1927, Kansas State University. (GF)
HARLOW, STEVEN D., ASsociate Professor of Education (1971). AA 1960, Pueblo College; BA 1962 and MA 1963. Adams State College; PhD 1967 University of Nebraska.
HAUSE, RICHARD G., Associate Professor of Education (1966, 1970). AB 1954, MA 1955, Colorado State College; EdD 1966, University of Colorado. (GF)
HAZLETT, EMERSON L., Instructor in Education, Economics and Com merce (1969). BS 1948, MS 1964, University of Kansás.
HOLEN, MICHAEL C., Assistant Professor of Education (1971). BA 1967, Stanford University; MA 1968 and PhD 1971, University of Oregon.
HOYT, DONALD P., Professor and Director of Office of Educational Research (1968). BS 1948, University of lllinois; MA 1950, PhD 1954, University of Minnesota. (GF)
HUDSON, WANDA L., Instructor in Education (1966). BS 1949, MEd 1957, University of Texas
JAMES, RORERT K., Assistant Professor (1969). BS 1959, Northwest Missouri State; MA 1962, University of Northern lowa; PhD 1969, University of lowa. (GF)
JOHNSON, ROBERT L., Professor and Coordinator of Extension Personnel Training (1965). BS 1951, University of Nebraska; MS 1956, PhD 1958, University of Wisconsin. (GF)
KAISER, HERBERT EMIL, Associate Professor of Education (1961, 1969). BS 1941, Concordia Teachers College; MS 1943, Oklahoma State Univer sity; PhD 1959, University of Nebraska. (GF)
KASPER, EUGENE C., Dean of Students, Associate Professor of Education (1968). BS 1956, MS 1956, Kansas State Teachers College: EdD 1963, University of North Dakota. (GF)
KAUPP, CLAYTON LOUIS, Instructor (1970). BA 1964, Fort Hays Kansas State College; MA 1968, Kansas State University.
KEYS, SAMUEL R., Professor and Dean of College of Education (1969). AB 1948, Olivet College, Kankakee, Illinois; MA 1949, University of Missouri Kansas City; PhD 1959, University of Minnesota. (GF)
KING, KENNETH L., Assistant Professor of Education (1969). AA 1962, Sayre Junior College, Sayre, Oklahoma; BA 1964, Southwestern State College, Weatherford, Oklahoma: MEd 1968, EdD 1969, University of Oklahoma. (GF)
KITTLESEON, HOWARD M., Assistant Professor of Education (1969). BS 1965, MA 1966, PhD 1969, University of Minnestoa. (GF)
KURTZ, VERNONRAY, Associate Professor (1970). BS 1955, MS 1959, Fort Hays Kansas State College; EdD 1967, University of Nebraska. (GF)
LAUGHERY, WAYNE W., Associate Professor of Education (1967). BS 1948, MA 1955, San Diego State College; EdD 1958, Teachers College, Columbia MA 1955, San Dieg
University. (GF)
LITTRELL, J. HARVEY, Professor of Education (1954, 1966). BA 1935, Iowa State Teachers College; MA 1939, State University of lowa; EdD 1950, University of Missouri. (GF)
LITZ, CHARLESE., Assistant Professor of Education (1971). BA 1963, Ohio University: MA 1967, University of Michigan; PhD 1970, University of Michigan.
LOEB, JOE HENRY, Assistant Professor of Education (1956). BA 1948, Northeastern State College: MS 1951, Kansas State Teachers College (Pittsburg): EdD 1957, University of Arkansas. (GF)
MCANARNEY,HARRY EDWARD, Assoclate Professor of Education (1957, 1966). BS 1943, Kansas State Teachers College (Emporia); MS 1947, EdD 1958. University of Kansas. (GF)

MCCAIN, JAMES ALLEN, President (1950). Professor of Higher Education (1970). AB 1926, LLD 1951, Wofford College: MA 1929, Duke University; EdD 948, Stanford University, LLD 965, Montana State University, LLD 1965, Colorado State University: DSc 1967, Andhra Pradesh State University (India).
MCILVAINE, JOSEPH, Assistant Professor (1970). BS 1961, Pennsylvania State University; MS 1967, Central Missouri State College; PhD 1970. Oh io University.
MEISNER, ROBERT G., Associate Professor and Head, Department of Adult and Occupational Education (1969). BS 1948, Oklahoma A \& M College: MS 1957. Oklahoma State University: EdD 1967, University of Collifornia, Berkeley. (GF)
MOGGIE, MAURICE CHARLES, Professor of Education (1930, 1945). BS 1929, MS 1931, Kansas State University; PhD 1941, Ohio State University. (GF)

MOORE, ARNOLD J., Protessor of EdUcation and Head, Department of Curriculum and Instruction (1967). BA 1949, State College of Iowa; MA 1955, PhD 1961, State University of Iowa. (GF)
NELSON, WILLARD J., Instructor in Education (1971). AA 1952, Luther Junior College; BA 1954, Bethany College.
NORDIN, MARGARET N., Associate Dean of Students and Dean of Women, Associate Professor (1957). BS 1941, MA 1953, PhD 1962, University of Minnesota
O'FALLON, OWEN KENNETH, Professor of Education (1950, 1958). AB 1937. MA 1941, Western State College of Colorado; EdD 1952. University of Colorado. (GF)
OLSON, GEORGE ARTHUR, Professor of Education Emeritus (1949, 1969). \(A B\) 1928, AM 1931, University of Kansas: PhD 1953, Northwestern University. (GF)
OWENS, RICHARD E., Associate Professor of Education (1964, 1969). AB and BS 1949, Northwest Missouri State College; MA 1953, EdD 1964, University of Northern Colorado. (GF)
PAUL, WARREN I., Assistant Professor of Education (1969). AB 1954, Rutgers, the State Úniversity; AM 1966, Newark State College, Union, N.J.
PRICE, FLOYDHAMILTON, Associate Professor of Education (1963, 1965). AB 1951, Friends University; MEd 1957, Wichita State University; EdS 1960, George Peabody College; EdD 1965, University of Oklahoma. (GF)
REPLOGLE, RENATAJ., Instructor in Education and Art (1966). AB 1963, AM 1964, Colorado State College.
ROSCOE, JOHN T., Professor of Education and Head of Department of Administration and Foundations (1968, 1970). BE 1961, Colorado State University: AM 1963, PhD 1965, University of Northern Colorado. (GF)
RUMBAUGH, WELCOME, Instructor (1970). BS 1952, MS 1963, Oregon State
RUST, LUCILE OSBORN, Professor of Education Emerita (1924, 1960). BS 1921, Kansas State Teachers College (Pittsburg); MS 1922, Kansas State University. (GF)
SARTHORY, JOSEPH A., Associate Professor of Education (1969). BA 1961, MA 1964, PhD 1967, University of New Mexico. (GF)
SCHELL, LEO M., Associate Professor of Education (1966, 1969). AB 1955, Bethany College; MS 1962, University of Kansas; PhD 1964, University of Iowa. (GF)
SCHROEDER, ARDINA, Instructor in Education (1971). BS 1960, Bethel College: MS 1962 and EdSpec 1964, Kansas State Teachers College.
SCOTT, ROBERT, Associate Professor of Education (1970). AA 1951, Independence, Kansas Junior College: BS 1953, MS 1956, Kansas State Teachers College; EdD 1965, University of Missouri. (GF)
SMETHERS, HOWARD DEWIGHT, Assistant Professor of Education (1947, 1951). BS 1927, Kansas State Teachers College (Emporia); MS 1935, Kansas State University.
STEFFEN, JOHN D., Assistant Professor, Center for Student Development (1967). BA 1956, Hamline University; PhD 1968, University of Minnesota. STRICKLAND, VIVAN LEWIS, Professor of Education Emeritus (1917. 1950). AB 1906, MS 1915, PhD 1925, University of Nebraska. (GF)

SULLIVAN, RITA J., Instructor in Education (1966). BS 1956, Kansas State Teachers College (Pittsburg); MS 1964, University of Kansas.
TRENNEPOHL, HARLAN JEAN, Associate Professor of Education (1956, 1983). BS 1947, MS 1951, Kansas State Teachers College (Emporia); EdD 1956, University of Colorado. (GF)
UTSEY, JORDAN, Associate Professor of Education (1969). BA 1952, College of Idaho; MEd 1958, EdD 1963, University of Oregon. (GF)
WISSMAN, JANICE R., Instructor in Education (1968). BS 1963, MS 1988, Kansas State University.

\section*{College of Engineering}

AHMED, NASIR, Associate Professor of Electrical Engineering (1968). BS 1961, University College of Engineering, Bangalore, India; MS 1962, PhD 1966, University of New Mexico. (GF)
ALNEMA, MUDHAFAR AHMED, Instructor in Electrical Engineering (1971). BS 1960, Baghdad University; MS 1969, University of Kansas.

AKINS, RICHARD GLENN, Associate Professor of Chemical Engineering (1963, 1967). BS 1957, MS 1958, University of Louisville; PhD 1962, Northwestern University. (GF)
ANDERSON, CARL ELMER, Instructor in Agricultural Engineering, Agricultural Experiment Station (1967). BS 1962, Pennsylvania State University; MS 1965, University of Arizona. Professional Engineer, 1967. ANNIS, JASON CARL, Assistant Professor of Mechanical Engineering, Associate, Institute for Envrionmental Research (1959, 1969). BS 1953, University of Minnesota; MS 1956, Michigan College of Mining and Technology; PhD 1969, Kansas State University. (GF)
APPL, FREDRIC CARL, Jennings Distinguished Professor of Mechanical Engineering (1960, 1964, 1967). BS 1954, MS 1955, PhD 1958, Carnegie In. stitute of Technology. (GF)
ASHOUR, ELSAID A., Associate Professor of Industrial Engineering (1967, 1970). "Diploma Ingenieurd" 1955, "Technische Hochschule", Muenchen, 1970). "Diploma Ingenieurd" 1955, "Technische Hochschule", Muenchen, Germany;
lowa. (GF)
AZER, NAIM ZAKE, Associate Professor of Mechanical Engineering; Associate, Institute for Environmental Research (1958, 1964). BS 1950, MS 1954, University of Alexandria, Egypt; PhD 1959, University of Illinois. (GF)
BALL, HERBERT DEAN, Assistant Professor of Mechanical Engineering (1958). BS 1956, MS 1958, University of Nebraska.

BATES, HERBERT TEMPLETON, Professor of Chemical Engineering (1958, 1960). BS 1935, Iowa State University; MS 1938, Virginia Polytechnic Institute; PhD 1941, Iowa State University. (GF)

BAUGHER, EARL EUGENE, Assistant Professor of Agricu!tural BELL, CLARENCE ALTON, Instructor in Mechanical Engineering (1964). BS 1953, MS 1955, Kansas State University
BENNETT, CORWIN A., Professor of Industrial Engineering; Associate, Institute for Environmental Research (1970). BS 1950, Iowa State University; MA 1951, PhD 1954, University of Nebraska.
BEST, CECIL HAMILTON, Professor of Applied Mechanics: Associate Dean (1961, 1964, 1968). BS 1955, MS 1956, PhD 1960. University of California. Professional Engineer, 1962. (GF)
BLACKBURN, JACK BAILEY, Professor: Head, Department of Civil Engineering (1963). BS 1947, Oklahoma University; MS 1949, PhD 1955, Purdue University. Professional Engineer, 1950. (GF)
BRAINARD, BOYD BERTRAND, Professor of Mechanical Engineering Emeritus (1923, 1938, 1967). BS 1922, University of Colorado; SM 1931, Massachusetts Institute of Technology. Professional Engineer, 1945.
BUSSEY, LYNN E., Associate Professor of Industrial Engineering (1971). BS 1947, Cornell' University; MS 1969, PhD 1970, Oklahoma State University.
BYERS, EARL CONRAD, Assistant Professor of Industrial Engineering (1946, 1956). AB 1941, Greenville College; MS 1954, Kansas State University.
CALCOTE, LEE ROY, Professor of Applied Mechanics (1970). BS 1948, MS 1952, Texas \(A\) and \(M\); PhD 1963, University of Illinois. Professional Engineer in Texas, 1953. (GF)
CASEY, JR., KENDALL FRANCIS, ASsociate Professor of Electrical Engineering (1970). BS 1961, California Institute of Technology; MS 1962, PhD 1965, University of Southern California. (GF)
CHEZEM, CURTIS G., Professor; Head, Department of Nuclear Engineering (1969). BA 1951, MA 1952, University of Oregon; PhD 1957. Engineering (1969). BA 1951, MA
Oregon State University. (GF)
CHUNG, DO SUP, Associate Professor of Agricultural Engineering (1965, 1966). BS 1958, Purdue University; MS 1960. PhD 1965, Kansas State University. (GF)
CLACK, ROBERT WYNANDUS, Assistant Professor of Nuclear Engineering; Director of Nuclear Reactor Facility (1955, 1959, 1969). BS 1943, U.S. Naval Academy. Professional Engineer, 1956.
CLARK, STANLEY JOE, Associate Professor of Agricultural Engineering; Agricultural Experiment Station (1966). BS 1954, MS 1959, Kansas State University; PhD 1966, Purdue University. Professional Engineer, 1969. (GF)
CLARK, STANLEY R., Instructor in Agricultural Engineering (1969). BS 1969, MS 1971, Kansás State University
CLIFTON, JOHN PAUL, Associate Professor of Industrial Engineering Emeritus (1947, 1956, 1971). BS 1929, University of Kansas; MS 1956, Emeritus (1947, 1956, 1971). BS 1929, University of Kansas
Kansas State University. Professional Engineer, 1956. (GF)
CONVERSE, HARRY H., Associate Professor of Agricultural Engineering (1966). BS 1946, MS 1947, Kansas State University. U.S.D.A., Tran. sportation and Facilities Research Division.
COOPER, PETER B., Associate Professor of Civil Engineering (1966, 1968). BS 1957, MS 1960, PhD 1965, Lehigh University. Professional Engineer, 1969. (GF)

COTTOM, MELVIN CLYDE, Assistant Professor of Electrical Engineering (1955). BS 1945, MS 1948, University of Kansas. Professional Engineer in Kansas, 1947; in Missouri, 1952
CRANK, ROBERT EUGENE, Professor of Mechanical Engineering (1947, 1969). BS 1947, MS 1950, Kansas State University. Professional Engineer, 1949. (GF)

