KSU

GENERAL CATALOG

1970 1971

bulletin

KANSAS STATE UNIVERSITY

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Contents

KANSAS STATE UNIVERSITY BULLETIN

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Business Directions

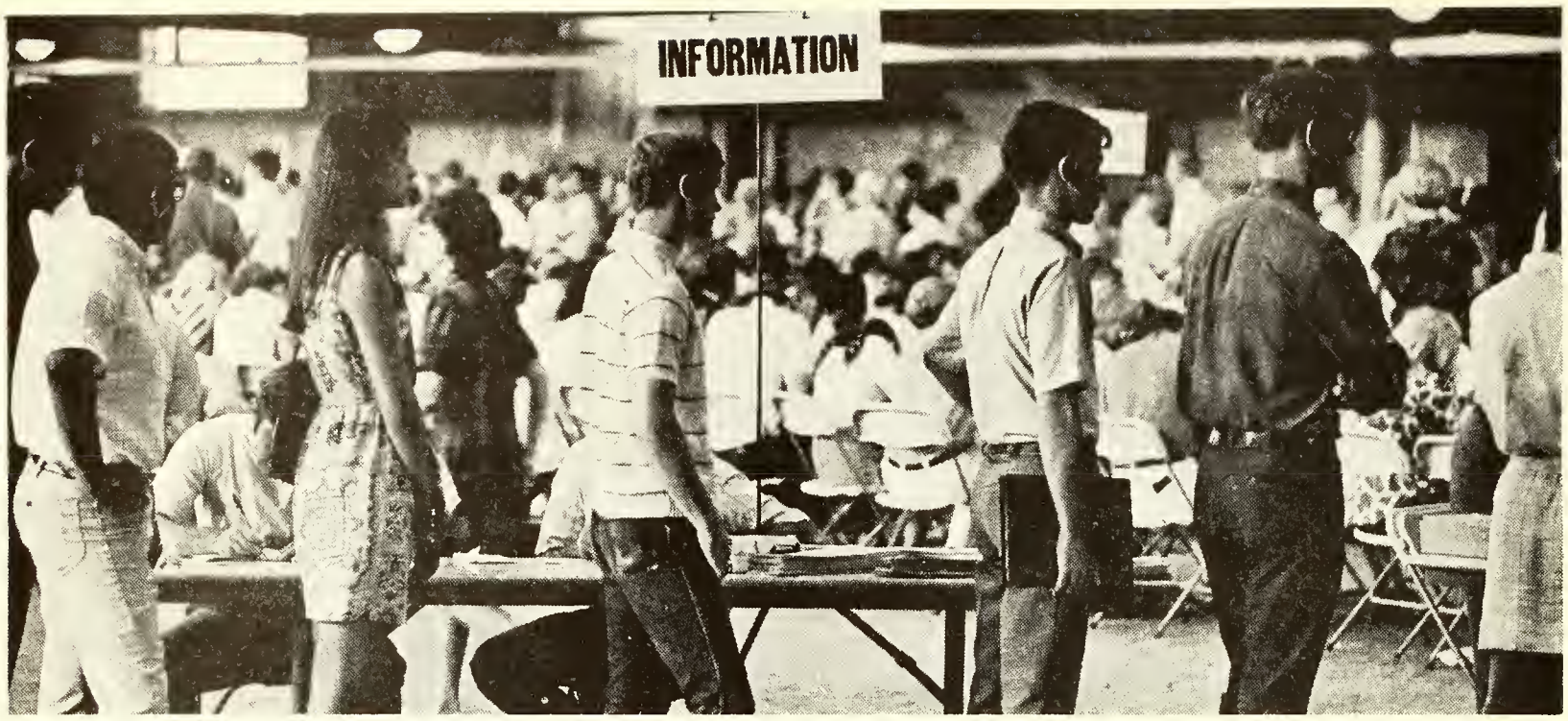
General information about the University is obtainable from the President.

Prospective undergraduate students should communicate with the Dean of Admissions and Records.

Prospective graduate students should communicate with the Dean of the Graduate School.

The experiment stations and the various departments are always ready to respond to requests for information in their special fields. Those who need scientific and practical information should write to the head of the department concerned with the work under consideration.

Requests for publications of the Agricultural Experiment Station or the Engineering Experiment Station should be made to director of the station.



Calendar

First Semester 1970-71

August 27-29, Thursday-Saturday
Registration of all students including physical examinations, testing, and orientation for new students.

August 31, Monday
Classes begin. Late fee, $2.50.

September 4, Friday
Regular registration closes for University staff, elementary and secondary school teachers. End of first week. Late fee $5.00 for subsequent enrollment.

September 11, Friday
Last day to enroll without permission from student's dean (2nd week).

September 18, Friday
Last day for all students except new undergraduate students to drop courses without a Wd or Failure being recorded.

October 9, Friday
Last day to withdraw and receive a fee refund (6th week).

October 16, Friday
Mid-semester grade reports due in Office of Admissions and Records (7th week).

October 30, Friday
Last day for new undergraduates to drop courses without a Wd or Failure being recorded (9th week).

November 24, Tuesday, 10:00 p.m.
Thanksgiving student recess begins.

November 26, Thursday
Thanksgiving Day.

November 30, Monday
Classes resume.

December 4, Friday
Last day subject may be dropped before end of semester.

December 14-22, Monday-Tuesday
Semester examinations for all students.

December 24, Thursday Noon
Deadline for grade reports to Office of Admissions and Records.

Second Semester, 1970-1971

January 14-16 Thursday-Saturday
Registration of all students including physical examinations, testing, and orientation for new students.

January 18, Monday
Classes begin. Late enrollment fee, $2.50.

January 22, Friday·Noon
Regular registration closes for University staff, elementary and secondary teachers. End of first week. Late fee $5.00 for subsequent enrollment.

January 29, Friday
Last day to enroll without special permission from student's Dean (2nd week).

February 5, Friday
Last day for all students except new undergraduate students to drop courses without a Wd or Failure being recorded.

February 22-23, Monday-Tuesday
Washington's Birthday.

February 26
Last day to withdraw and receive a fee refund (6th week).

March 5, Friday
Mid-semester grade reports due in Office of Admissions and Records.

March 19, Friday
Last day for new undergraduate students to drop courses without a Wd or Failure being recorded (9th week).

April 3, Saturday
Spring student recess begins. (Easter is April 11.)

April 13, Tuesday
Classes resume.

April 30, Friday
Last day a subject may be dropped before end of semester.

May 6-14, Thursday-Friday
Semester examinations for all students.

May 14, Friday
Commencement.

May 17, Monday
Deadline for grade reports to Office of Admissions and Records. (Noon)

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 self-responsibility.
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:

1. The ability to recognize and master fundamental principles in his field of specialization.
2. The knowledge basic to his special field of study.
3. The ability to reason critically from facts and recognized assumptions to useful technical conclusions.
4. The basic skills associated with his field of study.
5. 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:

1. Develop his communication skills.
2. Develop the ability to apply critical and creative thinking to the solution of theoretical and practical problems.
3. Understand the basic concepts of the natural sciences, the interrelations of the natural and social sciences, and the impact of science on society.
4. 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.
5. 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.
6. Develop a well-adjusted personality, good character traits, and a sound philosophy of life.
7. Prepare for effective participation in family life.
8. 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.

Admission of Undergraduates

Students interested in attending Kansas State University should write to the Admissions Office for the admission application form. The student should complete the form, indicate the curriculum in which he plans to enroll 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 all day on Saturday.

Students and their parents are always welcome, and are encouraged to visit the campus for individual counseling. However, it is usually advisable to write two weeks in advance for an appointment. Normally several admissions counselors are available to consult 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-of-state 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 to the University. Students are urged to apply early in their 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 previous 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 a 2.0 (C) overall average in their previous academic work in order to be considered for admission to the University. This standard applies to both Kansas and out-of-state transfer students.

Most credits from other 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 high school principal.

Advanced Placement Examinations

A student who has completed one of the College Entrance Examination Board Advanced 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 certain 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 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 faculty adviser is available to him any time during the year when he needs help. Faculty advisers assist students in defining goals to be reached in college, give information regarding appropriate curriculums and courses, and discuss any personal problems that the students may have, especially those problems related to the student's progress and plans for subsequent work.

Late Admission

A student who seeks to enter the University later than 10 calendar days after the day classes begin for a 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 late enrollment fee of $5.00. (See University Calendar.)

Physical Examinations

All new students are required to take a physical examination prior to registration under the Board of Regents regulations.

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 students are admitted as special students to take several courses in the summer between their junior and senior year in high school. 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 that they did complete 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, 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 $3.00 per semester credit hour in which examined for residents of Kansas and staff members; $9.00 per semester credit hour for nonresidents of Kansas. 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.

However, a first-semester freshman at Kansas State University may take a test to receive credit in English Composition I, Chemistry and/or Modern Languages without charge. Only first-semester freshmen who have met the standard set by the Department of English in the English placement examination are eligible for the examination in English Composition I.