CRARY, JAMES FRED, Assistant Professor of Applied Mechanics (1947, 1952). BS 1947, Kansas State University; MS 1969, Oklahoma State University. Professional Engineer, 1948.
CRAWFORD, WILLIAM WESLEY, Associate Professor of Civil Engineering Emeritus (1923, 1942, 1949). BDi 1903, MDi 1905, lowa State Teachers College; AB 1912, BS 1917, Iowa State University.
DAR BY, EARL G., Professor of Industrial Arts Emeritus (1941, 1952, 1963). BS 1923, MS 1943, Kansas State University.
DIETRICH, HARVEY F., Assistant Professor of Industrial Arts Emeritus (1948, 1957, 1967). BS 1957, Kansas State University.
DOLLAR, JOHN PAUL, Instructor in Electrical Engineering (1960). BS 1956, MS 1966, Kansas State University
DONNERT, HERMANN JAKOB ANTON, Professor of Nuclear Engineering (1966, 1969). PhD 1951, Leopold-Franzens University, Austria. (GF)
DUNCAN, ALLEY H., Professor of Mechanical Engineering (1942, 1954). BS 1937, MS 1949, Kansas State University. Professional Engineer, 1948. (GF)
DURLAND, MERRILL AUGUSTUS, Dean and Director Emeritus; Professor of Mechanical Engineering Emeritus (1919, 1961, 1967). BS 1918, MS 1923, Kansas State University. Professional Engineer, 1935.
ECKHOFF, N. DEAN, Assistant Professor of Nuclear Engineering; Director of Neutron Activation Analysis Labor atory (1961, 1968). BS 1961, MS 1963, PhD 1968, Kansas State University. (GF)
ERICKSON, LARRY EUGENE, Associate Professor of Chemical Engineering (1964, 1968). BS 1960, PhD 1964, Kansas State University. (GF)
FAIRBANKS, GUSTAVE EDMUND, Professor of Agricultural Engineering: Agricultural Engineer, Ágricultural Experiment Station (1941, 1957). BS 1941, MS 1950, Kansas State University. Professional Engineer, 1948. (GF)
FAN, LIANG-TSENG, Professor; Head, Department of Chemical Engineering; Director, Institute for Systems Design and Optimization: Kansas Power and Light Distinguished Professor; Associate, Institute of Environmental Research (1957, 1963, 1967). BS '1951, National Taiwan University; MS 1954, Kansas State University; PhD 1957. West Virginia University. (GF)
FAW, RICHARD EARL, Professor of Nuclear Engineering; Director of Shielding Facility (1962, 1966, 1968). BS 1959, University of Cincinnati; PhD 1962, University of Minnesota. (GF)

FENTON, FREDERICK CHARLES, Professor of Agricultural Engineering Emeritus; Agricultural Engineer, Agricultural Experiment Station (1928, 1961). BS 1914, MS 1930, Iowa State University. Professional Engineer, 1947.

FLINNER, ARTHUR ORAN, Professor of Mechanical Engineering (1929, 1947). BS 1929, MS 1934, Kansas State University; SM 1937, Massachuset ts Institute of Technology. Professional Engineer, 1937. (GF)
FRAZIER, FORREST FAYE, Professor of Civil Engineering Emeritus (1911, 1922, 1954). BS 1910, Ohio State University. Professional Engineer, 1931.

FUNK, MONROE LYLE, Assistant Professor of Civil Engineering (1956, 1961). BS 1956, MS 1960, Kansas State University. Professional Engineer, 1960.

GALLAGHER, RICHARD RAY, Assistant Professor of Electrical Engineering; Associate, Institute for Environmental Research (1968). BS 1964, MS 1966, PhD 1968, Iowa State University. (GF)
GERDIS, THOMAS A., Instructor: Engineering News Editor (1970). BA 1963, Evangel College; MS 1970, Kansas State University.
GOERING, EUGENE H., Instructor in Agricultural Engineering (1969). BS 1969. Kansas State University.

GORTON, ROBERT LESTER, Associate Professor of Mechanical Engineering; Associate, Institute of Environmental Research (1960, 1969). BS 1953, Louisiana Polytechnic Institute; MS 1960, Louisiana State University; PhD 1966, Kansas State University. Professional Engineer, 1953. (GF)

GOWDY, KENNETH KING, Associate Professor of Mechanical Engineering; Assistant Dean; Associate, Institute for Environmental Research (1957, 1965, 1969). BS 1955, MS 1961, Kansas State University; PhD 1965, Oklahoma State University. (GF)
GROSH, DORIS LLOYD, Assistant Professor of Industrial Engineering (1965, 1968). BS 1946, University of Chicago; MS 1949, PhD 1969, Kansas State University
GROSH, LOUIS E., Associate Professor of Industrial Engineering (1965, 1966). BS 1944, Louisiana State University; BS 1947, MS 1949, PhD 1954, 1966). BS 1944, Louisiana
Purdue University. (GF)

HAFT, EVERETT EUGENE, Professor of Applied Mechanics (1961). BS 1947, MS 1951, PhD 1955, University of Wisconsin. Prof essional Engineer in Wisconsin, 1952. (GF)
HALL, RAYMOND CLARENCE, Assistant Professor of Chemical Engineering (1950, 1952). BS 1941, Iowa State University; MS 1951, Kansas state University. (GF)
HANSEN, CARL ULLMAN, Assistant Professor of Industrial Engineering (1957, 1962). BS 1936, Kansas State University; MS 1961. University of Nebraska Professional Engineer, 1961.
HARRIS, FLOYD WAYNE, Associate Professor of Electrical Engineering (1965, 1969). BS 1956, University of Oklahoma; MS 1960, PhD 1965, Oklahoma State University
HEARN, JR., NORVAL KELLY, Instructor in Electrical Engineering (1969). BA 1951, Kansas State Teachers College; MS 1966, Kansas State (1969). BA 1951, Kansas State Teachers College; MS 1966, Kansas State
University.

HELANDER, LINN, Professor of Mechanical Engineering Emeritus (1935, 1961). BS 1915, University of lllinois. Professional Engineer, 1941.

HEYMACH, GEORGE JOHN, Assistant Professor of Chemical Engineering (1969). BS 1964, City College of the City University of New York: MS 1966, PhD 1969, University of Pennsylvania.
HIGHTOWER, RAY E., Assistant Professor of Nuclear Engineering (1961, 1969). BS 1964, Kansas State University.

HOBSON, LELAND STANFORD. Professor of Mechanical Engineering (1946, 1968). BS 1927, Kansas State University. Professional Engineer, 1946.

HODGES, TEDDY OMAR, Professor of Agricultural Engineering; Agricultural Engineer, Agricultural Experiment Station (1959). BS 1950, Agricultural Engineer, Agricultural Experiment Station (1959). BS 1950, University. Professional Engineer in lowa, 1952. (GF)
HONSTEAD, WILLIAM HENRY, Professor of Chemical Engineering; Director, Kansas Industrial Extension Service (1943, 1957, 1970). BS 1939, MS 1946, Kansas State University; PhD 1956, lowa State University. Professional Engineer, 1948. (GF)
HOSTETTER, ABRAM ELDRED, Professor of Industrial Engineering Emeritus (1931, 1952, 1969). BS 1925, McPherson College; MS 1932, PhD 1938, Kansas State University
HU, KUO-KUANG, Assistant Professor of Applied Mechanics \((1968,1969)\). Graduation, 1956, Taiwan Provincial Taipei Institute of Technology; MS 1966, PhD 1969, Kansas State University. (GF)
HUANG, CHI-LUNG, Associate Professor of Applied Mechanics \((1964,1968)\). BS 1954, National Taiwan University: MS 1960, University of lllinois; Doctor of Engineering 1964, Yale University. (GF)
HUMMELS, DONALD RAY, Assistant Professor of Electrical Engineering (1970). BS 1967, MS 1967, PhD 1969, Arizona State University. (GF)

HUNT, ORVILLE DON, Professor of Electrical Engineering Emeritus (1923, 1947, 1970). BS 1923, Washington State University; MS 1930, Kansas State University. Professional Engineer, 1947.
HWANG, CHING-LAI, Associate Professor of Industrial Engineering (1964, 1968). BS 1953, National Taiwan University; MS 1960, PhD 1962, Kansas State University. (GF)
JOHNSON, GARY LEE, Assistant Professor of Electrical Engineering (1966). BS 1961, MS 1963, Kansas State University; PhD 1966, Oklahoma State University. (GF)
JOHNSON, WILLIAM H., Professor: Head, Department of Agricultural Engineering (1970). BS Agriculture, BS Agricultural Engineering 1948, MS 1953, Ohio State University; PhD 1960, Michigan State University. Professional Engineer in Ohio, 1970. (GF)
JORGENSON, LOUIS, Professor of Electrical Engineering Emeritus (1925, 1951, 1954). BS 1907, MS 1931, Kansas State University.
KAUFMAN, DALE EDWARD, Assistant Professor of Electrical Engineering (1965, 1967). BS 1959, MS 1963, PhD 1967, Kansas State University. (GF)

KERCHNER, RUSSELL MARION, Professor of Electrical Engineering Emeritus (1922, 1934, 1965). BS 1922, University of lllinois; MS 1927, Kansas State University. Professional Engineer, 1945.
KIPP, JOHN EDWARD, Associate Professor of Applied Mechanics; Associate, Institute of Environmental Research (1956, 1969). BS 1951, MS 1955, University of Kansas; PhD 1968, Oklahoma State University. Professional Engineer, 1960. (GF)
KIRMSER, PHILIP GEORGE, Professor of Mathematics; Professor Head, Department of Applied Mechanics (1942, 1958, 1962). BS 1939, MS 1944, PhD 1958, University of Minnesota. Professional Engineer, 1961. (GF)
KLOEFFLER, ROYCE GERALD, Professor of Electrical Engineering Emeritus (1916, 1923, 1960). BS 1913, University of Michigan; MS 1930, Massachusetts Institute of Technology. Registered Engineer, 1945.
KNOSTMAN, HARRY DANIEL, Assistant Professor of Applied Mechanics (1957, 1965). BS 1951, MS 1961, Kansas State University: PhD 1965 Colorado University. Professional Engineer, 1959. (GF)
KOEPSEL, WELLINGTON WESLEY, Professor; Head, Department of Electrical Engineering (1964). BS 1944, MS 1951, The University of Texas PhD 1960, Oklahoma State University. Professional Engineer in Texas, 1952. (GF)

KONZ, STEPHAN ANTHONY, Professor of Industrial Engineering; Associate, Institute of Environmental Research (1964, 1969). BS 1956, MBA 1956. University of Michigan; MS 1960. State University of Iowa; PhD 1964 University of Illinois. (GF)
KRICK, MERLYN S., Assistant Professor of Nuclear Engineering (1970). BS 1959, Albright College; PhD 1966, University of Pennsylvania. (GF)
KYLE, BENJAMIN GAYLE, Professor of Chemical Engineering (1958, 1964). BS 1950, Georgia Institute of Technology; MS 1955, PhD 1958 University of Florida. (GF)
LARSON, GEORGE HERBERT, Professor of Agricultural Engineering; Agricultural Engineer, Agricultural Experiment Station (1939, 1950). BS 1939, MS 1940, Kansás State University; PhD 1955, Michigan State University. Professional Engineer, 1947. (GF)
LEE, E. STANLEY, Professor of Industrial Engineering (1966, 1970). BS 1953, Ordnance Engineering College, China; MS 1957, North Carolina State College: PhD 1962, Princeton University. (GF)
LENHERT, DONALD HOWARD, Associate Professor of Electrical Engineering (1966, 1969). BS 1956, Kansas State University; MS 1958 Syracuse University ; PhD 1966, University of New Mexico. (GF
LINDHOLM, JOHN C., Associate Professor of Mechanical Engineering (1960). BS 1949, Kansas State University; MS 1957, University of Kansas; PhD 1961, Purdue University. Professional Engineer, 1954. (GF)
LINDLY, EDWIN CURGUS, Associate Professor of Apllied Mechanics (1949, 1965). BS 1942, Oklahoma State University; MS 1949, Purdue University; MS 1957, Kansas State University; PhD 1964, lowa State University; MS 1957, Kansas State Universit
University. Professional Engineer, 1950. (GF)
LIPPER, RALPH IDEN, Associate Professor of Agricultural Engineering; Associate Agricultural Engineer, Agricultural Experiment Station (1946 1957). BS 1941, MS 1950, Kansas State University. Professional Engineer, 1953. (GF)

LUCAS, MICHAEL S. P., Professor of Electrical Engineering (1968, 1970). MS 1962, PhD 1964, Düke University. (GF)
MANGES, HARRY LEO, Associate Professor of Agricultural Engineering; Assistant Agricultural Engineer, Agricultural Experiment Station (1956 1963). BS 1949, MS 1959, Kansas State University; PhD 1969, Oklahoma State University. (GF)
MATTHEWS, JOHN CARTER, Associate Professor of Chemical Engineering (1962). BS 1959, DSC 1965, Washington University. (GF)
MCCORMICK, FRANK JAMES, Professor of Applied Mechanics (1939, 1947). BS 1927, MS 1931, Iowa State University. Professional Engineer, 1944. (GF)

MCDONALD, CHARLES RICHARD, Instructor in Applied Mechanics (1969). BS 1960, Kansas State University. Professional Engineer in Illinois 1964, in Indiana, 1966.
MCGINTY, RALPH J., Assistant Professor of Agricultural Engineering (1969). BS 1959, MS 1960, Kansas State University. Agricultural Research Service, U.S.D.A., Transportation and Facilities Research Division.
MCMILLAN, ALAN DREW, Instructor in Agricultural Engineering Agricultural Experiment Station (1967). BS 1967, Kansas State University
MCNALL, PRESTON ESSEX, Professor; Head, Department of Mechanical Engineering; Associate Director; Institute for Environmental Research (1965, 1968). BS 1947, University of Wisconsin; MS 1949, PhD 1951, Purdue University. (GF)
MERKLIN, JOSEPH FREDERICK, Associate Professor of Nuclear Engineering (1967). BS 1957, Manhattan College of New York; PhD 1963, University of Minnesota. (GF)
MESSENHEIMER, ALVA ERNEST, Associate Professor of Mechanica Engineering Emeritus (1942, 1963, 1971). BS 1924, Kansas State University Professional Engineer, 1948.
MEYER, WALTER, Professor of Nuclear Engineering (1964, 1968). BS 1956, MS 1957, Syracuse University; PhD 1964, Oregon State University. (GF) MILLER, PAUL LEROY, Associate Professor: Assistant Head, Department of Mechanical Engineering; Director of Institute for Effective Teaching, Associate, institute for Environmental Research (1958, 1968 1969). BS 1957, MS 1961, Kansas State University; PhD 1966, Oklahoma tate University. Protessional Engineer, 1962. (GF)
MINGLE, JOHN ORVILLE, Professor of Nuclear Engineering; Director, Institute for Computational Research in Engineering (1956, 1965). BS 1953 MS 1958, Kansas State University; PhD 1960, Northwestern University. Professional Engineer, 1961. (GF)
MORSE, REED FRANKLIN, Professor of Civil Engineering Emeritus (1923, 1945, 1968). BA 1921, Cornell College; BS 1928, lowa State University; MS 1933, Kansas State University; PhD 1941, Cornell University Professional Engineer, 1939.
MUNGER, HAROLD HAWLEY, Associate Professor of Applied Mechanics Emeritus (1939, 1954, 1961). BS 1939, MS 1941, Kansas State University Professional Engineer, 1941.
MURPHY, JAMES PATRICK, Instructor in Agricultural Engineering (1968). BS 1968, BS 1969, MS 1970, Kansas State University.

NASH, RODNEY TRUMAN, Instructor in Mechanical Engineering (1968). BS 1967, MS 1969, Kansas State University. Professional Engineer, 1968. NELSON, CLARENCE LESLIE, Instructor in Industrial Engineering

NESMITH, DWIGHT ALVIN, Associate Professor of Engineering; Director, Engineering Experiment Station (1948, 1958, 1969). BS 1948, Northwestern University; MS 1952, Kansas State University. Professional Engineer, 1962.

NEVINS, RALPH GRIFFITH, Director, Institute for Environmental Research; Professor of Mechanical Engineering; Dean, College of Engineering (1948, 1962, 1967). BS 1945, BME 1947, MS 1949, University of Engineering ( \(1948,1962,1967\) ). BS 1945, BME 1947, MS 1949, University of
Minnesota; PhD 1953, University of Illinois. Professional Engineer, 1948. (GF)
PAULI, ROSS IRWIN, Assistant Professor of Mechanical Engineering (1947, 1954). BA 1941, Westmar College; MS 1947, Kansas State College of Pittsburg
RETZLOFF, DAVID G.. Assistant Professor of Chemical Engineering (1969). BS 1963, MS 1965, PhD 1967, University of Pittsburgh. (GF)

ROBINSON, MARION JOHN, Associate Professor of Nuclear Engineering (1966, 1969). BS 1960, MS 1962, PhD 1965, University of Michigan. Professional Engineer in Michigan, 1966; in Kansas, 1967. (GF)
ROHLES, JR., FREDERICK HENRY, Professor of Mechanical Engineering; Associate Director, Institute for Environmental Research (1963, 1965). BS 1942, Roosevelt University, Chicago; MA 1949, PhD 1956, University of Texas. (GF)
ROSEBRAUGH, VERNON HART, Associate Professor of Civil Engineering (1953, 1954). BS 1933, Oregon Institute of Technology; BS 1938, Oregon State University; MA 1952, University of Portland; CE 1956, Oregon State University. Professional Engineer, 1954. (GF)
ROSENKRANZ, WILLIAM ALLEN, Instructor in Electrical Engineering (1971). BS 1967, Kansas State University.

ROTH, THOMAS A., Assistant Professor of Industrial Engineering (1965) BS 1960, MS 1961, PhD 1966, University of Wisconsin. (GF)
SCHMID, LAWRENCE A., Assistant Professor of Civil Engineering (1968) BS 1962, MS 1963, Iowa State University; PhD 1968, University of Kansas. Professional Engineer, 1969. (GF)
SHULTIS, J. KENNETH, Assistant Professor of Nuclear Engineering (1970). BASC 1964, University of Toronto; MS 1965, PhD 1968, University of Michigan. (GF)
SITZ, EARL LEROY, Professor of Electrical Engineering Emeritus (1927, 1948, 1969). BS 1927, Iowa State University; MS 1932, Kansas State University. Professional Engineer, 1947.
SMALTZ, JACOB JAY, Professor of Industrial Engineering (1939, 1952). BS 1939, Bradley Polytechnic Institute; MS 1946, Kansas State University. Professional Engineer, 1960. (GF)
SMITH, BOB LEE, Professor of Civil Engineering (1948, 1965). BS 1944, MS 1953, Kansas State University; PhD 1963, Purdue University. Professional Engineer, 1953. (GF)
SMiTH, EARL O., Adiunct Professor of Nuclear Engineering (1969). BS 1955, University of Houston. Professional Engineer in Illinois; Professional Engineer in Kansas
SMUTZ, FLOYD ALONZO, Professor of Machine Design Emeritus (1918, 1934, 1960). BS 1914, Kansas State University.
SNELL, ROBERT ROSS, Professor of Civil Engineering (1957, 1968). BS 1954, MS 1961, Kansas State University; PhD 1963, Purdue University Professional Engineer, 1959. (GF)
SPILLMAN, CHARLES KENNARD, Assistant Professor of Agricultural Engineering (1969). AS 1958, Vincennes University: BS 1960, MS 1963, University of lllinois; PhD 1968, Purdue University. (GF)
SPRAGUE, CLYDE HOWARD, Associate Professor of Mechanical Engineering: Associate, Institute for Environmental Research (1963, 1970). BS 1958, MS 1963, Kansas State University; PhD 1968, Purdue University. (GF)
STEVENSON, PAUL NELSON, ASsociate Professor of Agricultural Mechanics (1957). BS 1948, University of Missouri; MS 1957, Iowa State University. (GF)
SWANSON, EINAR A., Adjunct Professor of Nuclear Engineering (1969). BME 1948, University of Minnesota. Prof essional Engineer in Minnesota, Oklahoma, Florida, South Dakota, and Kansas.
SWARTZ, STUART ENDSLEY, Assistant Professor of Civil Engineering (1968). BS 1959, MS 1962, PhD 1968, Illinois Institute of Technology. Professional Engineer, 1970. (GF)
SWEARINGEN, THOMAS BURKE, Associate Professor of Mechanical Engineering (1965). BS 1954, Kansas State University; MS 1961, Washington State University; PhD 1966, University of Arizona. Professional Engineer, 1958. (GF)
TAYLOR, DELOS CLIFTON, Professor of Applied Mechanics Emeritus (1931, 1956, 1970). BS 1925, MS 1937, Kansas State University. Professional Engineer, 1948
TENEYCK, GEORGE ROBERT, Instructor in Agricultural Engineering; Superintendent, Sandyland Experiment Field (1964, 1970). BS 1951, MS 1970, Kansas State University
TILLMAN, FRANK AUBREY, Professor; Head, Department of Industrial Engineering; Associate Director, Institue for Systems Design and Optimization (1965, 1966, 1969). BS 1960, MS 1961, University of Missouri; PhD 1965, State University of lowa. (GF)
TRIPP, WILSON, Professor of Mechanical Engineering (1936, 1947). BS 1930, MS 1933, University of California; PhD 1956, University of lllinois. Professional Engineer, 1946. (GF)
TURNQUIST, RALPH OTTO, Associate Professor of Mechanical Engineering (1959, 1969). BS 1952, MS 1961, Kansas State University; PhD 1965, Case Institute of Technology. (GF)
VERSER, FORT A., Instructor in Nuclear Engineering; Director, Office of Civil Defense, Professional Advisory Service Center (1970). BS 1948, MS 1950, Texas A and M; MS 1960, U.S. Naval Post Graduate School.
WAKABAYASHI, ISAAC, Instructor in Electrical Engineering (1955). BS 1953, University of California.

WALAWENDER, WALTER P.: ASsistant Professor of Chemical Engineering (1969). BA 1963, Utica College of Syracuse University; MS 1967, PhD 1969, Syracuse University. (GF)
WALKER, DUANE ELDON, Instructor in Electrical Engineering (1970). BS 1961, MS 1962, Kansas State University.
WALKER, HUGH SANDERS, Associate Professor of Mechanical Engineering ; Associate Director, Institute for Computational Research in Engineering (1964, 1968). BS 1957, MS 1960, Lovisiana State University; PhD 1965, Kansas State University. (GF)
WALLACE, DOUGLAS A., Assistant Professor of Civil Engineering (1971). BS 1960, University of Illinois; MS 1968, PhD 1971, University of Iowa. Professional Engineer, 1965.

WARD, JR., JOSEPH EVANS, Professor of Electrical Engineering (1940, 1961). BS 1937, The University of Texas; MS 1940, University of Illinois. Professional Engineer, 1948. (GF)
WILLIAMS, WAYNE WATSON, Associate Professor of Civil Engineering (1965). BS 1951, MS 1953, lowa State University. (GF)

WIRTZ, LEO ANDREW, Associate Professor of Electrical Engineering (1947, 1962). BS 1947, BS 1951, MS 1957, Kansas State University. Professional Engineer, 1954. (GF)
WOOD, JOE NATE, Professor of Mechanical Engineering (1936, 1947). BS 1936, University of lowa. Professional Engineer, 1948.
WOODARD, CLAUDE LOWELL, Associate Professor of Industrial Engineering (1949, 1969). BS 1948, Kansas State University; MS 1961, PhD 1968, University of Missouri. (GF)
WRIGHT, EARL B., Instructor in Agricultural Engineering (1970). BS 1960, Kansas State University; MS 1969, Colorado State University.
ZOVNE, JEROME J., Assistant Professor of Civil Engineering (1970). BS 1965, MS 1966, University of Wisconsin; PhD 1970, Georgia Institute of Technology. (GF)

\section*{College of Home Economics}

AGAN, ANNA TESSIE, Associate Professor of Family Economics Emerita; Agr. Exp. Sta. (1929, 1944, 1968). BS 1927, University of Nebraska; MS 1930, Kansas State University. (GF)
ALDOUS, CORAL KERR, Associate Professor of Family and Child Development Emerita (1940, 1958). BS 1911, Utah State Agricultural College; MA 1940, Columbia University. (GF)
ANNIS, PATTY SMITH, Assistant Professor of Family Economics, Agr. Exp. Sta. (1958, 1961). BS 1955, Mississippi State College for Women; MS 1957, University of Tennessee. (GF)
BAILEY, JANICE A., Instructor of Family and Child Development (1968). BA 1963, Colorado College; MS 1969, Kansas State University.
BARFOOT, DOROTHY, Professor of Art Emerita \((1930,1962,1966)\). BA, State University of Iowa; MA 1928, Columbia University. (GF)
BARNES, JANE WILSON, Assistant Professor Emerita (1939, 1963). BS 1912, MS 1932, Kansas State University. (GF)
BERGEN, BETSY, Instructor of Family and Child Development (1966). AB 1949, Ottawa University; MS 1964, Kansas State University.
BOLLMAN, STEVE RAY, Associate Professor of Family and Child Development; Agr. Exp. Sta. (1966, 1969). BS 1957, MS 1963, PhD 1966, lowa State University. (GF)
BOTTGER, JEAN L., Assistant Professor of Institutional Management (1964, 1970). BS 1939, MS 1960, Kansas State University.
BOWERS, JANE RAYMOND, Associate Professor of Foods and Nutrition; Agr. Exp. Sta. (1966). BS 1962, MS 1963, PhD 1967, Kansas State Univer sity. (GF)
BRAUN, AUDREY A., Instructor of Clothing, Textiles and Interior Design (1969). BS 1967, MS 1969, University of Nebraska.

BROCKMAN, HELEN L.. Professor of Clothing, Textiles and Interior Design (1967). BA 1926, University of lowa. (GF)
BROWNING, NINA MYRTLE, Associate Professor of Foods and Nutrition Emerita; (1930, 1943, 1970). BS 1923, MS 1927, Kansas State University. (GF)
CAUL, JEAN FRANCES, Professor of Foods and Nutrition; Agr. Exp. Sta. (1967). AB 1937, Lake Erie College; MA 1938, PhD 1942, Ohio State University. (GF)
COATES, CAROLYN, Instructor of Family and Child Development (1969). BS 1953, and MEd 1962. Temple University.
COLEMAN, KATHERINE D., Instructor of Clothing, Textiles and Interior Design (1969, 1970). BS 1948, University of Kansas; MS 1970, Kansas State University.
CORMANY, ESTHER MARGARET, ASsociate Professor of Clothing, Textiles and Interior Design; Agr. Exp. Sta. (1936, 1941). BS 1926, MS 1932, Kansas State University. (GF)
CRAIGIE, BARBARA, Assistant Professor of Clothing, Textiles and Interior Design (1954, 1963). BA 1932, University of Minnesota; MA 1942, University of Missouri. (GF)
CRUMRINE, JUDITH L., Instructor of Foods and Nutrition (1970). BS 1968, MS 1969, Kansas State University
DOLLAR, DIANE A., Instructor in Clothing, Textiles and Interior Design (1970). BS 1955, MS 1967, Kansas State University.

FASSE, WILLIAM R., Instructor of Family Economics; Agr. Exp. Sta. (1969). BS 1968, Washburn University; MS 1970, Kansas State University.

FINKELSTEIN, BEATRICE, Professor of Foods and Nutrition; Agr. Exp. Sta. (1967). BA 1933, Hunter College; MS 1939, Columbia University. (GF)
FRIEND, SHIRLEY E., Assistant Professor of Clothing, Textiles and In. terior Design; Agr. Exp. Sta. (1969). BS 1962, University of Arkansas; MS 1964, University of Missouri; EdD 1969, University of Arkansas. (GF)
FRYER, BETH ALSUP, Associate Professor of Foods and Nutrition; Agr. Exp. Sta. (1959). BS 1945, University of New Mexico; MS 1949, Ohio State University; PhD 1959, Michigan State University. (GF)

HARRISON, DOROTHY LUCILE, Professor of Foods and Nutrition; Agr. Exp. Sta. (1947, 1963). BS 1938, Dakota Wesleyan University; MS 1943, PhD 1947, lowa State University. (GF)
HESS, KATHARINE PADDOCK, Associate Professor of Clothing and Textiles Emerita (1925, 1950). BS 1900, MS 1925, Kansas State University. (GF)
HILL, OPAL BROWN, Associate Professor of Clothing, Textiles and Interior Design Emerita (1944, 1954, 1965, 1969). BS 1944, MS 1950, Kansas State University. (GF)
HOEFLIN, RUTH, Associate Dean; Professor of Home Economics (1957, 1960). BS 1940, lowa State University; MA 1945, University of Michigan PhD 1950, Ohio State University. (GF)
HOFFMAN, DORETTA, Dean, Professor of Home Economics; Associate Director, Agr. Exp. Sta. (1954). BS 1941, University of Nebraska; MS 1943, Michigan State University; PhD 1949, Cornell University; DSC 1966, University of Nebraska. (G'F)
HOWE, HAZEL DELL, Associate Professor of Clothing and Textiles Emerita (1936, 1947, 1967). BS 1921, MS 1935, Kansas State University. (GF)
KELL, LEONE POWER, Professor of Family and Child Development Emerita; Agr. Exp. Sta. (1927, 1947, 1965). BS 1923, MS 1928, Kansas State University. (GF)
KENNEDY, CARROLL E., Professor of Family and Child Development (1970). AB 1949, Wheaton College; MS 1953, Kansas State University; EdD 1963, University of Maryland. (GF)
KRAMER, MARTHA MORRISON, Professor of Home Economics Emerita (1922, 1960). BS 1916, University of Chicago; MS 1919, PhD 1922, Columbia University. (GF)
LATZKE, ALPHA CORINNE, Professor of Clothing and Textiles Emerita (1927, 1960, 1965). BS 1919, MS 1928, Kansas State University. (GF)
LEONARD, DONALD G., Instructor of Family and Child Development (1970). BS 1957, Oregon State University; MS 1958, Springfield College.