Failure in these free examinations will not be entered on the student's permanent record. Grades received on all other 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 catalog

statements 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 this 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. Later assignments to courses are made during regular office hours by the student's dean or adviser. A student may not enroll later than 10 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. (See the calendar and the section on Late Enrollment Fees, page 14.)

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 his 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 non-graded 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 regularly enrolled student must have the permission of his dean to take correspondence or extension courses while enrolled; and then is counted as part of his 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 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 from the University not later than 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. (See the University Calendar.) Beginning undergraduate students have nine weeks for this purpose.

Auditing Classes

An auditor is one who attends 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 of the University. 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.
NCr, for no credit in courses for which no letter grade is given.

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 semester. Final examinations are to be given during the scheduled examination 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 ex-

amination 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 head of the department in which the course is given, from the dean of the college in which the student is assigned. Such 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 a credit hour for residents, $7.50 per credit hour for non-residents.

Report of Grades

As shown on the academic calendar, mid-semester 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 self-addressed 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. (See the University Calendar.)

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 full semester grade of failure 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 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 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; B, 3; C, 2; D, 1; F, 0. (See page 10.)

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) over-all or semester average. A student with less than 60 hours is placed on probation whenever he has more than five grade points less than a 2.0 (C) over-all or semester average.

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

A student who neglects his academic responsibility may be dismissed at any time on the 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 may not be readmitted until approved for readmission by the Academic Standards Committee of the college from which he was dismissed or is about 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. However, 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.

Bachelor degree candidates who have completed a minimum of 45 hours of undergraduate graded work in residence are considered for commencement scholastic honors on their resident scholastic record up to the term of graduation. Students with a 3.950 or above academic average are eligible for "Summa Cum Laude." The committee will also designate those with 3.70 or above to receive diplomas inscribed "Magna Cum Laude." The remaining candidates with 3.3 or above are graduated "Cum Laude". 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 of 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-State Singers	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 journalism	1	4
Ag Student News journalism	1	4
Kansas State Engineer journalism	1	4
Royal Purple journalism	1	4

Credits may be counted as electives in the student's curriculum. A student may use not 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 graduation.

Course Description Key

Courses carrying no credit (pre- or non-collegiate 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 is offered. I means first or fall semester; II, second semester; and S, summer session. I, II, mean both semesters. Pr. indicates "Prerequisite." Conc. is the abbreviation for 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 all prerequisite high school courses and has 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 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 = 2.0) on all Kansas State University courses taken for resident 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 accept-

able to Kansas State University and submits 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 6. It is recommended that entering freshmen complete the prerequisite mathematics courses. However, deficiencies in mathematics preparation can be removed at the University during the first year.

In the College of Agriculture

(E) Agriculture, B. S. in Agriculture, B. S. in Agricultural Journalism, pages 28 and 30.
- (Agricultural Economics major) page 30.
- (Agricultural Journalism major), page 30.
- (Agricultural Mechanization major), page 30.
- (Agronomy major), page 30.
- (Animal Science and Industry major), page 30.
- (Dairy Production major), page 30.
- (Entomology major), page 30.
- (Horticulture major), page 30.
- (Plant Pathology major), page 30.
- (Poultry Science major), page 31.
- (Pre-Veterinary Medicine major), page 31.

(E) Agricultural Education (Teachers), B. S. in Agriculture, page 32.

(E) Bakery Science and Management, B. S. in Bakery Science and Management, page 33.
- (Administration option), page 33.
- (Science option), page 33.
- (Operations option), page 33.

(F) Biochemistry, B. S. in Biochemistry, page 34.

(E) Dairy Foods Processing, B. S. in Agriculture, page 35.

(E) Feed Science and Management, B. S. in Feed Science and Management, page 33.
- (Administration option), page 34.
- (Chemistry option), page 34.
- (Operations option), page 34.

(E) Milling Science and Management, B. S. in Milling Science and Management, page 34.
- (Administration option), page 34.
- (Chemistry option), page 34.
- (Operations option), page 34.

In the College of Architecture and Design

(F) Architecture (five years), Bachelor of Architecture, page 58.

(F) Architectural Structures Option (five years), Bachelor of Architecture, page 59.

(F) Bachelor of Interior Architecture, page 60.

(F) Landscape Architecture (five years), Bachelor of Landscape Architecture, page 60.

(F) Building Construction, B. S. in Building Construction, page 59.

In the College of Arts and Sciences

Bachelor of Arts

A. B.

(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
(F) Mathematics
(A) Modern Languages
(A) Music
(A) Philosophy
(B) Political Science
(B) Psychology
(B) Radio and TV
(B) Sociology
(A) Speech
(A) Statistics
(B) Technical Journalism

Bachelor of Science

B. S.

(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
(F) Mathematics
(E) Physics
(B) Political Science
(B) Psychology
(B) Radio and TV
(B) Sociology
(B) Speech
(E) Statistics
(B) Technical Journalism

Pre-Professional

A. B.

(D) Physical Therapy
(E) Pre-Dentistry
(B) Pre-Law
(E) Pre-Medicine
(A) Bachelor of Music
(A) Bachelor of Music Education
(A) Bachelor of Physical Education

B. S.
(E) Medical Technology
(D) Physical Therapy
(E) Pre-Dentistry
(A) Pre-Elementary Education
(B) Pre-Law
(E) Pre-Medicine
(B) Pre-Nursing
(E) Pre-Pharmacy
(A) Pre-Secondary Education
(E) Pre-Veterinary

In the College of Business Administration

(E) Business Administration, B. S. in Business Administration, page 144.
(E) Accounting, B. S. in Business Administration, page 145.

In the College of Education

(A) Elementary Education, Bachelor of Science in Elementary Education, page 153.
(A) Secondary Education, Bachelor of Science, page 154.

In the College of Engineering

(F) Agricultural Engineering, B. S. in Agricultural Engineering, page 166.
(F) Chemical Engineering, B. S. in Chemical Engineering, page 167.
(F) Civil Engineering, B. S. in Civil Engineering, page 168.
(F) Electrical Engineering, B. S. in Electrical Engineering, page 168.
(F) Industrial Engineering, B. S. in Industrial Engineering, page 169.
(F) Mechanical Engineering, B. S. in Mechanical Engineering, page 169.
(F) Nuclear Engineering, B. S. in Nuclear Engineering, page 170.
(Option I), page 170.
(Option II), page 170.
(Option III), page 170.
Dual degree in Engineering and Business Administration, page 171.

In the College of Home Economics

(C) Home Economics with options, B. S. in Home Economics, page 196.
(Home Economics Education-Vocational Teaching), page 197.
(Extension), page 199.
(Radio and Television), page 197.
(Clothing and Retailing), page 197.
(Textile Research), page 197.
(Fashion Design), page 198.
(Interior Design), page 198.
(Community Services), page 199.
(Early Childhood Education), page 198.
(Consumer Interest), page 199.
(Housing and Equipment), page 199.
(Foods and Nutrition in Business), page 200.
Foods and Nutrition in Research), page 200.
(Dietetics and Institutional Management), page 200.
(C) Home Economics and Journalism, B. S. in Home Economics and Journalism, page 201.
(C) Home Economics with Liberal Arts, B. S. in Home Economics, page 200.
(C) Restaurant Management, B. S. in Restaurant Management, page 201.

In the College of Veterinary Medicine

Veterinary Medicine, Doctor of Veterinary Medicine, page 212.
(For completion of six-year combination of pre-veterinary curriculum and veterinary medicine curriculum)
(See Colleges of Agriculture and Arts and Sciences for B. S. degrees in connection with College of Veterinary Medicine.)

Fees

Fees Subject to Change. All fees are subject to change at any time without notice by the Board of Regents.

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 21.

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 Stadium revenue bonds.

Student Activities Fee. The Student Activities fee is used for student publications, Union operations; judging, debate, rifle, rowing and soccer teams; musical groups, fine arts, intramural sports, open houses, University for Man, Student Governing Association 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

Subject to Change Without Notice

For students enrolled in seven or more semester credit hours.

	Residents of Kansas and Staff Members	*Non-residents of Kansas*
Incidental Fee:		
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—Veterinary Medicine students	278.00	593.00

For students enrolled in six or less semester credit hours.

	Residents of Kansas and Staff Members	*Non-residents of Kansas*
Incidental Fee:		
All except Veterinary Medicine students ..... per credit hour	$12.00	$32.00
Veterinary Medicine students ..... per credit hour	15.00	35.00
Student Health ..... total fee	25.00*	25.00*
Student Union Annex I .. total fee	1.50	1.50
Student Union Annex II . total fee	6.50	6.50
Stadium Bonds ..... total fee	.50	.50
Student Activities (including Union operations) . total fee	4.50†	4.50†

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
Stud. Union Annex II . total fee	10.25
Stadium Bonds ..... total fee	4.25
Student Activities (including Union operations) ..... total fee	16.25
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 ..... total fee	.50
Student Activities (including Union operations) ..... total fee	4.50†

* 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.

Fees for Summer Sessions

Subject to Change Without Notice

The following schedule of fees covers the Incidental, Student Health, Student Union Annex I and II, Stadium Bonds, Student Activities fees.

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

Definitions, Special Fees and Refund Policy

Residents of Kansas. For fee assessment purposes the residence of students entering Kansas State University is determined by an act of the legislature (K. S. A. 76-2701), which reads as follows: "Persons entering the state educational institutions who, if adults, have not been, or if minors, whose parents have not been residents of the state of Kansas for six months prior to matriculation in the state educational institutions, are non-residents for the purpose of the payment of matriculation and incidental fees: Provided further, that no person shall be deemed to have gained a residence in this state for the aforesaid purpose while or during the lapse of time attending such institution as a student, nor while a student of any seminary of learning, unless, in the case of a minor, his parents shall have become actual residents in good faith of the state of Kansas during such period, or unless, in the case of a minor, he has neither lived with nor been supported by his parents or either of them for three years or more prior to enrollment and during said years has been a resident in good faith of the state of Kansas."

Staff Members. For fee assessment purposes, staff members are those who work four tenths time or more and are 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—February and March

For summer sessions—June or the preceding February and March

Also wives and dependent children, but not husbands, of full-time employees paid on the above payrolls, military ROTC staff members and federal employees given courtesy appointments.

* 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.

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 outlined below):

	University Students	*Non-University Students*
Two 30-minute lessons a week, per semester	$42.00	$70.00
One 30-minute lesson a week, per semester	24.00	36.00
Two 30-minute lessons a week, summer session	21.00	35.00
One 30-minute lesson a week, summer session	12.00	18.00
Single lessons, each	4.00	4.00
Practice piano, 1 hour daily, per semester	5.00	5.00
Practice piano, 2 hours daily, summer session	5.00	5.00
Practice organ:		
Two-manual, 1 hour daily, per semester	10.00	10.00
Two-manual, 2 hours daily, summer session	10.00	10.00
Three-manual, 1 hour daily, per semester	20.00	20.00
Three-manual, 2 hours daily, summer session	20.00	20.00

Field Geology Fee. The fee for the summer geology field camp is $80.00, 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, viz., 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 eight-week 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.

	Amount of Refund	
	Regular Semester	*8-week Summer 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 $5.00 shall be assessed and collected from each person enrolling, re-enrolling 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 $2.00 fee is assessed for each card replaced.

Examination Fees. The fee for taking an examination to obtain college credit (in lieu of attending classes) is $3.00 per semester credit hour in which examined for residents of Kansas and staff members; $9.00 per semester credit hour for non-residents of Kansas.

Auditing Fee. An auditor who is neither an enrollee paying full incidental fee nor a staff member shall be assessed $1.00 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 or breakage or losses due to personal negligence on the part of the student, and then only for the actual fair value of supplies so used or lost and 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. The cost of these items will vary from semester to semester.

Postal Center

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.

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 non-academic department of the University and functions directly under the authority of the Vice-President for Academic Affairs. The Kansas State University Computing Center IBM 360/50 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 128K bytes of main core and 1,000K 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 and first floors 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/I, RPG, WATFOR, 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-V tandem de Graaff which became operational in 1969. Also, there are several smaller accelerators which together with the 12-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 neurton 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 graduate students at Kansas State University who are preparing for careers in Speech Pathology. 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.

University Publications

General Catalog
Student Catalog
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 weekly 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 six times a year by the Alumni Association.
The Trumpet—published quarterly by the Endowment Association.

The University's System of Libraries

The Francis David Farrell Library, named for Kansas State University's eighth President, is the main library of the University. It provides seating for 780 students and faculty members at individual carrels, in listening rooms, around seminar tables, in browsing alcoves, and in the Library's film-projection rooms. Branch libraries include the Architecture Library, located in the new addition to Seaton Hall; the Veterinary Medicine Library, housed in Veterinary Hall; the Chemistry Library in Willard Hall; and the Physics Library, located on the main floor of the Physical Science Building. A collection of printed matter, pictures, and three-dimensional models relating to elementary, secondary, and college teaching is contained in the Teaching Materials Center.

The Audio-Visual Department of the Library consists of collections of slides, records, magnetic tapes, film, film strips and mounted art work for the use of students in the Library and faculty members for classroom use. Five listening and projection rooms are equipped with modern listening and viewing equipment. A central audio console allows records and tapes to be played in rooms and over earphones throughout the Library gallery. Extensive collections of materials and equipment catalogs and advice concerning the selection of new materials and equipment are also provided.

The University libraries contain more than 500,000 volumes, and approximately 40,000 carefully selected items are added to this number each year. The Library Courier Service, a cooperative arrangement with other public, private and special libraries within close proximity to Manhattan, affords K. S. U. students ready access to the several million volumes included in collections of the Linda Hall, University of Kansas, Kansas State Historical Society, University of Kansas Medical School, Harry S. Truman, Dwight D. Eisenhower, and the Command and General Staff College Libraries. Scheduled passenger service is available to these facilities.

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 will 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, includ-

ing housing, food service, counseling and testing services, Student Health Center, and Student 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 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 the regular session with the addition of conferences and workshops planned to meet special needs. The particular courses chosen for Summer School are determined by student demand.

The Summer School consists of an eight-week session in which a student may earn as many as nine semester hours of credit on a regular assignment. A student may, if he wishes, take a part-time assignment.

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 single week to four-week lengths.

The Summer School Bulletin gives complete and detailed information on all aspects of 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.

Student Personnel Services

Kansas State University has developed a complete program of student personnel services because it believes that education involves many experiences outside the classroom. This philosophy considers 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 nine divisions comprising the Student Personnel Program: Aids, Awards, and Veterans Service; Career Planning and Placement Center; Counseling Center; Dean of Students; 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.

Dean of Students Office

Members of the Dean of Students Office work in a variety of ways with individual students and student groups and function as a liaison to all elements of the university community.

Specifically, these responsibilities include relationships with residence halls, fraternities and sororities, student government, student organizations, campus religious groups, and the university judicial system.

In addition, some of the staff hold part-time appointments in the College of Education.

Major direction for many programs comes from this office, including the following: summer enrollment and orientation; foreign student advisement; workshops for house mothers.

Religious Life at the University

Religion at Kansas State University finds expression in many church-sponsored student religious organizations, within the administrative and academic structure of the University, and in over 30 church congregations in Manhattan.

On campus there are two memorial chapels —Danforth and All-Faith—which are available for student religious services and private meditation.

Foreign Student Office

The Foreign Student Office serves as a facilitator for the over 400 foreign students on the campus of Kansas State University. This Office serves as a catalyst in developing a foreign student program while at the same time is frequently called upon to advise the student in matters of renewals of stay, passports, work permits, and general status questions peculiar to the non-American student.

The Foreign Student Office works with all facets of the university structure to implement and support both the goal of the student and the goal of the University in International Education.

The Foreign Student Adviser serves as adviser to two of the international student organizations on campus and he uses his office to help promote a mutual concern between foreign and American students as well as concern between the foreign students, the faculty, and the community.

Orientation for New Students

During the registration period for each semester an orientation program is provided for all new undergraduates. Most new students participate in the two-day summer program as they prepare to enter the University in the fall. Additional programs are planned as a part of each new semester.

New students receive a personal introduction to life in the K-State Community as they meet with upperclass students, faculty members and administrators. Traditionally, it is the time when students and their parents begin to make Kansas State their University. For a good beginning it is important that all new students participate in the activities planned for them.

No one may register as an undergraduate unless he has completed the required physical examination and required aptitude tests.

University Housing

Kansas State University considers the housing of students as part of the total educational plan. All unmarried undergraduate minor students attending the University and not living at home must live in University-approved housing such as residence halls, scholarship houses, fraternities, sororities, rooming houses, and apartments.

All single, minor freshman women not living at home are housed in University-operated residences.

Single, minor freshman men not living at home or classified as veterans may either live in a fraternity house or a University-operated residence.

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; 576 apartments and 52 mobile home lots for married couples. Sororities provide 600 places for women, and fraternities have accommodations for 1,200 men. Others find privately owned rooms and apartments from University-approved listings.

Self-Government on Campus

Learning to manage one's 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.

On the lighter side, 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 game-watching party to a Christmas ball.

With the exception of a 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 a receipt of a residence hall room application and $25.00 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 University nine-month contract is forwarded to the student.

Students may elect either the full payment plan or installment plan without any additional credit charge.

Payment Schedule

A. Full payment of $437.50 or $110.00 with contract
B. Payment schedule (if not paid in full)

Fall Semester		*Spring Semester*	
Payment with contract	$110.00	January 10	$110.00
September 10	110.00	February 10	110.00
October 10	110.00	March 10	110.00
November 10	107.50	April 10	107.50

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 housekeeping —cooking, cleaning, and dishwashing. In this way living costs, a big item in the budget, are lowered considerably. The men in Straube and Smith spend about six hours a week at their house duties. Forty-five 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 that 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 Director of Aids, Awards, and Veterans Services, Holtz Hall, Kansas State University, Manhattan, Kansas 66502, for applications and information.