LEWIS, ALVIN, Instructor of Family and Child Development (1969, 1970). BS 1969, Kansas State University.
LIENKAEMPER, GERTRUDE ELISE, Associate Professor of Clothing and Textiles Emerita (1941, 1948, 1966). BS 1921, Oregon State College; \(M A\) 1938, University of Washington. (GF)
MCCORD, IVALEE HEDGE, Professor of Family and Child Development (1957, 1963). BS 1933, MS 1951, Kansas State University; PhD 1964, Purdue University. (GF)
MCMILLAN, EVA M., Associate Professor of Foods and Nutrition Emerita (1930, 1937, 1939, 1958). MS 1918, PhD 1929, University of Chicago. (GF)
MIDDLETON, RAYMONA, Assistant Professor of Institutional Management; Agr. Exp. Sta. (1962, 1966). BS 1937, University of Nebraska; MS 1941, Kansas State University. (GF)
MORSE, RICHARD L. D., Professor; Head, Department of Family Economics; Agr. Exp. Sta. (1955). BA 1938, University of Wisconsin; PhD 1942, Iowa State University. (GF)
MOXLEY, VIRGINIA, Instructor of Family and Child Development (1970). BS 1968, MS 1969, Kansas State University.
MULLEN, IVA MANILLA, Assistant Professor of Foods and Nutrition Emerita (1936, 1964). BS 1925, Kansas State University; MS 1928, lowa State University. (GF)
MUNSON, DEANN A M., Instructor of Clothing, Textiles and Interior Design (1967). BS 1966, MS 1967, Kansas State University.

NEWBY, FRANCES ANN, Assistant Professor of Clothing, Textiles and Interior Design (1963). BFA 1961, Kansas City Art Institute.
NEWELL, KATHLEEN, Assistant Professor of Foods and Nutrition (1962). BS 1944, Kansas State University; MS 1951, University of Wisc onsin.
PARKER, JANAT F., Assistant Professor of Family and Child Development (1971). BA 1964, MCGill University, Canada; PhD 1969, University of California at Berkeley.
PETERSON, MARY D., Instructor of Clothing, Textiles and Interior Design (1968). BS 1958, MS 1959, University of Tennessee.

RAFFINGTON, MARGARET ELIZABETH, Assistant Professor of Family and Child Development Emerita (1938, 1939, 1966, 1970). BS 1924, MS 1928, Kansas State University; Professional Diploma, 1954, Columbia University.
RASMUSSEN, ALBIEC., Assistant Professor of Family Economics (1966, 1967). BS 1942, University of Alaska; MS 1964, Kansas State University. (GF)
REEHLING, JEAN ELIZABETH, Assistant Dean; Assistant Professor of Home Economics (1964, 1967). BS 1962, Kansas State University; MA 1963, home Economics Clligi,
Colorado State College.
RIEMANN, NANCY E., Instructor of Family Economics (1969). BS 1963, Michigan State University; MS 1968, Kansas State University.
ROACH, FAITH RUSSELL, Instructor of Institutional Management (1965). BS 1947, MS 1966, Kansas State University.
SEGO, R. JEAN WHEELER, Assistant to Dean; Instructor of Home Economics (1967). BA 1960, Friends University; MS 1967, Kansas State Economics
SHUGART, GRACE SEVERANCE, Professor; Head, Department of Institutional Management; Agr. Exp. Sta. (1951, 1961). BS 1931, State College of Washington: MS 1938, Iowa State University. (GF)
SISTRUNK, JOAN N., Instructor of Family and Child Development (1970). BS 1951, Kansas State University; MS 1956, University of Minnesota.
STITH, MARJORIE MAY, Professor; Head, Department of Family and Child Development; Agr. Exp. Sta. (1961). BS 1943, Alabama State College for Women; MS 1958, PhD 1961, Florida State University. (GF)
STUCKY, VIRGINIAT., Assistant Professor of Foods and Nutrition (1969). BS 1943, Kansas State University; MS 1948, Columbia University.
TINKLIN, GWENDOLYN LaVERNE, Professor of Foods and Nutrition; Agr. Exp. Sta. (1943, 1956). BS 1940, MS 1944, Kansas State University. (GF)
VADEN, ALLENE G., Instructor of Foods and Nutrition (1970). BS 1960, University of Texas; MS 1967. Texas Technological College.

WAKEFIELD, LUCILLE MARIAN, Professor; Head, Department of Foods and Nutrition; Agr. Exp. Sta. (1966). BS 1949, MS 1956, University of Connecticut: PhD 1965, Ohio State University. (GF)
WARDEN, JESSIE A., Professor; Head, Department of Clothing, Textiles and Interior Design; Agr. Exp. Sta. (1960). BS 1940, Northeast Missour State Teachers College; MA 1946, Columbia University; PhD 1955, Penn sylvania State University. (GF)
WEST, BESSIE BROOKS, Professor of Institutional Management Emerita (1928, 1960). AB 1924, MA 1928, University of California; MS 1951, Michigan State Normal College. (GF)
WILLIAMS, JENNIE, Professor of Family and Child Development Emerita (1932, 1959). BS 1920, MS 1933, Kansas State University; Graduate, 1925, University of Michigan School of Nursing. (GF)
ZACCAGNINI, JUDITH, Instructor of Clothing, Textiles and Interior Design (1970). BS 1969, State College At Framington; MS 1970, Kansas State University

\section*{College of Veterinary Medicine}

ANDERSON, NEIL V., Associate Professor of Comparative Gastroen terology (1967). BS 1953, Mankato State College; BS 1959, DVM 1961, University of Minnesota. (GF)
ANTHONY, HARRY D., Professor and Director of Diagnostic Laboratory (1955, 1967). DVM 1952, MS 1957, Kansas State University. (GF)
BARNHART, JAMES L., Temporary Instructor of Physiological Chemistry (1966). BS 1965, Kansas State University.

BAUGH, ROBERT C., Instructor Animal Resource (1965, 1968). DVM 1965, Kansas State University.
BESCH, EMERSON L., Professor and Head, Department of Physiological Sciences (1967, 1968). Staff Associate, Institute for Environmental Research. BS 1952, MA 1955, Southwest Texas State College; PhD 1964, University of California. (GF)
BLAUCH, BRUCES., Instructor of Small Animal Medicine (1965). BS 1949, Pennsylvania State University; DVM 1956, University of Pennsylvania.
BOZARTH, ANDREW J. III, Instructor of Pathology (1970). BS 1965, DVM 1967, Kansas State University.
BRANDT, GARY W., Assistant Professor of Equine Medicine (1969). BS 1964, DVM 1966, University of Illinois.
BURROUGHS, ALBERTL. Associate Professor of Virology (1960). BS 1938, University of Wyoming; DVM 1958, Texas A \& M College; MS 1941, Montana State College; PhD 1946, University of California. (GF)
BUTLER, HUGH C., Professor of Surgery (1968). DVM 1954, MS 1968, Washington State University. (GF)
CARDINET, GEORGE H. III, Associate Professor of Anatomy (1966). AA 1957, Diablo Valley College; BS 1960, DVM 1963, PhD 1966, University of 1957, Diablo Valle
California. (GF)
CARNAHAN, DAVID L., Assistant Professor of Obstetrics and Gynecology (1961, 1964). BS 1959, DVM 1959, MS 1964, Kansas State University.
CHAPMAN, THOMAS E., Assistant Professor of Physiological Chemistry (1969). BS 1962, DVM 1964, PhD 1969, University of California.

CHEN, CHAO L., Assistant Professor of Physiology (1969). Associate, Institute for Environmental Research. BS 1960, DVM 1960, Nat'l. Taiwan University; MS 1966, lowa State University; PhD, Pend., Michigan State University.
CLARENBURG, RUDOLF, Associate Professor of Physiological Chemistry (1966). BS 1954, PhD 1959, State University of Utrecht. (GF)

COFFEE, E. GUY, Assistant Professor, Veterinary Medicine Library, (1970). AB 1958, University of Missouri; ML 1970, Kansas State Teachers College.
COLES, JR., EMBERT H., Professor and Head, Department of Infectious Diseases (1954, 1968). DV́M 1945, PhD 1958, Kansas State University; MS 1948, Iowa State College, (AID NIGERIA, 1970-1972). (GF)
COOK, JAMES E., Professor of Pathology (1969). Diplomate, 1956, American College of Veterinary Pathologists; DVM 1951, Oklahoma State University; PhD 1970, Kansas State University. (GF)
DENNIS, STANLEY M., Professor and Head, Department of Pathology (1966, 1968). FRCVS 1962, BVSC 1949, PhD 1961, University of Sidney. (GF)
ERICHSEN, DEBORAH, Temporary Instructor of Physiology and Pharmacology (1968). BS 1966, DVM 1968, Kansas State University.
FEDDE, M. ROGER, Associate Professor of Physiology (1964, 1968). BS 1957, Kansas State University; MS 1959, PhD 1963, University of Minnesota. (GF)
FRANK, EDWARD R., Professor of Surgery Emeritus (1926, 1935, 1962). BS 1918. DVM 1924, MS 1929, Kansas State University.

FREY, RUSSELL A., Associate Professor of Medicine (1963, 1964). DVM 1952, PhD 1970, Kansas State University. (GF)
FRICK, EDWIN J., Professor, Department of Surgery and Medicine Emeritus (1919, 1935, 1966). DV'M 1918, Cornell University. (GF)
GERDIS, THOMAS A., Instructor (1970). Veterinary Medicine News Editor. BA 1963, Evangel College; MS 1970, Kansas State University.
GRAY, ANDREW P., Associate Professor of Pathology (1964, 1966). DVM 1953, MS 1963, PhD 1966, Kansas State University.
GRONWALL, RONALD R.. Associate Professor of Physiology (1966). Associate, Institute for Environmental Research. BS 1960, DVM 1962, PhD 1966, University of California. (GF)
GUFFY, MARK N., Associate Professor of Radiology (1963, 1969). DVM 1949, MS 1966, Colorado State University. (GF)
HARRIS, STANLEY G., Assistant Professor of Comparative Cardiology (1964, 1969). BS 1958, DVM 1960, MS 1967, Kansas State Universlty.
HARTKE, GLEN T., Instructor in Anatomy (1962). BS 1958, DVM 1960, MS 1965, Kansas State University.
HEDRICH, HANS J., Temporary Instructor of Medicine (1970). DVM 1969, Justus Liebig University.

HENRY, JR., JACK D., Instructor in Surgery and Medicine (1968). BA 1960, DVM 1968, Kansas State University.
HEUSCHELE, WERNER P., Associate Professor of Virology (1970). AB 1952, DVM 1956, University of California; PhD 1968, University of Wisconsin.
JERNIGAN, LOYCE D., Temporary Assistant Professor of Medicine (1965). DVM 1945, Kansas State University.
KELLY, DONALD C., Professor of Pathology (1958, 1969). Diplomate, American Board of Veterinary Public Health. DVM 1935, MS 1952, Kansas American Board of Vete
State University. (GF)
KENNEDY, GEORGE A., Instructor of Equine Medicine (1970). BS 1962, University of New Mexico: DVM 1967, Washington State University.
KIMBALL, ALICE DAY, Instructor in Pathology, Parasitology and Public Health Emeritus (1934, 1955). BS 1935, Kansas State University.
KITSELMAN, CHARLES H., Professor of Pathology Emeritus (1919, 1933, 1965). VMD 1918, University of Pennsylvania; MS 1927, Kansas State University. (GF)
KRUCKENBERG, SAMUEL M., Instructor in Surgery; Director of Animal Resources (1966, 1967). DVM 1963, MS 1965, Kansas State University.
LEASURE, ELDEN E., Dean Emeritus; Professor of Pathology, Parasitology and Public Health Emeritus (1926, 1948, 1964). DVM 1923, MS' Parasitology and Public Health Emerit
LEIPOLD, HORST W., Associate Professor of Pathology (1970). DVM 1963, Justus Liebig University; MS 1967, PhD 1968, Kansas State University.
LELAND, JR., STANLEY E., Professor and Acting Head, Department of Infectious Diseases (1967). BS 1949, MS 1950, University of Illinois; PhD 1953, Michigan State University. (GF)
LINDQUIST, WILLIAM D., Professor of Infectious Diseases (1968). BS 1940, MS 1942, University of Idaho; SCD 1949, Johns Hopkins University. (GF) MCGAVIN, MATTHEW D., Associate Professor of Pathology (1968). BVSC 1952, University of Queensland; PhD 1964, Michigan State University; Diplomate, American College of Veterinary Pathologists, 1963. (GF)
MILLERET, ROY J., Assistant Professor of Food Animal Medicine (1960, 1964). DV'M 1944, ḾS 1959, Kansas State University.

MINOCHA, HARISH C., Associate Professor of Infectious Diseases (1969). BVSC 1955, Indian; MŚ 1963, PhD 1967, Kansas State University.
MOORE, WILLIAM E., Assistant Professor of Infectious Diseases (1968). BS 1956, DVM 1958, Cornell University; PhD 1968, University of Minnesota. (GF)
MOSIER, JACOB E., Professor and Head, Department of Surgery and Medicine (1945, 1961). DVM 1945, MS 1948, Kansas State University. (GF) MUNGER, LADDIE L.. Assistant Professor of Pathology (1968). BS 1962, DVM 1962, University of Missouri; MS 1971, Kansas State University.
NOORDSY, JOHN L., Professor of Surgery (1966). BS 1943, South Dakota State College: DVM 1946, MS 1962, Kansas State University. (GF)
OEHME, FREDERICK W., Associate Professor of Toxicology and Medicine (1969). BS 1957, DVM 1958, Cornell University; MS 1962, Kansas State University: PhD 1969, University of Missouri. (GF).
OLSON, JAY R., Instructor of Medicine (1970). DVM 1945, Kansas State University.
OSBALDISTON, GEORGE W., Associate Professor of Pathology (1967). Associate, Institute for Environmental Research. BVSc 1956, Queensland Associate, Institute for Environmental Research. BVSC 1956, Queensland
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RAILSBACK, LEE T., Assistant to the Dean (1961). BS 1936, DVM 1937, Kansas State University.
RAPP, WILLIAM R., Instructor in Pathology (1967). BS 1964, DVM 1966, Kansas State University.
RIDLEY, ROBERT K., Assistant Professor of Infectious Diseases (1939). AB 1958, Bowdoin College; MS 1960, University of Kentucky; PhD 1967, Florida'State University.
SCHONEWEIS, DAVID A., Instructor of Food Animal Medicine (1966). BS 1956, DVM 1956, Kansas State University.
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STRAFUSS, ALBERT C., Associate Professor of Pathology (1968). BS 1952, DVM 1954, MS 1958, Kansas State University; PhD 1963, University of Minnesota. (GF)
TAUSSIG, ROBERT A., Assistant Professor of Small Animal Medicine (1966). DVM 1945, Colorado State University; MS 1970, Kansas State University.
TAYLOR, BERNARD C., Temporary Instructor of Medicine (1970). BS 1968, DVM 1970, Kansas State University.
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TROTTER, DONALD M., Dean; Professor of Anatomy (1956, 1971). Diplomate, 1951, American College of Veterinary Pathologists; DV'M 1946, MS 1957, Kansas State University. (GF)
UNDERBJERG, G. K. L., Professor of Physiology (1948). BS 1926, Royal Veterinary and Agricultural College, Copenhagen; DVM 1943, PhD 1939, lowa State University. (GF)
UPSON, DAN W., Associate Professor of Pharmacology (1959, 1969). DVM 1952, MS 1962, PhD 1969, Kansas State University. (GF)
VESTWEBER, JEROME G. E., Instructor of Food Animal Medicine (1967). BS 1962, DVM 1964, University of Minnesota.
WALLACE, LARRY J., Associate Professor of Surgery and Medicine (1966, 1969). BS 1960, DVM 1962, MS 1964, Michigan State University. (GF)