Married Student Housing

The married students have not been overlooked in the housing expansion 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 the "home-owning" couples.

The apartment rates are $72.50 for a one-bedroom apartment and $85.00 for a two-bedroom apartment. The trailer parking lot rental is $22.50 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 $72.50 a month for a one-bedroom and $85.00 a month for a two-bedroom. These are furnished and all bills are paid up to 140 KWH of electricity. (See source of applications under Married Student Housing.)

Off-Campus Housing

The Department 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 $25.00 to $40.00 a month for one person to a room and $25.00 to $30.00 a month per person when two or more reside in a room. Meals at the K-State Union Cafeteria and local cafes will cost $60.00 to $80.00 a month. Rates in board-and-room houses usually run $380.00 a semester. This includes 17 meals per week. Apartments rent from $50.00 to $200.00 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 freshmen 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 $540.00 per term. This figure includes room, board, and sorority dues. Freshman members, however, live in residence halls and pay sorority dues of approximately $25.00 a month. The following national sororities have established chapters at Kansas State:

Alpha Chi Omega
Alpha Delta Pi
Alpha Xi Delta
Chi Omega
Delta Delta Delta
Delta Zeta
Gamma Phi Beta
Kappa Alpha Theta
Kappa Delta
Kappa Kappa Gamma
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 $540.00 per semester. For more information, write Faculty Adviser to Fraternities, Holtz Hall, Kansas State University, Manhattan, Kansas. 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 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
Triangle

Clovia

Clovia 4-H House provides accommodations for 62 upperclass women. Although 4-H members are given preference, any coed is eligible for membership. Freshmen 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 $75.00 including social fees. The women spend about six hours a week at their house duties. Applications are made through the County Extension Offices or the State 4-H Department at Kansas State University.

Intramurals and Recreation

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.

In addition to the organized intramural programs for men and women, the department sponsors as much free play and recreational use of its facilities as possible, including gym, swimming pool, playing fields and courts.

Other departmental responsibilities include the intercollegiate crew and soccer team, judo, fencing, and sports parachute clubs.

Aids, Awards, and Veterans Services

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, a student, undergraduate or graduate, 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 June 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, Holtz Hall, Kansas State University.

Scholarship Programs

More than 700 Kansas State University undergraduate students receive some scholarship assistance each year. Some scholarships are awarded for a single year, others are renewable for additional years of undergraduate study.

Students desiring scholarship applications or information relative to scholarships should write to the Aids, Awards, and Veterans Services Office, Holtz Hall, Kansas State University, Manhattan, Kansas. The deadline for submitting completed applications is February 15 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, Holtz Hall, immediately after he arrives 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, Holtz Hall, Kansas State University.

Services for Veterans

The University maintains a Veterans Service Office for the purpose of aiding 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, Holtz Hall, 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.

Counseling Center

Most students find the Counseling Center services useful. Counselors are available to discuss with students a wide variety of concerns, often having to do with decision-making or planning, such as vocational uncertainty or difficulty in choosing a major. Sometimes students can develop new habits and attitudes through counseling, such as better study habits or 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 to contribute his professional training and experience to helping the student. 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 relevant information sources, such as students' experiences, psychological tests, occupational data, University requirements, and others.

High school seniors are also eligible to use the Counseling Center services before they enter college, and may make appointments by writing to the Center, or by coming to 226 Anderson Hall.

Lafene Student Health Center

The Lafene Student Health Center, a modern facility to serve the health needs of K-State 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 K-State 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 the 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 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.

Career Planning and Placement Center

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, located 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 the areas of business and industry, education, alumni, and summer employment the Center is particularly effective in attracting employers from throughout the state and nation; recently, more than 1,200 recruiters representing over 700 organizations have each year conducted on campus more than 10,000 interviews. Considerable emphasis is placed upon career counseling and guidance. Supplementing this effort is the service available from the Counseling Center, particularly in

terms of 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 college-educated 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 has been added to assist students in planning for advanced study. In the field of education, current information is filed on positions open and the qualifications required in elementary, secondary, and college-level work, including administration. Complete records and credentials are kept for every graduate in teacher education. Increasing emphasis is being placed on employment opportunities in higher education. Extension information on employment opportunities is available, and qualified staff members are always eager to help students and alumni with employment considerations.

Regarded by many as 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, resulting in optimal matching of educated talent in challenging positions, to the ultimate benefit of applicants, employers, and society.

K-State Union

The K-State Union is the "campus community center," offering extensive facilities for the 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 600-seat auditorium, a union-operated 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 all-University event.

The Union Governing Board is responsible for the Union policies and program. There are over 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, Harlequinade, Hospitality, K-Purrs, Magic Lantern Company, News and Views, Open Cyrkle and Trips and Tours. All students are invited to apply for membership on one of these committees.

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 may not secure parking permits. 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, as any community, 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 recreation opportunities.

The All-University governing body is the Student Governing Association. Within the Executive, Legislative, and Judicial Branches is the only elected student body officer, the president of SGA; Student Senate, comprised of representatives from the seven colleges and the Graduate School of the University; and Tribunal, which hears cases involving violations of the Honor and Conduct Code. 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 that is consonant with the objectives of the University.

The Student Governing Association constitution and all student organizations, their presidents and faculty advisers, are in the Kansas State University Directory. Students should read through these pages. Judicious participation in these activities can add an important dimension to their university lives.

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

Professional

Alpha Chi Sigma (Chem., Chem. Engg., Biochem.)
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
Bakery Management Club
Institute of Aerospace Sciences
Institute of Electrical and Electronics Engineers
Kappa Alpha Mu (Photo Journalism)
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 (Men's Journalism)
Society of American Military Engineers
Soil Conservation Society of America
Steel Ring (Engineering)
Theta Sigma Phi (Women Journalists)
Wildlife Society

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)

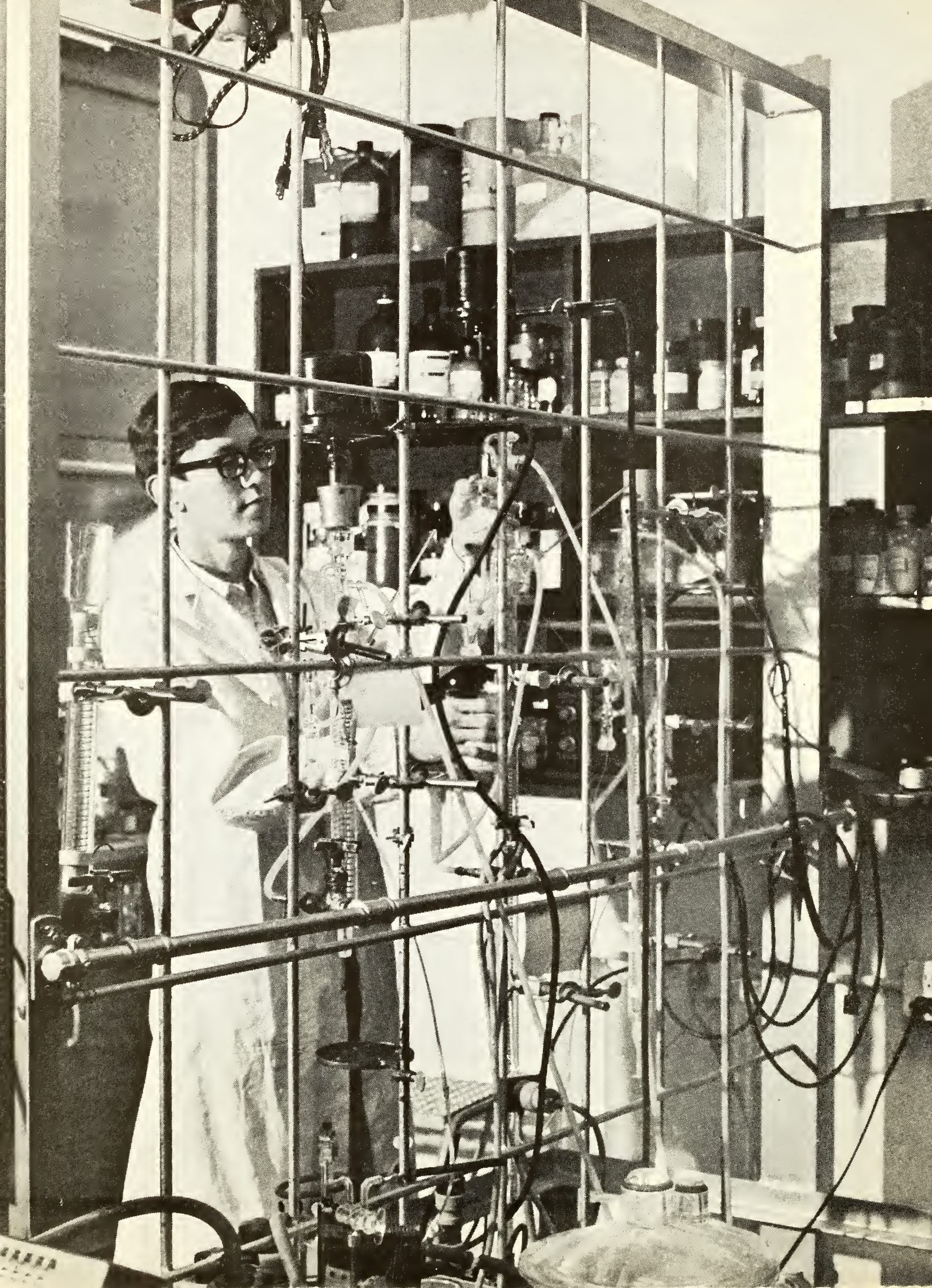
Scholastic Honorary

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 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.



Agriculture

GLENN H. BECK, Vice President for Agriculture

Agriculture at Kansas State University includes instruction, research, extension, and international agricultural programs with county agents, branch experimental stations, experimental fields located at strategic locations in the state, and programs of education and development in foreign countries. Under the vice president for agriculture are four administrators in charge of those four phases of work: the dean of the College of Agriculture, the director of the experiment station, the director of cooperative extension, and the director of international agricultural programs.

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. The first is to help the student develop the qualities of an educated person—a philosophy for constructive living, an understanding of people, and a capacity for leadership. The second is to provide professional education in agriculture so the student is equipped to enter and advance in the professional and scientific area of his choice. Curriculums in the College are designed to provide liberal, professional and scientific education.

The Profession

Professional agriculture is the application of the physical, biological and social sciences and/or 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, economic development and related fields. This broad profession includes, therefore, disciplines that range from soil physics, to animal nutrition, to cereal chemistry, to land economics. Practitioners in the profession range from industrial researchers, to farmers, to technical salesmen, to soil conservationists.

The profession (and academic programs in the College of Agriculture) might be grouped into five areas: (1) Agricultural Production, (2) Agricultural Business, (3) Agricultural Science, (4) Agricultural Services, and (5) Agricultural Education.

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, U. S. D. A.
13. Commission Salesman, livestock market
14. Editor, flower and garden magazine
15. Assistant Manager, pork department of meat
16. Economist, Foreign Agricultural Service, U. S. D. A.
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 are housed and work closely with extension specialists in their fields. Such integration of teaching, research, and extension activities helps to insure that professional courses are current, factual, and relevant.

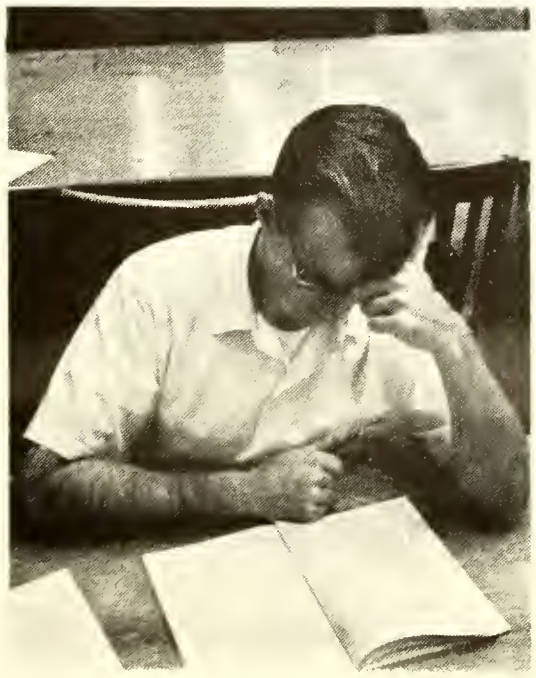
Facilities

Effective instruction in the application of basic sciences to "going industries" requires expensive and varied equipment. A feed mill, flour mill, and bakery, completed in 1961, include modern equipment from eight countries. Well-equipped drafting rooms are used by milling students. Greenhouses, hotbeds, and field plots provide ample stock for horticulture courses.

Over 4,000 acres of land are used for experimental work and for support of the teaching program—for work with poultry and livestock of many breeds and of various ages, and with various soil types, field crops, fruits, vegetables, ornamentals, etc.

A Dairy and Poultry building completed in the fall of 1963 and a modern Animal Industries 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.

Nearly all classrooms and laboratories are in close proximity within the College, near faculty offices. Many students work part time in these facilities, on specific research projects, adding greatly to their understanding of the disciplines and to their familiarity with the equipment.



Curriculums and Majors in Agriculture

Majors in the Curriculum in Agriculture	Options
Agricultural Economics	Bus. and Industries Science Production Services
Agricultural Journalism	
Agricultural Mechanization	Bus. and Industries Science Production Services
Agronomy (crops and soils)	Bus. and Industries Science Production Services
Animal Science and Industry	Bus. and Industries Science Production Services
Dairy Production	Bus. and Industries Science Production Services
Entomology	Bus. and Industries Science Services
General Agriculture	
Pre-Forestry (2-year program)	
Pre-Veterinary* Medicine	
Horticulture	Bus. and Industries Science Production Services
Plant Pathology	Science
Poultry Science	Bus. and Industries Science Production Services

Other Curriculums in the College of Agriculture	Options
Agricultural Education	
Bakery Science and Management	Administration Chemistry Operations
Biochemistry	
Dairy Foods Processing	Administration Science Food Processing
Feed Science and Management	Administration Chemistry Operations
Milling Science and Management	Administration Chemistry Operations
Natural Resources Conservation and Use	Soil and Water Conservation Economics of Conservation Conservation of Recreation Areas
Horticultural Therapy	

Note that most curriculums and majors primarily are aligned with commodities: Agronomy with crops and soils, animal science and industry with livestock and livestock products, milling science and management with flour,

* Pre-veterinary requirements may also be completed in the College of Arts and Sciences (see page 71).

etc. 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, depending on the primary interest.

The "Agriculture" curriculum includes those majors which have a relatively large number of courses in common. Note that a student may enroll in Agriculture—General, 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 students whose professional interests dictate a unique program of course work. These curriculums are Agricultural Education, Bakery Science and Management, Biochemistry, Dairy Foods Processing, 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/or he may take courses in several branches of agriculture to determine which best fits his interests and abilities.

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

Academic Programs

The curriculum structure in the College of Agriculture permits sufficient flexibility for the student and his adviser to take maximum advantage of courses available on the campus in designing the most effective program.

Requirements on the following pages have been established by the faculty of the College. Each student, during the freshman year or early in the sophomore year, will, with his adviser, develop an individual program within the guidelines of the stated requirements. This individual program, when signed by the student, his adviser, his department head, and the dean, becomes the student's degree requirement. The minimum credits for the B. S. degree are 126, except that degree requirements in Grain Science and Industry are 132 and for Biochemistry, 120.

Preparing for Agricultural Business

About 25 per cent of the 1960-64 graduates of the College of Agriculture (excluding those in military service) are now employed in industry as salesmen, plant superintendents, buyers, writers, etc. This implies that many students should plan strong "minors" or groups of supporting courses to prepare themselves to compete in industry. Likely courses are accounting, labor relations, corporation law, sales psychology, journalism, and others.

Preparation for Agricultural Science—Research and Graduate Study

Nearly 30 per cent of recent graduates are now in graduate school, aiming for Master of Science or Doctor of Philosophy degrees in their respective majors. The proportion is increasing. Students aiming for graduate school will do best if their undergraduate programs are sufficiently strong in the basic sciences—mathematics, botany, zoology, physics, chemistry, statistics, computer science, economics, and in communications.

Preparation for Agricultural Production

Those who plan to farm or ranch in the Midwest (another 20 per cent of recent graduates) should consider their future community responsibilities and the changing characteristics of farming as they develop their individual academic programs. They will want to understand state and local government, principles of taxation, corporation law as applied to farms, etc., in addition to the technology of crop and livestock production.

Preparation for Agricultural Services

This option is designed to meet the need for personnel to administer programs of varying combinations of administration, education and service which are rapidly increasing in our society. These programs require that individuals have a broad understanding of agriculture, including production, assembly, processing and distribution. In addition they must develop a working knowledge of selected concepts in the social sciences and the humanities. Fields of employment which majors in this proposed option may consider include: cooperative extension work, international agriculture, community or area economic planning and development, recreation administration, and positions in many other public and quasi-public agencies and private businesses.

Preparation for Agricultural Education

Most students who plan to teach vocational agriculture major in the Agricultural Education curriculum. Those who plan to enter county extension work may prepare in this curriculum or in other majors within the Curriculum in Agriculture.

Preparation for Veterinary Medicine

Students planning to apply for admission to the College of Veterinary Medicine should enroll in the Pre-Veterinary major in the Curriculum in Agriculture, see page 31 (or optionally the Pre-Veterinary program in the College of Arts and Sciences). Upon completion of the Pre-Veterinary major in Agriculture and the first two years of the Curriculum in Veterinary Medicine, the student will be eligible for a Bachelor of Science degree in the College of Agriculture.