WESTFALL, JANE A., Associate Professor of Anatomy (1967). AB 1950, College of Pacific: MA 1952, Mills College; PhD 1965, University of California. (GF)
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ANDERSON, ELINOR, Associate Professor; Extension Specialist, Home Management (1957, 1971). BS 1939, MS 1952, Kansas State University.
APEL, J. DALE, Professor; Associate State Club Leader (1962, 1967). BS 1950, Kansas State University; MS 1961, The American University; PhD 1966, University of Chicago. (GF)
APPLEBY, MARIELLEN J., Assistant Professor; District Extension Home Economist (1955, 1965). BS 1955, Kansas State University; MS 1965, University of Maryland,
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ATKINSON, DAISY ELIENE, Assistant Professor; Extension Specialist in Foods and Nutrition (1959). BA 1938, University of Iowa; MS 1954, University of Alabama.
BAIRD, HARRY CHARLES, Professor Emeritus; District Agricultural Agent (1920, 1952). BS 1914, Kansas State University.
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BALDING, JAMES LEWIS, Extension Assistant: Extension Specialist in Formula Feeds Manufacturing (1965). BS 1960, Kansas State University.
BARTLETT, CLARENCE EDWARD, Instructor Emeritus; Extension Economist in Farm Management (1947). BS 1929, University of Nebraska,
BATES, CHARLES THOMAS, Assistant Professor; Extension Specialist in 4-H Club Work (1956, 1961). BS 1951, Oklahoma A \& M; MS 1960, University of Wisconsin.
BIEBERLY, FRANK GEARHARD, Professor: Section Leader and Ex tension Specialist in Crops and Soils (1941, 1949). BS 1938, MS 1949, Kansas State University.
BILES, LARRY E., Instructor; Area Extension Forester, Watershed Project (1967). BS 1967, University of Missouri.
BISWELL, CLIFFORD R., Associate Professor; Assistant State Extension Forester (1957, 1971). BS 1954, MS 1965, University of Missouri.
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BLECHA, FRANK OTTO, Professor Emeritus; District Agricultural Agent (1919, 1948). BS 1918, MS 1924, Kansas State University.
BOHANNON, ROBERT ARTHUR, Professor; Director of Extension (1951, 1965). BS 1949, Michigan State University: MS 1951, Kansas State University; PhD 1957, University of Illinois.
BONEWITZ, EDWIN RALPH, Associate Professor: Extension Specialist in Dairy Science (1943, 1949). BS 1941, MS 1955, Kansas State University.
BORST, WILLIAM H., Associate Professor; Extension Specialist, 4.H Nutrition Program (1953, 1970). BS 1950, Kansas State University: MS 1962, Colorado State University.
BRATTON, GERALD F., Instructor; Area Extension Forester, Watershed Project (1967). BS 1966, Colorado State University.
BREWER, DONALD I., Instructor; Extension Specialist, Radio and TV (1967). BA 1953, University of Tulsa

BRIGGS, VIVIAN BAHR, Assistant Professor Emeritus; Extension Specialist in Family Life (1946, 1951). BS 1942, University of Nebraska; MS Specialist in Family Lite (1946,
1952 , Kansas State University.
BRILL, MARTHA E., Assistant Professor: Extension Specialist in Health (1946, 1948). BS 1940, Kansas State University; RN 1940, University of Kansas.
BROOKS, HOWARD LEROY, Assistant Professor: Extension Specialist, Insecticides (1965). BS 1960, MS 1963, University of ArkansaS; PhD 1967, Kansas State University.
BURKE, JACK M., Associate Professor: Manager of Radio Station KSAC (1958). BA 1953, ME 1963, North Dakota State University.

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CALEY, HOMER K., Associate Professor; Extension Specialist in Veterinary Medicine (1965). DVM 1952, Kansas State University.
CARLSON, JEAN K., Assistant Professor: Extension Specialist, Home Management (1950, 1966). BS 1950, Kansás State University; MS 1965, Oklahoma State University.
CLARY, F. GERALD, Assistant Professor; Extension Specialist, Beef Cattle, Nutrition and Management (1971). BS 1960, MS 1967, Kansas State University.
CLEAVINGER, EUGENE A., Professor Emeritus: Extension Specialist in Crops and Soils (1926, 1947). BS 1925, Kansas State University.
COEN, LINDA L., Instructor; Area Extension Specialist, 4-H Nutrition Program (1970). BA 1968, Graceland College.
COLLINS, BILL D., Instructor; Extension Economist, Farm Management (1954). BS 1951, Kansas State University; MS 1962, University of Wisconsin.

COOLIDGE, JOHN H., Professor Emeritus; Extension Economist in Farm Management (1926, 1948). BS 1925, MS 1932, Kansas State University.
COPPERSMITH, ROBERTL., Professor; Extension Economist, Livestock Marketing (1960). BS 1948, Kentucky State College; MS 1950, University of Kentucky; PhD 1953, University of Illinois. (GF)
COX, LAWRENCE J., Professor; District Extension Supervisor (1952, 1971). BS 1948, Oklahoma State University; MS 1960, Kansas State University; EdD 1970, North Carolina State University.
COZART II, H. THAYNE, Assistant Professor; Assistant Extension Editor (1969). BS 1964, Kansas State University; MS 1967, Oklahoma State University.
CRIST, ROSEMARY A., Assistant Professor: District Extension Home Economist (1950, 1965). BS 1947, Kansas State University; MA 1967, University of Nebraska
DeLANO, FREDRICK D., Instructor: Extension Economist in Farm Management (1964). BS 1961, Kansas State University.
DEUTSCH, HENRY, Assistant Professor: District Extension Forester (1964). BS 1957, MS 1964, University of Missouri.

DeWEESE, PAUL F., Assistant Professor: Extension Specialist, Radio and Television (1948, 1966). BS 1947, Kansas State University
DICKEN, D. DEAN, Assistant Professor: Area Extension Specialist, Crops and Soils (1942, 1963). BS 1937, Kansas State University: MS 1942, University of Illinois
DICKINSON, ANNABELLE J., Associate Professor Emeritus; Associate State Leader, Home Economics (1940, 1969). BS 1933, Fort Hays Kansas State College; MS 1954, University of Missouri.
DICKSON, WILLIAM M., Instructor, Extension Economist in Farm Management (1961). BS 1956, MS 1961, Kansas State University.
DIERKING, GARY R., Instructor, Extension Specialist, Visual Aids (1961). BFA 1958, University of Kansas
DUNHAM, JAMES R., Assistant Professor; Extension Specialist, Dairy Science (1969). BS 1959, MS 1967, PhD 1969, Kansas State University.
EDELBLUTE, DALE HENRY, Associate Professor; Area Extension Specialist, Crops and Soils (1947, 1971). BS 1934, Kansas State University.
ELLING, CARL GEORGE, Professor Emeritus; Extension Specialist in Animal Husbandry (1907, 1951). BS 1904, Kansas State University.
ELLITHORPE, VERA MAY, Associate Professor; Extension Specialist, Home Management ( 1938,1947 ). BS 1935, MS 1939, Kansas State University; PhD 1963. Ohio State University
ERICKSON, DONALD B., Associate Professor; Section Leader and Ex tension Economist, Resource Development (1966). BS 1955, MS 1960, University of Wyoming; PhD 1964, Purdue University.
EYESTONE, CECIL L., Associate Professor: Extension Specialist in 4.H Club Work (1943, 1958). BS 1944, Kansas State University; MS 1958, Colorado State University.
FAIDLEY, DONALD L.. Instructor, Extension Economist in Farm Management (1956). BS' 1953, Kansas State University.
FERGUSON, JOHN M., Professor Emeritus; State Leader, Extension Engineering (1937, 1958). BS 1934, Kansas State University.
FIGURSKI, DONALD L., Assistant Professor: District Extension Economist, Farm Management (1960). BS 1952, MS 1959, Colorado State University.
FLINCHBAUGH, BARRY L., Assistant Professor; Extension Economist, Public Affairs (1971). BS 1964, MS 1967, Pennsylvania State University; PhD 1971, Purdue University.
FRANCIS, EUGENE N., Associate Professor; Area Extension Specialist, Animal Science (1967). BS 1949, Kansas State University; MS 1953, Iowa State University
FRAZIER, LESLIE PAUL, Assistant Professor: Extension Economist, Resource Development (1943, 1965). BS 1942, Oklahoma State University; Resource Development (1943, 1965).
FREDERICK, ALLAN LEROY, Assistant Professor; Extension Economist, Grain Marketing and Agricultural Firm Management (1971). BS 1966, MS 1968, University of Nebraska; PhD 1971, Purdue University.
FREDERICK, HOBART, Instructor; Extension Economist in Farm Management (1941). BS 1941, Kansas State University.
GALLAHER, HAROLD G., Professor: Assistant Department Head of Horticulture, Extension, and State Extension Forester (1951, 1965). BS 1949, University of Missouri; MS 1959, Kansas State University.
GATES, DELL E., Professor; Extension Specialist in Entomology (1948, 1971). BS 1948, MS 1952, Kansas State University.

GEISLER, JAMES C., Instructor, District Extension Forester (1966). BS 1964, University of Missouri
GLOVER, OTIS BENTON, Associate Professor Emeritus; District Agricultural Agent (1929, 1963). BS 1917, Kansas State University.
GOULD, LEONARD KEITH, Instructor; Area Extension Forester, Utilization and Marketing (1963). BS 1956, Color ado State University.
GRAHAM, RALF O.. Associate Professor: Assistant Extension Editor (1961). AB 1948, Peru State Teachers College; MA 1955, University of Minnesota.
GREENE, LAURENZ S., Instructor, Extension Economist in Farm Management (1952). BS 1950, Kansas State University.
GREY, GENE W., Associate Professor; Assistant State Extension Forester (1962, 1971). BS 1956, University of Missouri; MS 1969, Michigan State (1962, 1971)
University.
GRIFFITH, PAUL W., Professor: Associate Director of Extension (1935, 1950). BS 1934, MS 1948, Kansas State University; PhD 1961, University of Wisconsin. (GF)
GUTHRIE, GERSILDA, Assistant Professor; District Home Management Specialist (1937, 1958). BS 1934, Kansas State University; MA 1949, Columbia University
GUY, WILLIAM D., Instructor, Extension Economist in Farm Management (1951). BS 1942, Kansas State University.

HACKLER, RAYMOND F., Instructor, Extension Economist in Farm Management (1960). BS 1952, MS 1966, Óklahoma State University.
HAGANS, FRANK ALEXANDER, Associate Professor Emeritus; District Agricultural Agent (1930, 1956). BS 1925, Kansas State University.

HAGEMAN, CHARLES A., Instructor Emeritus; Extension Economist in Farm Management (1936). BS 1936, Kansas State University
HALAZON, GEORGE C., Associate Professor; Extension Specialist in Wildife Management (1954, 1956). PhB 1943, MS 1953, University of Wisconsin.
HANNA, JOHN B., Associate Professor; Extension Specialist in 4-H Club Work (1934, 1960). BS 1932, MS 1954, Kansas State University.
HARPER, HAROLD B., Associate Professor; Extension Specialist in Soil Conservation (1932, 1946). BS 1933, MS 1957, Kansas State University.
HENDERSON, F. ROBERT, Assistant Professor; Extension Specialist, Wildlife Damage Control (1968). BS, MS 1956, Fort Hays Kansas State College.
HEROD, JON C., Instructor, Extension Economist in Farm Management (1957). BS 1957, Kansas State University.

HERPICH, RUSSELL L., Professor; Extension Irrigation Engineer (1951, 1958). BS 1950, MS 1953, Kansas State University.

HOLMES, ELWYN S., Associate Professor; Extension Agricultural Engineer (1966). BS 1943, MS 1953, Texas A \& M University
HORN, RODNEY S., Instructor; Extension Agricultural Engineer (1970). BS 1970, Kansas State University.
HONSTEAD, ARLISS E., Associate Professor ; Extension Specialist in 4.H Club Work (1946, 1961). BS 1937, Kansas State University; MS 1960, Columbia University.
HOSS, RAY M., Associate Professor; District Extension Supervisor (1935, 1958). BS 1930, Kansas State University.

HOWE, JERELDINE E., Instructor: Extension Specialist, Clothing and Textiles (1965). BS 1951, MS 1965, Kansas State University
HYDE, ROBERT M., Associate Professor; Extension Specialist, Range Management (1966, 1970). BS 1959, MS 1961, Fort Hays Kansas State College; PhD 1963, University of Wyoming. (GF)
JACCARD, CLARENCE ROY, Professor Emeritus; Coordinator of EX. tension Program Planning (1922, 1957). BS 1914, Kansas State University.
JACKSON, MARION E., Associate Professor; Extension Economist, Poultry Marketing and Production (1945). BS 1941, Purdue University; MS 1955, Kansas State University.
JEPSEN, RICHARD L., Assistant Professor; Extension Specialist, Rural Civil Defense (1953, 1962). BS 1950, MS 1963, Kansas State University.
JOHNSON, J. HAROLD, Professor Emeritus; State 4.H Club Leader (1927, 1958). BS 1927, Kansas State University: MS 1942, George Washington University.
JOHNSON, NAOMI M., Associate Professor; Extension Specialist, Clothing and Textiles (1938, 1950). BS 1932, MS 1949, K ansas State University.
JOHNSON, ROBERT L.., Professor; Coordinator of Extension Personnel Training (1965). BS 1951, University of Nebraska; MS 1956, PhD 1958, University of Wisconsin. (GF)
JONES, HAROLD E., Professor; Extension Specialist, Crops and Soils (1946, 1956). BS 1940, Kansas State University; MS 1942, PhD 1949, Purdue University. (GF)
JONES, MILAM T., Instructor; Area Extension Specialist, Horticulture (1966). BS 1964, MS 1966, Kansas State University.