Other Agriculturally Related Professions

In some cases college-bound students want to prepare for specific professions that are considered a part of agriculture or are closely related to agriculture, but are not identified here as curriculums or majors. Range management, food technology and pest control are examples. Careful study of majors and curriculums that do exist in the College of Agriculture and other Colleges of the University, and review of course offerings in the General Catalog, usually reveal that the desired program exists or can be developed.

The Freshman Year

Because entering students vary considerably in their academic backgrounds and their capacity to pursue college work rapidly, academic advisers work individually with new students in planning credit loads and lists of courses to be taken the first year.

Courses that might be taken by freshmen in the Agriculture curriculum follow. These are only examples; other combinations may be developed by the student and his adviser. The principle also applies to other curriculums in the College of Agriculture.

Example I:

Fall Semester

English Composition I	3
Agriculture in Our Society	2
Animal Sciences	3
College Algebra	3
Plant Science	4
Physical Education	0
	15

Spring Semester

English Composition II	3
Oral Communications I	2
General Botany or General Zoology	4
Chemistry I or General Chemistry	5
Physical Education	0
	14

Example II:

Fall Semester

English Composition I	3
Agriculture in Our Society	2
Chemistry I or General Chemistry	5
College Algebra	3
Plant Science	4
Physical Education	0
	17

Spring Semester

English Composition II	3
General Botany	4
Animal Sciences	5
Soils	4
Physical Education	0
	16

Example III:

Fall Semester

General Psychology	3
Agriculture in Our Society	2
Animal Sciences	4
Physical Geology	4
Intermediate Algebra	3
Physical Education	0
	16

Spring Semester

Plant Science	4
English Composition I	3
College Algebra	3
Dairy Science	1
Poultry Science	1
Physical Education	0
	12

Curriculum in Agriculture

B. S. in Agriculture

Courses required for students in the majors within the Curriculum in Agriculture 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 Chem.	5
Physical Education I	0
Physical Education II	0
Humanities	6[1]
Social Sciences	6[2]
Communications	2 or 3[3]

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 I)
   - Sociology
   - Anthropology
   - History (other than those used for humanities above)
   - Political Science
   - Psychology
   - Philosophy
3. Communications courses suggested are:
   - English Composition III
   - Advanced Composition
   - Technical Journalism
   - Agricultural Journalism
   - Courses in Speech and Speech Education, Nos. 120-665

Additional Minimum Requirements for Majors in the Curriculum in Agriculture Except for Pre-Forestry and Pre-Veterinary Medicine

	Science	Business and Industries	Production	Services
Agriculture:				
Soils Plant Sci. Prin. An. Sci. or Basic An. Sci. & Ind. Prin. Ag. Econ. Engg. in Ag. Econ. Entom. Plant Path.	Five of the courses listed (three for Ag. Econ. and Entomology majors).	Prin. Ag. Econ., a second Ag. Econ. course, and 12 credits in other courses listed.	Four of the courses listed.	Prin. of Ag. Econ. plus four other courses listed.
Biological Science:				
Gen. Botany[1] Gen. Zoology[1] Genetics Microbiol. Envir. Biol.	Gen. Botany or Gen. Zoology plus two[2] 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.	Gen. Bot. or Gen. Zoology plus one[3] other course listed.
Math, Stat., and Comput. Science:				
Plane Trig. Calc. I Elem. Stat.[4] Elem. Dig. Comp. Fund. Comp. Prog.	Plane Trig. plus two other courses listed.	Two of courses listed.	One of courses listed.	Elem. Stat.[5] plus one other course listed.
Physical Science:				
Desc. Physics Physics I Physics II Physical Geol. Chem. II Chem. Anal. Elem. Org. Chem. Gen. Org. Chem. Org. Chem. I Intro. Org. Chem. & Biochem. Elem. Biochem. Gen. Biochem.	One course from each of three of the four groups (one course from two of the four groups for Ag. Econ. majors).	One of courses listed.	Two of courses listed, including one Org. Chem. course or the course Intro. to Org. & Biochem.	One of courses listed: Gen. Psych.[6] Social Psych.[6] Intro. to Soc.[6] Comm. Org. & Lead. Adm. Process or Adm. Policy Pub. Finance Ethics or Prof. Ethics Elem. Logic Prin. of Acctg. Meth. of Ext. Teaching Persuasion Group Discussion
Accounting and Business Admin.:				
	3 credits	12 credits	6 credits	

1. The combination of Prin. of Biol. and Organismic Biology may be substituted 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.

In addition, each student will complete courses prescribed by his major department, some of which are listed on the following pages. The remainder of his planned program will strengthen his training toward the sciences, business and industries, agricultural services, or production.

Agricultural Economics

Major Courses

Principles of Agricultural Economics	3
Agricultural Economics Summary	2
Agricultural economics courses selected by the student with the consent of his adviser to fulfill his interests and objectives	15 to 25 hours

Non-Major Courses

Depending upon the student's professional interests and objectives, he may select, with the consent of his adviser, courses from the following areas: 9 to 12 hours

- Professional Agriculture
- Business Administration
- Extension Education
- Economics, Political Science, Sociology and Psychology

General Electives

General electives may be selected by the student with the consent of his adviser to fulfill the student's personal educational interests and objectives ..... 12 to 15 hours

Agricultural Journalism

Technical Journalism Courses

Reporting II	3
Editing	3
Photo-Journalism I	3
Principles of Advertising	3
Magazine Article Writing	3
Public Relations	3
Radio & TV News	2
Ag Student Journalism	4
Journalism Electives	5

Professional Agriculture Courses

A minimum of 12 hours must be taken in one of the following areas:

1. Agricultural Economics
2. Agronomy
3. Animal Science and Industry
4. Dairy Science
5. Entomology
6. Grain Science and Industry
7. Horticulture and Forestry
8. Poultry Science
9. Agricultural Mechanization

Agricultural Mechanization

Major Courses

Farm Power	3
Agricultural Machinery Management	3
Planning and Management of Agricultural Buildings	3
Conservation Surveying and Planning	3
Farmstead Utilities	3
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	3

Professional Agriculture Courses

A minimum of 12 hours in one of the following:

1. Agricultural Economics and Journalism
2. Agronomy, Entomology, Horticulture, and Plant Pathology
3. Animal, Dairy, and Poultry Science

Agronomy

Major Courses

Plant Science	4
Soils	4
Crop Production	4
Soil Fertility	3
Weed Science	3
Range Management	3
Soil Management and Moisture Conservation	3
Crop Improvement	3
Soil Development and Classification	3

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	2
Principles of Animal Science	3
Animal Science and Industry	1
Principles of Feeding	3
Animal Nutrition	3
Principles of Livestock Selection	3
Elements of Meat Processing	3
Beef Science	3
Swine Science	3
Sheep Science	3
Animal Breeding	3
Animal Science and Industry Seminar	1

Non-Major Courses

To be chosen in consultation with adviser.

Students may specialize in animal nutrition, animal breeding and genetics, meat science, or livestock management.

Dairy Production

Major Courses

Principles of Animal Science	3
Dairy Science	1
Fundamentals of Nutrition	3
Genetics	3
Dairy Cattle Nutrition	3
Dairy Cattle Management	3
Dairy Cattle Genetics	4
Dairy Cattle Judging	2
Milk Secretion	3
Artificial Breeding of Farm Animals	3
Market Milk & Dairy Inspection	4
Dairy Seminar	1

Non-Major Courses

To be chosen in consultation with adviser.

Entomology

Major Courses

General or Economic Entomology	3
External Insect Morphology	3
Insect Taxonomy	3
Advanced Applied Entomology I	3
Advanced Applied Entomology II	3
Properties of Insecticides	2

Non-Major Courses

Biology	8
Chemistry II and Lab	5
Elementary or General Organic Chemistry	5
Plant Pathology	2
Genetics	3
Microbiology	4
Trigonometry	3

Students who plan to continue 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	2
Horticulture Seminar	0
Plant Science	4
Landscape Horticulture	3
Fruit Production	3
Floriculture	3
Vegetable Ecology	3

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	4
Plant Science	4
Plant Pathology	2
Botanical Science	3
Introductory Mycology	4

Non-Major Courses

Soils	4
General Zoology	4
Genetics	3
Chemistry II and Lab	5
General Organic Chemistry	5
Economic Entomology	3
Bacteriology	5
General Physics I	4
General Plant Biochemistry	4
Descriptive Meteorology	3

Poultry Science

Major Courses

Principles of Animal Science	3
Poultry Science	1
Nutrition of the Fowl	3
Quantitative Genetics and Poultry Improvement	4
Avian Metabolism	3
Poultry Products Technology	3
Poultry Management	3

Non-Major Courses

To be developed in consultation with adviser.

In addition, two-year programs are available in Pre-Veterinary Medicine and Pre-Forestry. Satisfactory completion of these two-year programs may qualify students to enter a college or university offering a professional degree.