KASPER, PAUL T., Associate Professor; Area Extension Specialist, 4-H (1971). BS 1957, MS 1960, Emporia Kansas State Teachers College; EdD 1970, Oklahoma State University.
KEPLEY, LARRY R., Instructor; Extension Economist in farm Management (1954). BS 1961, Kansas State University.
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KING, JR., RICHARD F., Associate Professor ; District Extension Supervisor (1938, 1962). BS 1938, MS 1957, Kansas State University.
KINGSLEY, KENNETH E., Instructor; Extension Economist, Resource Development (1970). BS 1964, Kansas State University.
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KUEHN, LOWELL D., Instructor; Extension Television Producer (1962). BS 1950, lowa State University.
LANGEMEIER, LARRY N., Assistant Professor; Extension Specialist, Farm Management Studies (1968). BS 1963, University of Nebraska; MS Farm Management Studies (1968). BS 1963, Un
LEUTHOLD, LARRY D., Instructor; Extension Specialist, Ornamental Horticulture (1966). BS 1959, MS 1966, Kansas State University.
LIND, RUEBEN CARL, Professor Emeritus; Extension Specialist in Soil Conservation (1933, 1950). BS 1923, Kansas State University.
LOUCKS, WILLIAM L., Instructor; Area Extension Forester (1967). BS 1963, Colorado State University.
MCADAMS, VERL E., Associate Professor Emeritus; Extension Specialist, Animal Science (1934, 1952). BS 1928, MS 1957, Kansas State University.
MCCLELLAND, EVERETT L., Instructor Emeritus; Extension Economis \(\dagger\) in Farm Management (1936). BS 1928, Kansas State University.
MCMINIMY, MILTON W., Instructor: Extension Economist in Farm Management (1970). BS 1969, MS 1970, Kansas State University.
MCREYNOLDS, KENNETH L., Assistant Professor ; Extension Economist in Farm Management (1949, 1960). BS 1950, MS 1954, Kansas State University.
MANN, RAY H., Associate Professor; Area Extension Director (1956, 1969). BS 1951. Oklahoma State University; MS 1965, Kansas State University.
MARR, CHARLES W., Assistant Professor ; Extension Specialist, Vegetable Crops (1970). BS 1963, MS 1967, Southern Illinois University; PhD 1970, University of Tennessee.
MEANS, EARL T., Instructor Emeritus; Extension Economist in Farm Management (1944). BS 1948, Kansas State University.
MEDLIN, ROGER C., Assistant Professor; Assistant Extension Editor (1967). BS 1948, MS 1969, Kansas State University.

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MILLER, ELSIE LEE, Assistant Professor; Extension Specialist, Foods and Nutrition (1941, 1962). BS 1934, MS 1942, K ansas State University.
MORRISON, FRANK D., Associate Professor; Extension Specialist, Horticulture (1966). BS 1951, MS 1959, University of Idaho; PhD 1966, Michigan State University. (GF)
MOYER, WENDELL A., Professor; Section Leader and Extension Specialist, Animal Science (1941, 1956). BS 1941, MS 1955, Kansas State Specialist,
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MOYER, WILLIAM J., Assistant Professor; Area Exiension Forester (1969). BS 1964, OkIahoma State University; MA 1968, Ball State University.
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MYERS, GLADYS, Associate Professor Emeritus; Extension Speclalist in Home Management (1930, 1947). BS 1923, Kansas State University; MS 1939, Cornell University.
NAGEL, JOHN C.. Instructor; Extension Television Producer (1967). BS 1967, Kansas State University.
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NEELY, MARGERY A., Associate Professor; Extension Specialist, 4-H Child and Youth Development (1971). AB 1955, Southwest Missouri State College; MeD 1968, University of Missouri.
NEFF, LEONARD FAY, Associate Professor Emeritus; Coordinator of Extension Personnel Training (1924, 1958). BS 1922, Purdue University.
NEUFELD, DOROTHY H., Assistant Professor: District Extension Home Economist (1957, 1965). BS 1950, Texas Technological College; MS 1964, Kansas State University.
NIGHSWONGER, JAMES J., Assistant Professor; Extension Specialist, Landscape Architecture (1961, 1970). BS 1960, MS 1970, Kansas State University.
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NORBY, OSCAR W., Professor; District Extension Specialist (1942, 1961, 1969). BS 1942, Kansas State University; MS 1959, PhD 1961, University of Wisconsin. (GF)
OLSEN, DUANE A., Assistant Professor: Area Extension Economist, Resource Development (1963, 1966). BS 1961, University of Minnesota; MS 1964, Purdue University.
OLSON, ROSS A., Instructor ; Extension Economist in Farm Management (1968). BS 1965, MS 1968, Kansas State University.

OSBURN, MELVIN W., Associate Professor Emeritus; Extension Specialist, Veterinary Medicine (1952, 1954). DVM 1934, lowa State Specialist,
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PARKER, LEONARD C., Instructor; Extension Economist in Farm Management (1956). BS 1952, Kansas State University.
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RINGLER, WILBER E., Professor, Assistant Director of Extension (1957). BS 1948, MS 1949, Úniversity of Nebraska; PhD 1958, University of Wisconsin. (GF)
ROSS, EUGENE, Professor ; District Extension Supervisor (1955, 1966). BS
1952, Oklahoma State University; MS 1962, Kansas State University; PhD 1952, Oklahoma State University; MS 1962, Kansas State University; PhD 1966, University of Wisconsin. (GF)
ROWLAND, JACK J., Assistant Professor ; Area Extension Forester (1969). BS 1968, MS 1970, University of Missouri.
SCHAAF, JANE M., Instructor ; Extension Specialist in Home Management (1969). BS 1966, Montana State University.

SCHLINDLER, DALE E.. Associate Professor ; Extension Architect (1955, 1961). B Arch 1953, MS 1960, Kansas State University. Registered Ar. chitect, MA 1960, Kansas State University.
SCHLENDER, JOHN R., Associate Professor; Extension Economist in Farm Management (1951, 1971). BS 1951, Kansas State University; MS 1960, Oregon State University; PhD 1969, Purdue University.

SCHOEFF, ROBERT W., Professor: Section Leader and Extension Economist in Marketing and Utilization of Formula Feeds (1960). BS 1942, MS 1947, PhD 1952, Purdue University. (GF)
SCHROEDER, MARY M., Assistant Professor: District Extension Home Economist (1961, 1966). BS 1938, MS 1968, Kansas State University.
SELBY, WALTER E., Associate Professor; Extension Agricultural Engineer (1944, 1947). BS 1929, Kansas State University; MS 1957, University of Nebraska.
SELF, ETHEL W., Associate Professor Emeritus; Extension Specialist, Home Management (1929, 1953). BS 1926, MS 1952, Kansas State Univer. sity.
SHANKLAND, HAROLD G., Associate Professor Emeritus; Associate Extension Editor (1943, 1949). AB 1924, College of Emporia.
SHREVE, LOY W., Instructor: Area Extension Forester (1964). BS 1951, West Virginia University.
SLINKMAN, ZOE E., Instructor: Extension Specialist, Cultural Resources Development (1967). BS 1947, Greeley Colorado State College; MS 1970, Kansas State University.
SMURTHWAITE, GEORGIANA HOPE, Professor Emeritus; Extension Specialist, Home Economics Program Development (1924, 1954). BS 1911, Utah State College; MS 1931, Kansas State University
SPOON, DARRELL D., Assistant Professor; Extension Specialist, Family Life (1970). BA 1965, University of Iowa; MS 1969, Kansas State Univer. sity.
SPRINGER, DONALD M., Assistant Professor: Extension Television Producer (1957, 1962). BS 1957, MS 1966, Kansas State University
STARKEY, WINONA M., Assistant Professor Emeritus; Extension Specialist, Home Furnishings (1944, 1956). BS 1947, MS 1954, Kansas State University.
STIEGLER, JAMES H., Assistant Professor; Extension Specialist, Land Utilization (1971). BS 1964, Texas A \& I College; MS 1967, Oklahoma State University: PhD 1970, Virginia Polytechnical Institute.
STIELOW, KENNETH L.. Instructor; Extension Economist in Farm Management (1969). BS 1967, MS 1969, Kansas State University
STOCKARD, JOHN R., Assistant Professor: Extension Motion Picture Producer (1966). BS 1955, University of North Carolina; MS 1969, Kansas State University.
STOVER, HAROLD E., Professor Emeritus; Extension Agricultural Engineer (1936, 1954)."BS 1929, Kansas State University.
STRICKLER, JOHN K., Associate Professor; Associate State Extension Forester (1961, 1969). BS 1957, University of Missouri; MS 1967, Kansas State University
TEAGARDEN, EARL HICKS, Professor Emeritus; Coordinator, Extension Studies (1929, 1952). BS 1920, Kansas State University.
TENNANT, MARJORIE A., Assistant Professor; Assistant Extension Editor (1947, 1952). BS 1946, MS 1957, Kansas State University.
THOMAS, KENNETH E., Professor; Head, Department of Extension In formation (1951, 1963). AB 1951, Southwestern College; MS 1952, Kansas State University; PhD 1961, University of Wisconsin. (GF)
THOMAS, WILTON B., Associate Professor; Section Leader and Extension Economist, Farm Management (1946, 1966). BS 1937, MS 1960, Kansas State University.
TITUS,RALPH S., Associate Professor: Assistant Manager, Radio Station KSAC (1951, 1965). BS 1955, Kansas State University
TOBIN, LESLIE W., Assistant Professor; Extension Specialist, Soil Fertility ' (1967). BS 1948. MS 1951, PhD 1960, Michigan State University.
TRAYER, DANNY D., Instructor; Extension Economist in Farm Management (1950). BS 1951, MS 1967, Kansas State University.
TREAT, JAY L., Assistant Professor; Extension Economist in Farm Management (1960). BS 1949, University of Arkansas; MA 1952, University of Missouri.
UNRUH, CHESTER R., Associate Professor: Assistant Extension Editor (1961). AB 1940, Bethel College; MS 1956, Kansas State University.

URBAN, KENNETH E., Instructor: Extension Economist in Farm Management (1954). BS 1952, MS 1957, Kansas State University.
VACIN, GARY L., Assistant Professor; Extension Economist, Resource Development Information (1966). BS 1960. MS 1964, Kansas State University.
WALKER, MILDRED L., Associate Professor: Extension Economist, Consumer Marketing (1956, 1970). BS 1952, Kansas State University; MS 1960, Pennsylvania State University.
WARNER, EUGENE D., Professor: Extension Editor (1935, 1947). BS 1934, Kansas State University.
WELLS, RUTH I., Associate Professor; Extension Specialist, Limited Resources Program (1953, 1971). BS 1943, Central Missouri State College; MS 1948, Kansas State University.
WENDLING, LEO T., Professor; State Leader, Extension Engineering (1947, 1965). BS 1947, MS 1956, Kansas State University.
WESTMEYER, HERMAN W., Assistant Professor: Extension Specialist, Animal Science (1936, 1961). BS 1936, University of Missouri; MS 1965, Kansas State University.
WHIPPS, LOREN E., Assistant Professor: District Extension Economist, Farm Management (1946, 1966). BS 1938, Kansas State University; MS 1953, Colorado State University.
WHITEHAIR, NORMAN V., Professor: Assistant Head, Department of Economics and State Leader of Extension Marketing, Management and Resource Development (1946, 1961). BS 1943, MS 1953, Kansas State University; PhD 1964, Purdue University. (GF)
WHITNEY, DAVID A., Associate Professor: Extension Specialist, Soil Testing (1966). BS 1961, MS 1963, University of Nebraska; PhD 1966, Iowa State University. (GF)
WIGGINS, M. CHRISTINE, Associate Professor Emeritus; Extension Specialist, Clothing and Textiles (1930, 1947). BS 1929, Kansas State University; MA 1938, Columbia University.
WILCOX, ROBERT W., Professor: Quality Control Specialist, Formula Feeds (1965). BS 1945, MS 1949, PhD 1960, South Dakota State University. (GF)

WILKINS, HOWARD D., Associate Professor; Extension Specialist, Crops and Soils (1959). BS 1953, MS 1954, Kansas State University.
WILLIS, WILLIAM G., Associate Protessor: Extension Specialist, Plant Pathology (1951, 1962). BS 1951, MS 1964, PhD 1967, Kansas State University.
WOODS, R. BRUCE, Instructor: Extension Specialist, Urban Family Life (1971). BA 1959, Wichita State University; MDiv 1962, Central Baptist Seminary.
WRIGHT, DEANNE D.. Instructor; Extension Specialist, Radio and TV (1970). BS 1959, University of Kansas; MS 1970, Kansas State University.

ZOELLNER, KEITH O., Associate Professor; Extension Specialist, Animal Science and Industry (1962). BS 1953, MS 1957, South Dakota State Science and Industry (1962). BS 1953, MS
University; PhD 1962, University of Missouri.

\section*{County Extension Directors}

COX, WILLIAM E., Sedgwick County (1957). Wichita DUCKERS, JR.,HARRY G., Wyandotte County (1943). Kansas City. GRIGGS, OTIS R., Reno County (1951). Hutchinson. HALL, C. T., Johson County (1934). Olathe.
NEWSOME, B. W., Riley County (1955). Manhattan.
VAN METER, EARL L., Douglas County (1960). Lawrence.

\section*{County Extension Agricultural Agents}

ALBRIGHT, KENNETH B., Ellis County (1955). Hays
ALLEN, KENNETH A., Lane County (1969). Dighton.
BACHMAN, DALE L., Gray County (1968). Cimarron
BARNES, JOHN H., Harvey Country (1953). Newton. BATES, GEORGE A., Clark Country (1971). Ashland BIBY, VIRGIL H., Rice Country (1966). Lyons.
BLAIR, W. LAWARENCE, Linn County (1960). Mound City BLISS, F. E., Elk County (1946). Howard.
BOZWORTH, ROBERT W., Franklin County (1960). Ottawa BRATCHER, STANLEY W., Sedgwick County (1970). Wichita. BULK, HERBERT W., Shawnee County (1949). Topeka. BURKHART, PEYTON H., Nemaha County (1962). Seneca. BYARLAY, LOWELL H., Osborne Country (1959). Osborne. CARLSON, VIRGIL P., Ellsworth County (1957). Ellsworth. CARSON, JAMES D., Stevens County (1967). Hugoton. CHISAM, DONALD L., Labette County (1968). Altamont DAUBER, DONALD D., Hodgeman County (1959). Jetmore. DAVIS, DEAN L., Morris County (1968). Council Grove. DUNAVAN, WILBUR J., Smith County (1960). Smith Center ETHERIDGE, RAY W., Barber County (1954). Medicine Lodge. FINLEY, PHILIP B., Decatur County (1967). Oberlin. FISH, G. KEITH, Trego County (1958). Wakeeney. FORD, ROY D., Stanton County (1964). Johnson. FROMM, KENNETH W., Mitchell County (1953). Beloit. GEBHART, JEWELL O., Sheridan County (1945). Hoxie. GOLLADAY, RICHARD E., Hamilton County (1957). Syracuse. GOSCH, JAY W., Clay County (1971). Clay Center. GOTTLOB, GLENN R., Brown County (1969). Hiawatha. GOTTSCH, A. HAROLD, Butler County (1954). EI Dorado. GRIFFITH, LESTER E., Marion County (1949). Marion. HARDING, WARREN G., Rooks County (1955). Stockton. HARRINGTON, MAURICE C., Anderson County (1958). Garnett. HARRIS, A. EUGENE, Meade County (1938). Meade. HENDERSHOT, ROGER L., Harper County (1941). Anthony. HENRY, LARRY G., Cheyenne County (1956). St. Francis. HOLLINGSWORTH, CLARENCE A., Greenwood County (1937). Eureka. HOSIE, DARREL D., Jewell County (1968). Mankato. JEFFREY, F. DUANE, Chautauqua County (1965). Sedan JEPSEN, DELBERT D., Russell County (1962). Russell. JOHNSON, ARTHUR R., Jefferson County (1958). Oskaloosa. KEELER, GARRY L., Washington County (1967). Washington. KIVETT, HARRY L., Haskell County (1957). Sublette. KRAISINGER, WILBUR S., Pratt County (1951). Pratt. KUBIK, RICHARD W., Thomas County (1949). Colby. LeVALLEY, JR., GERALD E., Doniphan County (1967). Troy. LINE, MERLIN E., Kearny County (1946). Lakin. LINN, JACK A., Wilson County (1966). Fredonia. LOHMANN, VERNON E., Neosho County (1968). Erie. LOTZ, WILLIAM R., Edwards County (1964). Kinsley. LOYD, DONALD G., Greeley County (1968). Tribune. McKAY, BEN D., Ness County (1954). Ness City.
MCWILLIAMS, DONALD D., Wallace County (1956). Sharon Springs. MADDUX, ALBERT G., Finney County (1959). Garden City. MALEY, ALVIN E., Lyon County (1953). Emporia. MANRY, E. CLIFFORD, Pawnee County (1940). Larned. MARLOW, DAROLD D., Wabaunsee County (1950). Alma. MAXWELL, THOMAS R., Allen County (1954). Iola. MCCAMMON, RONALD W., Lincoln County (1968). Lincoln. MEIREIS, CLIFFORD L.. Norton County (1955). Norton.
NEILL, JOE P., Cloud County (1946). Concordia.
NELSON, ROSS M., Logan County (1959). Oakley.

NEWCOMER, GLENN R., Bourban County (1965). Fort Scott. NUTTELMAN, R. F., Montgomery County (1941). Independence. OLTSMANN, PAUL G., Marshall County (1964). Marysville. ORR, BRYCE, Stafford County (1952). St. John. ORWIG, THOMAS W., Dickinson County (1955). Abilene. ROBERTSON, JOHN F., Comanche County (1956). Coldwater. ROLPH, RICHARD D., Saline County (1967). Salina ROWE, JR., SAMUEL S., Sumner County (1965). Wellington. RUTHERFORD, ROBERT E., Reno County (1969). Hutchinson. SCHILLING, DALE R., Sherman County (1958). Goodland. SCHLESENER, NORMAN E., Kingman County (1965). Kingman. SCOTT, JAMES M., Graham County (1969). Hill City. SISK, ENSLEY J., Miami County (1960). Paola. SMITH, CHARLES W., Cowley County (1955). Winfield. SMITH, JOHN F., Leavenworth County (1956). Leavenworth. SMITH, JOSEPH M., Woodson County (1967). Yates Center. SPENCER, ALBERT E., Pottawatomie County (1960). Westmoreland STAGG, BEVERLY R., McPherson County (1940). McPherson STROADE, RICHARD D., Republic County (1959). Belleville. STROUD, NELSON E., Geary County (1952). Junction City. TIEMANN, LARRY S., Coffey County (1971). Burlington. VAN CLEVE, JOSEPH E., Seward County (1948). Liberal. WALKER, JR., MARSHALL F., Grant County (1951). Ulysses. WAREHAM, ROBERT E., Jackson County (1968). Holton. WARY, JR., RAYMOND E., Cherokee County (1958). Columbus. WESTFAHL, STEVEN A., Chase County (1971). Cottonwood Falls. WHITE, CHARLES R., Riley County (1966). Manhattan. WHITSON, THOMAS D., Kiowa County (1971). Greensburg. WILES, DON K., Ford County (1956). Dodge City. WILLIAMS, H. ROOMAN, Morton County (1971). Elkhart. WILSON, JACK H., Wichita County (1951). Leoti. WILSON, PAUL H., Barton County (1946). Great Bend. YAUK, DON O., Phillips County (1963). Phillipsburg.

\section*{County Extension Home Economists}

ADAMS, ELEANOR O., Mitchell County (1960). Beloit.
BAILEY, SHIRLEY J., Wyandotte County (1971). Kansas City. BARNES, HALEN L., Linn County (1964). Mound City. BIEHL, FLORENCE F., Johnson County (1962). Olathe. BLACKWOOD, HELEN H., Reno County (1962). Hutchinson. BLEVINS, OLETHA L., Douglas County (1959). Lawrence. BOWMAN, NANCY J., Seward County (1963). Liberal. BRANDEN, ELSIE P., Finney County (1955). Garden City. BURDEN, KAREN ANN S., Kearny County (1966). Lakin. BUSH, SHARON W., Harvey County (1969). Newton. CAIN, MARCIA J., Saline County (1965). Salina. CARLSON, LOIS O., Neosho County (1964). Erie. CARR, LINDA J., Montgomery County (1963). Independence. CLARKSON, JEAN K., Ness County (1970). Ness City. CLINE, LUCILE G., Pawnee County (1951). Larned. CONLEY, JOSEPHINE, Johnson County (1955). Olathe. CRESS, JEANICE A., Allen County (1955). Iola. CULVER, JANET K., Doniphan County (1971). Troy. CURRIE, TRELLA, Cloud County (1955). Concordia. DeGEER, KATHARINE A., Comanche County (1966). Coldwater. DOMSCH, L. ANN, Rawlins County (1959). Atwood. DRYDEN, ELIZABETH R., Cheyenne County (1971). St. Francis. DUGGAN, MARGARET H., Butler County (1963). EI Dorado. DUNNING, BEVERLY K., Sedgwick County (1964). Wichita. EBERT, ALEXIS L., Osage County (1971). Lyndon. EDWARDS, MARY LEE, Woodson County (1961). Yates Center. FISHER, SHARON G., Meade County (1959). Meade. FRANKENBERY, JANET K., Greenwood County (1971). Eureka. FRANKENBERY, SHARON L., Wilson County (1969). Fredonia. FRAZIER, BEVERLY S., Franklin County (1970). Ottawa. FREY, ALICE L., Grant County (1968). Ulysses. GAFFORD, NANCY M., Nemaha County (1958). Seneca. GASTON, GLORIA J., Marshall County (1960). Marysville. GFELLER, LINDA H., Thomas County (1970). Colby. GRECIAN, PATRICIA A., Stevens County (1969). Hugoton. GREENSTREET, PATRICIA A., Hamilton County (1970). Syracuse. GRUBB, SHIRLEY K., Sherman Couny (1968). Goodland. HARZMAN, BARBARA R., Dickinson County (1967). Abilene. HAYES, MARY M., Smith County (1962). Smith Center. HEINLY, KAYANN, Riley County (1957). Manhattan. HODGES, R. JEAN, Segwick County (1964). Wichita. HOLDREN, MARY F., Jewell County (1964). Mankato. HORN, KAY L., Wabaunsee County (1970). Alma. HOWERTON, LELA JEAN M., Rice County (1969). Lyons. HOWERTON, PHYLLIS Y., Reno County (1966). Hutchinson. HUND, MARGARET A., Jackson County (1960). Holton. JACKSON, PRISCILLA K., Ellis County (1969). Lyons. JACKSON, RUTH A., Rice County (1968). Lyons.

JOHNS, MARGARET T., Brown County (1971). Hiawatha. JOHNSON, JUANITA B., Crawford County (1948). Girard. KANDT, BETTY L., Geary County (1964). Junctlon City. KASITZ, NANCY A., Pottawatomie County (1971). Westmoreland. KELLOGG, KAROLYN K., Clay County (1969). Clay Center. KENT, NANCY JO, Ford County (1958). Dodge City. KINDLER, BEVERLY L., Norton County (1951). Norton. KOOCHEL, NANCY A., Morton County (1971). Morton. KRUMSICK, MARY E., Shawnee County (1955). Topeka. LEACH, GLINDA B., Shawnee County (1967). Topeka. LEACH, LUCILLE H., Osborne County (1967). Osborne. LINDBERG, CASANDRA S., Lyon County (1966). Emporla. LOHMANN, ARLETA B., Jefferson County (1970). Oskaloosa. MCFALL, MARGENE H., Barber County (1969). Medicine Lodge. MAHONEY, LORITA M., Rooks County (1969). Stockton. MEIER, VIVIAN L., Lincoln County (1964). Lincoln. MITCHELL, MARY Z., Russell County (1971). Russell. MOLZ, OIXIE I., Stafford County (1953). St. John. MUNTZ, PAMELA L., Edwards County (1971). Kinsley. OLSON, CAROLYN D., Marion County (1970). Marion. OLSON, SALLY J., Chase County (1966). Cottonwood Falls. NEUSCHWANDER, OCIE A., Greeley County (1957). Tribune. PALMER, RACHEL F., Sedgwick County (1941). Wichlta. PARTCH, SUE L., Scoft County (1967). Scott City. PEARSON, GLENDA N., Washington County (1965). Washington. PILAND, JANICE, Wichita County (1968): Leoti.
PRESTON, LINDA R., Saline County (1970). Salina. PRICE, MARJORIE E., Coffey County (1957). Burlington. REDIKER, JANET B., Morris County (1966). Council Grove. REED, CLARENE L., Trego County (1970). WaKeeney. ROBBINS, EMILY R., Leavenworth County (1964). Leavenworth. ROBINSON, ELSIE C., Decatur County (1969). Oberlin. RYDELL, BARBARA C., MCPherson County (1969). McPherson. SCHROEDER, DOROTHEA A., Wyandotte County (1942). Kansas City. SCOTT, CATHERINE E., Phillips County (1969). Phillipsburg. SEBES, DOROTHY D., Gray County (1971). Cimarron.
SHIELDS, SANDRA A., Ellsworth County (1965). Ellsworth. SIMPSON, REBEKAH L., Graham County (1969). Hill City. SHOWERS, JANE A., Wallace County (1969). Sharon Springs. SMITH, BEVERLY B., Saline County (1961). Salina. STEWART, MARGARET S., Gove County (1963). Gove. SWISHER, MARY T., Rush County (1971). LaCrosse.
THODEN, NADA F., Miami County (1965). Paola.
THOMPSON, LOUISE P., Kiowa County (1969). Greensburg.
THORSELL, CATHERINE, Clark County (1968). Ashland.
TOOT, JANICE, Haskell County (1966). Sublette.
TRAUX, RUBY C., Sedgwick County (1959). Wichita.
VICE, FAYE E., Labette County (1946). Altamont.
VOSBURGH, SCHARON S., Lane County (1971). Dighton.
WEAVER, MAE E., Barton County (1952). Great Bend.
WEIR, MARY W., Douglas County (1969). Lawrence.
WESSEL, STELLA P., Atchison County (1964). Effingham.
WHITE, REBA B., Sheridan County (1967). Hoxie.
WIGGINS, JUDY L., Chautauqua County (1971). Sedan. WILKEY, MARGARET M., Ottawa County (1968). Minneapolis. WOLFE, FRANCES M., Wyandotte County (1971). Kansas City. WONER, ELIZABETH, Harper County (1949). Anthony. WUTKE, BETTY D., Bourbon County (1968). Fort Scott. YOUNG, CAROL H., Sumner County (1966). Weilington.

\section*{County Extension 4-H Agents}

ANDEREGG, MARVIN K., Labette County (1968). Altamont. BILES, JIMMY L., Cherokee County (1966). Columbus. BILKE, DARRELL L., Seward County (1971). Liberal. BRAZLE, FRANK K., Crawford County (1970). Girard. CLAWSON, ELDON L., Shawnee County (1965). Topeka. DAVIS, ROBERT J., Sumner County (1967). Wellington. ELLIOTT, KAREN B., Sedgwick County (1971). Wichita. FAULDS, JAMES R., Finney County (1971). Garden City. FRICK, GALEN G., Ford County (1968). Dodge City. FULTZ, WILLIAM E., Sedgwick County (1962). Wichita. GEORGE, HERSCHEL C., Marion County (1970). Marion. GILBERT, ROBERT W., Marshall County (1970). Marysville. GILLMORE, RALPH E., Rice County (1966). Lyons. HENSLEY, OALE, Montgomery County (1957). Independence. HUNDLEY, JR., WILLIAM C., Butler County (1965). EI Dorado. KUECK, DON L., Kingman County (1968). Kingman. JUSTICE, RONALD G., Wyandotte County (1968). Kansas City. MCGINNESS, KENNETH E., Johnson County, (1954). Olathe. MERHOFF, BILLY R., Douglas County (1968). Lawrence. NIELSON, DOUGLAS A., Lyon County (1971). Emporia. NYHART, SYLVESTER, Russell County (1959). Russell.

RECTOR, RALPH B., Leavenworth County (1949). Leavenworth.
RIAT, LARRY D., Dickinson County (1961). Abilene.
ROBBINS, BENNY S., Harvey County (1969). Newton.
ROBERTS, GARY L., Ellis County (1970). Hays.
SMITH, DAVID R., Franklin County (1970). Ottawa
STUDER, RAYMOND L., McPherson County (1966). McPherson.
UMSCHEID, JR., SYLVESTER C., Reno County (1962). Hutchinson.
VAN SKIKE, WILLIAM V., Barton County (1950). Great Bend.
WEAVER, ELDON R., Cowley County (1968). Winfield.

\section*{County Extension Horticultural Agents}

KIBBY, JIMMY R., Wyandotte County (1966). Kansas City.
MORRIS, MAX B., Shawnee County (1965). Topeka.
STOUSE, LAWRENCE D., Johnson County (1966). Olathe.
THOLE, H. THOMAS, Barton County (1966). Great Bend.
WARMINSKI, NORMAN V., Sedgwick County (1969). Wichita.

\section*{Division of Continuing Education}

ALFORD, HAROLD J., Director, Professor (1969). BA 1938, MA 1951 University of Washington; PhD 1966, University of Chicago.
CLAPSADDLE, DAVID, Instructor (1971). BA 1962, Howard Payne College;
MS 1969, Kansas State College at Pittsburg.
DEYOE, DUANE, Instructor (1965). BS 1964, Kansas State University.