Pre-Veterinary Medicine Program[1 2] *

FRESHMAN

Agriculture in Our Society	2
Chemistry I	5
English Composition I	3
College Algebra	3
Principles of Animal Science or Basic Animal Science	3 or 2
Animal Science and Industry	1
Physical Education	0
	16-17
General Zoology	4
Chemistry II	3
Plane Trigonometry	3
Dairy Science	1
Principles of Ag Economics	3
English Composition II	3
Physical Education	0
	17

SOPHOMORE

Physics I	4
General Organic Chemistry	5
Economics I	3
Humanities Elective	3
Poultry Science	1
	16
Physics II	4
Genetics	3
Humanities Elective	3
Oral Communications	2
Chemical Analysis	4
Agricultural Journalism or other Communication	2 or 3
	18-19

Pre-Forestry Program

FRESHMAN

Chemistry I	5
English Composition I	3
Oral Communication I	2
College Algebra	3
Physical Education	0
Forestry Conservation	3
Horticulture & Forestry Seminar	0
	16
Chemistry II	3
English Composition II	3
Plane Trigonometry	3
Economics I	3
Physical Education	0
Soils	4
	16

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General Botany	4
Economics II	3
Physical Geology	4
Forestry Practices	3
Elements of Statistics	3
	17
Physics I	4
Dendrology	4
Electives	3
Social Science Electives	6
	17

Nursery and Landscape Management

This is a two-year technical program administered by the Department of Horticulture and Forestry. It provides training for young men to serve in nurseries, garden centers, parks, and similar enterprises. Instruction for three semesters and a summer session in University classes is followed by four months of practical on-the-job training at a selected nursery. The student will be a regular employee of the nursery, receiving valuable experience and a salary sufficient to meet normal living expenses.

		Course	Sem. Hrs.
Fall Semester			
Biol.	215 210	General Botany	4
Hort. & For.	040 150	Home Horticulture	2
Hort. & For.	040 260	Plant Materials I	3
Engl.	229 100	Engl. Comp. I	3
Spch.	281 105	Oral Comm. I	2
Comm.	305 105	Elements of Bus. Adm.	2
			16
Summer School			
Chem.	221 210	Chemistry I	5
L. A.	110 100	Landscape Des.	3
			8
Spring Semester			
Hort. & For.	040 200	Plant Science	4
Hort. & For.	040 270	Plant Materials II	3
Hort. & For.	040 220	Plant Propagation	3
Hort. & For.	040 410	Landscape Hort.	3
		Electives	3
			16
Fall Semester			
Agron.	015 270	Soils	4
Entom.	030 200	Econ. Entomology	3
Pl. Path.	050 400	Plant Pathology	2
Comm.	305 343	Sales Comm.	3
Comm.	305 273	Principles of Accounting	3
			15

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 will be 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.

		Course	Sem. Hrs.
Fall Semester			
Art.	209 100	Design I	2
Engl.	229 100	Engl. Comp. I	3
Hort. & For.	040 131	Floral Arrangement	3
Biol.	215 210	General Botany	4
Psych.	273 110	General Psychology	3
			15
Summer School			
Comm.	305 273	Prin. of Acctg.	3
C. & T.	611 215	Intro. Interior Des.	2
L. A.	110 100	Gen. Landscape Des.	3
			8
Spring Semester			
Hort. & For.	040 140	Adv. Floral Arrangement	3
Hort. & For.	040 200	Plant Science	4
Spch.	281 105	Oral Comm. I.	2
Comm.	305 105	Element Bus. Adm.	2
Comm.	305 210	Personal Finance	2
Hort. & For.	040 150	Home Hort.	2
			15

1. Students who satisfactorily complete the Pre-Veterinary Medicine program above and the first two years of the Curriculum in Veterinary Medicine, page 212 will be eligible 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 (see page 71).

* These requirements are subject to change as the College of Veterinary Medicine changes its minimum requirements for admission to that College.

Summary:

Horticulture	12 credits
Business Admin.	7 credits
Art	2 credits
Botany	4 credits
English	3 credits
Speech	2 credits
Clothing and Textiles	2 credits
Landscape Architecture	3 credits
Psychology	3 credits
	38 credits

Curriculum in Horticultural Therapy

B. S. in Horticultural Therapy

This curriculum is designed to train undergraduate students in horticultural therapy which is one of the recognized adjunctive therapies. 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 6 months in field service training at the Menninger Foundation, Topeka, Kansas.

FRESHMAN

Fall Semester

		Course	Sem. Hrs.
Engl.	229 100	English Comp. I	3
Spch.	281 105	Oral Comm. I	2
Math.	245 100	College Algebra	3
Psych.	273 110	Gen. Psych.	3
Gn. Ag.	035 100	Ag. in Our Society	2
Ph. Ed.	261 011	Physical Education	0
		Humanities	3
			16

Spring Semester

Engl.	229 120	English Comp. II	3
Econ.	225 110	Econ. I	3
Chem.	221 210	Chemistry I or	5
Chem.	221 110	Gen. Chemistry	5
Soc.	277 214	Intro. to Soc.	3
Hort. & For.	040 150	Home Hort.	2
Ph. Ed.	261 011	Physical Education	0
Hort.& For.	040 160	Hort. Seminar	0
			16

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Fall Semester

Biol.	215 210	Botany I or	4
Biol.	215 121	Prin. of Biology	5
Hort.& For.	040 130	Floral Arr. I	3
L. A.	110 100	Landscape Design	3
		Humanities	3
		Electives	3
			16 or 17

Spring Semester

Hort. & For.	040 200	Plant Science	4
Psych.	273 405	Abnormal Psych.	3
Hort. & For.	040 410	Landscape Hort.	3
		Electives	3
		Family & Child Develop. Elective	3
			16

JUNIOR

Fall Semester

Hort. & For.	040 420	Fruit Production	3
Hort. & For.	040 260	Plant Materials I	3
Agron.	015 270	Soils	4
Pl. Path	050 400	Plant Pathology	2
Soc.	277 450	Gr. Beh. & Pr. Inter.	3
			15

Spring Semester

Hort. & For.	040 690	Veg. Crop Ecol.	3
Hort. & For.	040 625	Floriculture	3
Art	209 100	Design I	2
Educ.	405 202	Ed. Psych. I	3
Hort. & For.	040 220	Plant Prop.	3
		Electives 2 or	3
			16 or 17

SENIOR

Either Semester

Ento.	030 200	Econ. Ento	3
		Communications Elective	2
		Psychology Elective	3
		Electives 8 or	9
			16 or 17

Either Semester

Hort. & For.	040 640	Hort. Problems	6
Hort. & For.	040 661	Greenhouse Clinical Pr.	3-6
Hort. & For.	040 662	Garden & Land. Therapy	3-6
			15

Curriculum in 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.

FRESHMAN

Fall Semester

		Course	Sem. Hrs.
Gn. Ag.	035 100	Agr. in Our Society	2
Engl.	229 100	Engl. Comp. I	3
Math.	245 100	College Algebra	3
Agron.	015		
Hort.	040 200	Plant Science	4
		Elective Agr. Sci.	3
Ph. Ed.	261 011	Physical Education	0
		Elective	1
			16

Spring Semester

Engl.	229 120	Engl. Comp. II	3
Psych.	273 110	Gen. Psychology	3
Chem.	221 110	Gen. Chemistry	5
Bot.	215 200	Gen. Botany	4
Ph. Ed.	261 011	Physical Education	0
		Elective	1
			16

SOPHOMORE

Fall Semester

Biochem.	020 120	In. Bi. & Or. Chem.	5
Zool.	215 205	Gen. Zool.	4
Ag. E.	506 151	Agr. Mech. Prac.	2
Educ.	405 202	Educ. Psych. I	3
Ec. So.	225 110	Economics I	3
			17

Spring Semester

Agron.	015 270	Soils	4
Ag. Ec.	010 201	Prin. Agr. Econ.	3
Spch.	281 105	Oral Comm. I	2
		Elective Agr. Science	3
Ag. E.	506 251	Farm Power	3
		Elective	1
			16

JUNIOR

Fall Semester

Educ.	405 302	Educ. Psych. II	3
		Agr. Engg. Elec.	2
		Literature or Language	3
		Elective Agr. Science	6
		Elective Social Science	3
			17

Spring Semester

Educ.	405 450	Prin. Sec. Educ.	3
Journ.	289 350	Agr. Journalism	3
		Elective Agr. Science	6
		Agr. Engg. Elective	2
		Elec. Social Science	3
			17

SENIOR

Fall Semester

Educ.	405 702	Voc. Educ.	3
Educ.	405 500	Meth. Tchg. Agr.	2
Educ.	405 477	Tchg. Partic. Sec. Sch.	6
Ag. E.	506 459	Agr. Mech. Meth.	3
Ag. E.	506 351	Agr. Mach. Op.	2
			16

Spring Semester

Agr. Engg. Elective	2
Gen. Educ. Elec.	3
Elective	1
Elective—Agr. Science	8
Lit. or Lang.	3
	17

Seven weeks during the first or second semester of the senior year are devoted to full-time student teaching. On-campus courses meet extra periods while the student is on campus, so he has no other academic responsibilities while teaching. When student teaching is taken in the spring semester, fall semester courses shown on the preceding page are moved to spring semester. See page 152, "Admission to Teacher Education" and "Admission to Student Teaching."