DIECKHOFF, KENNETH L., Temporary Instructor (1969). BA 1965, Fort Hays State College; MA 1969, University of Kansas.
FRYE, DAVID W. M., Instructor (1970). BA 1959, Macalester College; MA 1962, MA 1964, EdS 1969, College of St. Thomas.
HAROLD, E. NORMAN, Assistant Director, Instructor (1963). BA 1960, Kansas State Teachers College at Emporia; MA 1962, Vanderbilt University.
HORTON, MARY, Instructor (1970). BS 1968, MS 1970, Kansas State University.
HUMMEL, KAREN J., Instructor (1970). BS 1965, Kansas State University.
LOCKHART, WILLIAM, Instructor (1970). BS 1957, Kansas State College at Pittsburg; MA 1960, Árizona State University.
MCCARTHY, MICHAEL J., Instructor (1971). BA 1964, California State College; MA 1966, Kansas State University.
MILLER, MAX B., Assistant Professor (1946). BS 1946, MS 1950, Kansas State Úniversity; Junior College Credential 1954, Humboldt State College.
MORDY, LUCILLE E., Assistant Professor (1947). BS 1928, Emporia State College; MS 1951, Kansas State University.
REICHOW, RONALD W., Temporary Instructor (1969). AA 1961, Kansas City Junior College; BS 1963, MS 1967, Kansas State University.
RICHARDSON, ROBERT E., Temporary Instructor (1969). AB 1937, University of Kansas; MA 1965, George Washington University.
SWEGLE, WILLIAM F., Assistant Professor (1966). AA 1948, Kansas City Junior College; BA 1950, University of Kansas; MBA 1965, University of Missouri at Kansas City.
WILLIAMSON, MICHAEL M., Assistant Director, Assistant Professor (1966). BS 1956, MA 1962, Kansas State University.

\section*{STATISTICAL SUMMARY FOR FALL SEMESTER 1970-1971}

\section*{Students by State}
\begin{tabular}{|c|c|c|}
\hline Alabama & 9 & Allen .... \\
\hline Alaska & 5 & Anderson \\
\hline Arizona & 11 & Atchison \\
\hline Arkansas & 21 & Barber \\
\hline California & 79 & Barton \\
\hline Colorado & 54 & Bourbon \\
\hline Connecticut & 29 & Brown \\
\hline Delaware & 8 & Butler \\
\hline Dist. of Columbia & . 1 & Chase \\
\hline Florida ........ & - 25 & Chautauqua \\
\hline Georgia & - 16 & Cherokee \\
\hline Hawaii & . 7 & Cheyenne \\
\hline Idaho & 4 & Clark \\
\hline \(1 l l i n o i s\) & 143 & Clay \\
\hline Indiana & - 29 & Cloud \\
\hline lowa & 52 & Coffey \\
\hline Kansas & 11,573 & Comanche \\
\hline Kentucky & .. 8 & Cowley \\
\hline Louisiana & . 10 & Crawtord \\
\hline Maine & 4 & Decatur \\
\hline Maryland & 29 & Dickinson \\
\hline Massachusetts & 49 & Doniphan \\
\hline Michigan & 22 & Douglas. \\
\hline Minnesota & 32 & Edwards \\
\hline Mississippi & 8 & Elk \\
\hline Missouri . & - 264 & Ellis \\
\hline Montana & .. 9 & Ellsworth \\
\hline Nebraska & 161 & Finney \\
\hline Nevada & 5 & Ford \\
\hline New Hampshire & - 6 & Franklin \\
\hline New Jersey ... & 109 & Geary \\
\hline New Mexico & - 19 & Gove \\
\hline New York & 228 & Graham \\
\hline North Carolina & . 11 & Grant \\
\hline North Dakota & - 16 & Gray \\
\hline Ohio & 33 & Greeley \\
\hline Oklahoma & 62 & Greenwood \\
\hline Oregon & . 4 & Hamilton \\
\hline Pennsylvania & - 58 & Harper \\
\hline Rhode Island & . 6 & Harvey \\
\hline South Carolina & 25 & Haskell \\
\hline South Dakota. & - 25 & Hodgeman \\
\hline Tennessee & . 7 & Jackson \\
\hline Texas ... & . 51 & Jefferson \\
\hline Utah & . 3 & Jewell \\
\hline Vermont & . 5 & Johnson \\
\hline Virginia & 23 & Kearney \\
\hline Washington & 12 & Kingman \\
\hline West Virginia & . 3 & Kiowa \\
\hline Wisconsin ... & . 44 & Labette \\
\hline Wyoming & 8 & Lane \\
\hline & & Leavenworth \\
\hline TOTAL ....... & 13,425 & Lincoln ...... \\
\hline
\end{tabular}

Kansas Counties


Foreign Countries and Territories
\begin{tabular}{|c|c|}
\hline \multicolumn{2}{|l|}{Afghanistan} \\
\hline Argentina & \\
\hline \multicolumn{2}{|l|}{Bolivia} \\
\hline \multicolumn{2}{|l|}{Brazil} \\
\hline \multicolumn{2}{|l|}{Canada} \\
\hline \multicolumn{2}{|l|}{Canal Zone} \\
\hline Chile & \\
\hline \multicolumn{2}{|l|}{China ............. 104} \\
\hline Colombia & 9 \\
\hline \multicolumn{2}{|l|}{Denmark} \\
\hline \multicolumn{2}{|l|}{Dominican Republic} \\
\hline \multicolumn{2}{|l|}{Egypt} \\
\hline \multicolumn{2}{|l|}{England} \\
\hline \multicolumn{2}{|l|}{Ethiopia} \\
\hline \multicolumn{2}{|l|}{Finland} \\
\hline \multicolumn{2}{|l|}{Germany ............. 10} \\
\hline Ghana & \\
\hline \multicolumn{2}{|l|}{Greece} \\
\hline \multicolumn{2}{|l|}{Holland} \\
\hline \multicolumn{2}{|l|}{Hong Kong} \\
\hline \multicolumn{2}{|l|}{India} \\
\hline \multicolumn{2}{|l|}{Indonesia} \\
\hline \multicolumn{2}{|l|}{Iran} \\
\hline \multicolumn{2}{|l|}{Iraq} \\
\hline \multicolumn{2}{|l|}{Israel} \\
\hline \multicolumn{2}{|l|}{Japan} \\
\hline \multicolumn{2}{|l|}{Jordan} \\
\hline \multicolumn{2}{|l|}{Kenya ................. 3} \\
\hline \multicolumn{2}{|l|}{Korea} \\
\hline \multicolumn{2}{|l|}{Lebanon} \\
\hline \multicolumn{2}{|l|}{Libya} \\
\hline \multicolumn{2}{|l|}{Mexico} \\
\hline \multicolumn{2}{|l|}{Nigeria} \\
\hline \multicolumn{2}{|l|}{Norway} \\
\hline \multicolumn{2}{|l|}{Okinawa} \\
\hline \multicolumn{2}{|l|}{Pakistan} \\
\hline \multicolumn{2}{|l|}{Paraguay} \\
\hline \multicolumn{2}{|l|}{Peru .} \\
\hline \multicolumn{2}{|l|}{Philippines} \\
\hline \multicolumn{2}{|l|}{Puerto Rico} \\
\hline \multicolumn{2}{|l|}{Romania} \\
\hline \multicolumn{2}{|l|}{Suadi Arabia} \\
\hline \multicolumn{2}{|l|}{Sikkim :} \\
\hline \multicolumn{2}{|l|}{Switzerland} \\
\hline \multicolumn{2}{|l|}{Thailand} \\
\hline \multicolumn{2}{|l|}{Trinidad} \\
\hline \multicolumn{2}{|l|}{Turkey} \\
\hline \multicolumn{2}{|l|}{Uganda} \\
\hline \multicolumn{2}{|l|}{United Arab Republic} \\
\hline \multicolumn{2}{|l|}{United Kingdom} \\
\hline \multicolumn{2}{|l|}{Venezuela .....} \\
\hline \multicolumn{2}{|l|}{Vietnam} \\
\hline \multicolumn{2}{|l|}{Virgin Islands} \\
\hline \multicolumn{2}{|l|}{Yugoslavia} \\
\hline
\end{tabular}


\section*{DEGREES CONFERRED IN THE YEAR 1970}


\section*{RECORD OF ENROLLMENT \& DEGREES CONFERRED 1967-1970}
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline YEAR & Summer School & \multicolumn{4}{|l|}{Special Freshman Sophomore Junior} & Senior & Graduate & Net total & Degrees granted \\
\hline \(1967 \cdot 68\) & 4209 & 353 & 3418 & 2827 & 2429 & 2541 & 2616 & 14,184 & 2,095 \\
\hline 1968-69 & 4298 & 307 & 3528 & 2939 & 2475 & 3001 & 2902 & 15,152 & 2,590 \\
\hline 1969-70 & 4287 & 418 & 3540 & 3070 & 2647 & 2780 & 3107 & 15,562 & 2,862 \\
\hline
\end{tabular}

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\section*{Kansas State University Bulletin}

\author{
Larry Perrine, Editor
}

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[^0]:    *Full time employees, and spouses of full time Kansas State University employees, may elect to be exempted from this fee and thereby not be eligible for Student Health Center services.
    "Not a full activity fee and does not entitle payee to the yearbook and certain student events without additional payment nor to student athletic ticket rates.

[^1]:    -Students who have not selected a curriculum or major, enroll in General Agriculture (AG 005)

    - Pre-Veterinary requirements may also be completed in the College of Ärts and Sciences (see page 84).

[^2]:    1. Approved humanities electives are

    Department of Art - Courses in appreciation and theory
    Department of English - Any, except courses in composition
    Department of Philosophy - Any course
    Department of Modern Languages - Any course
    Department of Music - Any course in theory or appreciation of music
    Department of Speech - Any course in theater and interpretation
    Department of History - History of Western Civilization, Asian
    Civilization, History of Christianity. History of Science I, and History of Science II
    College of Architecture and Design - Any course in history or appreciation of architecture
    2. Courses suggested to fulfill social science requirements are:

    Economics (above Economics 1)
    Sociology
    Anthropology
    History (other than those used for humanities above)
    Political Science
    Psychology
    Philosophy
    3. Communications courses suggested are:

    English Composition 111
    Advanced Composition
    Agricultural !ournalism
    Courses in Speech and Speech Education, Nos. $120-665$

[^3]:    1. Students who satisfactorlly complete the Pre-VeterInary Medlcine program above and the first two years of the Curriculum in Veterinary Medicine, will be eliglble for a Bachelor of Science degree in the College of Agriculture.
    2. Pre-Veterinary Medicine requirements may also be completed in the College of Arts and Sciences.
[^4]:    1. Biological Science requirement may be filled by either General Zoology (4) and General Botany (4); or Principles of Biology (5) and Organismic Biology (3).
[^5]:    1. For options B and C, Descriptive Physics in lieu of General Physics 1 2. Studnets enrolling in this option will be advised through the Agronomy Department.
    2. Students enrolling in this option will be advised through the Agricultural Economics Department.
    3. Students enrolling in this option will be advised through the Horticulture and Forestry Department.
[^6]:    Professors Bidwell,* Bieberly,* Casady,* Ellis, ${ }^{*}$ Feltner, ${ }^{*}$ Heyne, ${ }^{*}$ Hobbs, ${ }^{*}$ Jacobs, ${ }^{*}$ Jones, ${ }^{*}$ Mader, ${ }^{*}$ Olson,* Pittenger, * Sorenson,* and Woodruff;* Associate Professors Atkinson, Barnett,* Edelblute, Harper, Hyde,* Liang,* Murphy,* Nilson, Overley, Paulsen,* Peterson, Powers, ${ }^{*}$ Russ,* Sloan, Skidmore,* Teare,* Vanderlip, ${ }^{*}$ Wassom,* Whitney,* Wilkins, Withee;* Assistant Professors Dicken, Humburg, Kanemasu,* Lundquist, McMaster, Moore, Nickell,* Owensby,* Raney, Stiegler, Swallow, Thien, Tobin, and Walter; Instructors Bonne, Burchett, Dickerson, Eaton, Gronau, Gruver, and Lyles; Emeritus: Professors Anderson,* Axelton, Clapp, Cleavinger, Lind and Zahnley.*

[^7]:    Non majors lacking these prerequisites should obtain consent of instructor before enrollment.

[^8]:    Non-majors lacking these prerequisites should obtain consent of in structor before enrollment.

[^9]:    - Credit for Intermediate Algebra may not be applied toward a degree. - No more than three courses in history to fulfill E and F.
    $\cdots$ Each department and division with in the College of Arts and Sciences may of fer either the B.S. or A.B. degree or both the B.S. and A.B. degrees. Required of freshmen.

[^10]:    Suggested Schedule of
    Pre-Veterinary Medicine Requirements
    Fall Semester
    English Composition I
    College Algebra
    Chemistryl
    Chemistry 1
    Social Science elective or
    Principles of Animal Science
    Oral Communications 1
    Basic Physical Education

    Spring Semester
    English Composition II
    Chemistry ll
    -Principles of Biology or General Zoology
    Plane Trigonometry
    Social Science elective or
    Principles of Animal Science
    Principles of Animal Science
    Basic Physical Education

[^11]:    College of Veterinary Medicine recommends Principles of Biology but either is acceptable.

[^12]:    1. Most chemistry majors choose to work for the B.S. degree, but a slightly modified program leading to the B.A. degree is also available.
    2. A related program of preparation for high school chemistry teaching leading to a B.S. Degree in Secondary Education is conducted by the College of Education.
[^13]:    3. In the fall semester, the Chemistry Department conducts an AC celerated Program which provides the opportunity for students with good preparation in high school chemistry to earn credit in both Chemistry 1 (Chem 210) and Chemistry 11 (Chem 230). Credit in Chemistry 1 is earned through satisfactory performance on a review examination given the second week of the semester and completion of a special laboratory of three hours week of the semester and completion of a special laboratory of three hours per week. Students taking Chemistry 1 in this way are placed in a special section of Chemistry 11, thus allowing co
    Chemistry 11 during the first semester.
    4. All chemistry courses numbered 600 or above require the following as 4. All chemistry courses numbered 600 or above require the following as minimum prerequisites: Organic Chem. II (Chem 450), Organic Chem. II Lab. (Chem 451), Physical Chem. II (Chem 595), and Physical Chem. II Lab. (Chem. 598).
[^14]:    4. All chemistry courses numbered 600 or above require the following as minimum prerequisites: Organic Chem. II (Chem. 450), Organic Chem. II Lab. (Chem. 451), Physical Chem. II (Chem. 595), and Physical Chem. II Lab. (Chem. 598).
[^15]:    4. All chemistry courses numbered 600 or above require the following as minimum prerequisites: Organic Chem. II (Chem. 450), Organic Chem. II Lab. (Chem. 451), Physical Chem. II (Chem. 595), and Physical Chem. II Lab. (Chem. 598).
[^16]:    The College of Arts and Sciences section of the Department of Economics; see also College of Agriculture. Courses in Agricultura Economics are offered by the College of Agriculture; courses in Accounting and Business Administration are offered by the College of Business Administration.

[^17]:    *Option on Physical Education 216 and 241.

[^18]:    "Option on Biology 205, 215 and 425.

[^19]:    'Three hours academic credit, not applicable toward degree requirements. Student in curriculum requiring 120 credit hours must therefore accumulate 123 or 124 hours when taking this course. Hours will apply toward grade-point average.