Curriculums in Bakery Science and Management, Feed Science and Management and Milling Science and Management

These curriculums have options in (a) Administration, (b) Chemistry and (c) Operations. The freshman year is essentially the same for all curriculums. Each student must indicate his option after the first semester of the sophomore year. The Administration options prepare students for careers in sales, purchasing, personnel, etc.; the Chemistry options train individuals for research or quality control positions; and the Operations options provide training in the technical engineering aspects of the respective industries. The baking, feed manufacturing and grain milling industries provide graduates with unusually fine opportunities for employment and advancement.

Bakery Science and Management

B. S. in Bakery Science and Management

FRESHMAN

Fall Semester

		Course	*Sem. Hrs.*
Gn. Ag.	035 100	Agr. in Our Society	2
Gr. Sc.	045 100	Prin. of Milling	3
Chem.	221 210	Chemistry I	5
Engl.	229 100	English Comp. 1	3
Math.	245 100	College Algebra	3
Ph. Ed.	261 011	Physical Education	0
			16

Spring Semester

Chem.	221 230	Chemistry II	3
Ec. So.	225 110	Economics 1	3
Engl.	229 120	English Comp. II	3
Math.	245 150	Plane Trig.	3
Ph. Ed.	261 011	Physical Education	0
Spch.	281 105	Oral Comm. 1	2
Arch.	105 207	Arch. Graph. 1	2
		or	
M. E.	560 213	Graphical Comm. 1	3
			16 or 17

SOPHOMORE

Fall Semester

Gr. Sc.	045 632	Bakery Des. & Flow	2
Bot.	217 121	Biology 1	4
		Option A, B, or C	10
			16

Spring Semester

Bact.	213 450	Micro.	4
		Humanities Elec.	6
		Option A, B, or C	6
			16

JUNIOR

Fall Semester

Gr. Sc.	045 630	Exp. Baking I	4
Bact.	213 645	Micro. of Foods	4
		Option A, B, or C	8
			16

Spring Semester

Gr. Sc.	045 631	Exp. Baking II	4
Gr. Sc.	045 650	Qual. Wheat & Fl.	3
		Option A, B, or C	10
			17

SENIOR

Fall Semester

Gr. Sc.	045 633	Bakery Tech.	3
		Soc. Sci. Elec.	3
		Option A, B, or C	11
			17

Spring Semester

Gr. Sc.	045 651	Food Feed Pl. San.	4
		Option A, B, or C	13
			17

OPTION A (Administration)

Biochem.	020 120	Introd. Org. & Biol. Chem.	5
Gr. Sc.	045 610	Flour & Feed Anal.	3
Ec. So.	225 120	Economics II	3
Math.	245 350	Elem. Dig. Comp. Tech.	2
Phys.	265 211	Gen. Physics I	4
Stat.	285 320	Elem. of Stat.	3
Stat.	285 510	Stat. Qual. Control	3
B. A.	305 273	Intro. to Accounting	5
B. A.	305 305	Manag. Accounting	3
B. A.	305 325	Business Law 1	3
B. A.	305 326	Business Law II	3
B. A.	305 342	Sales Mgmt.	3
B. A.	305 410	Business Finance	3
B. A.	305 440	Marketing	3
		Electives	8

OPTION B (Chemistry)

Biochem.	020 421	Gen. Biochemistry	3
Biochem.	020 422	Gen. Biochemistry Lab	2
Gr. Sc.	045 610	Flour & Feed Anal.	5
Gr. Sc.	045 620	Adv. Wheat & Fl. Test	3
Chem.	221 271	Chemical Analysis	4
Chem.	221 431	Organic Chem. I	3
Chem.	221 432	Organic Chem. 1 Lab	2
Chem.	221 450	Organic Chem. II	3
Chem.	221 451	Organic Chem. II Lab	3
Chem.	221 400	Desc. Phys. Chem.	3
Math.	245 220	Anal. Geom. & Calc. I	4
Math.	245 221	Anal. Geom. & Calc. II	4
Phys.	265 310	Engg. Physics I	5
Phys.	265 311	Engg. Physics II	5
		Electives	11

OPTION C (Operations)

Biochem.	020 120	Introd. Org. & Biol. Chem.	5
Chem.	221 250	Chemistry II Lab	2
Math.	245 220	Anal. Geom. & Calc. I	4
Math.	245 221	Anal. Geom. & Calc. II	4
Math.	245 222	Anal. Geom. & Calc. III	4
Phys.	265 310	Engg. Physics I	5
Phys.	265 311	Engg. Physics II	5
Ap. M.	510 220	Strength of Matls.	2
Ap. M.	510 305	Statics	3
E. E.	530 419	Elec. Cir. & Mach.	4
I. E.	550 401	Ind. Management	3
M. E.	560 218	Graphical Comm. II	2
M. E.	560 400	Elem. Thermodynamics	3
		Electives	13

Feed Science and Management

B. S. in Feed Science and Management

FRESHMAN

Fall Semester

		Course	*Sem. Hrs.*
Gn. Ag.	035 100	Agr. in Our Society	2
Gr. Sc.	045 100	Prin. of Milling	3
Chem.	221 210	Chemistry 1	5
Engl.	229 100	English Comp. I	3
Math.	245 100	College Algebra	3
Ph. Ed.	261 011	Physical Education	0
			16

Spring Semester

Chem.	221 230	Chemistry II	3
Engl.	229 120	English Comp. II	3
Math.	245 150	Plane Trig.	3
Ph. Ed.	261 011	Physical Education	0
Spch.	281 105	Oral Comm. 1	2
M. E.	560 213	Graphical Comm. 1	3
		or	
Arch.	105 207	Arch. Graph. I	2
		Option A, B, or C	3
			16 or 17

SOPHOMORE

Fall Semester

Gr. Sc.	045 210	Flow Sheets	2
Bot.	213 121	Biology 1	4
Econ.	225 110	Economics 1	3
		Option A, B, or C	7
			16

Spring Semester

Dy. Sc.	025 200	Fund. of Nutrition	3
Bot.	213 122	Biology II	4
		Humanities Elec.	6
		Option A, B, or C	3
			16

JUNIOR

Fall Semester

Gr. Sc.	045 410	Feed Tech. 1	4
		Soc. Sci. Elec.	3
		Option A, B, or C	10
			17

Spring Semester

Gr. Sc.	045 660	Qual. Feed Ingred.	3
		Option A, B, or C	14
			17

SENIOR

Fall Semester

		Option A, B, or C	17
			17

Spring Semester

Gr. Sc.	045 651	Food & Feed Pl. San.	4
		Option A, B, or C	13
			17

OPTION A (Administration)

Ag. Ec.	010 120	Grain Marketing	3
Biochem.	020 120	Introd. Org. & Biol. Chem.	5
Gr. Sc.	045 610	Flour & Feed Anal.	5
Gr. Sc.	045 680	Feed Tech. II	4
Chem.	221 271	Chemistry II Lab	2
Econ.	225 120	Economics II	3
Econ.	225 430	Money & Banking	3
Math.	245 350	Elem. Dig. Comp. Tech.	2
Phys.	265 211	Gen. Physics I	4
Phys.	265 212	Gen. Physics II	4
Stat.	285 320	Elem. of Stat.	3
Stat.	285 510	Stat. Qual. Control	3
B. A.	305 273	Intro. to Accounting	5
B. A.	305 305	Manag. Accounting	3
B. A.	305 325	Business Law I	3
B. A.	305 342	Sales Mgnt.	3
B. A.	305 410	Business Finance	3
		Electives	8

OPTION B (Chemistry)

Biochem.	020 421	Gen. Biochemistry	3
Biochem.	020 422	Gen. Biochem. Lab.	2
Gr. Sc.	045 610	Flour & Feed Anal.	5
Chem.	221 271	Chemical Analysis	4
Chem.	221 400	Desc. Phys. Chem.	3
Chem.	221 431	Organic Chem. I	3
Chem.	221 432	Organic Chem. I Lab.	2
Chem.	221 450	Organic Chem. II	3
Chem.	221 451	Org. Chem. II Lab.	2
Math.	245 220	Anal. Geom. & Calc. I	4
Math.	245 221	Anal. Geom. & Calc. II	4
Math.	245 222	Anal. Geom. & Calc. III	4
Phys.	265 310	Engg. Physics I	5
Phys.	265 311	Engg. Physics II	5
Stat.	285 520	Stat. Meth. I	3
		Electives	14

OPTION C (Operations)

Biochem.	020 120	Introd. Org. & Biol. Chem.	5
Gr. Sc.	045 210	Adv. Flow Sheets	2
Gr. Sc.	045 680	Feed Tech. II	4
Gr. Sc.	045 720	Adv. Fl. & Feed Tech.	3
Gr. Sc.	045 730	Fl. & Fd. Mill Constr.	3
Chem.	221 250	Chemistry II Lab.	2
Math.	245 220	Anal. Geom. & Calc. I	4
Math.	245 221	Anal. Geom. & Calc. II	4
Math.	245 222	Anal. Geom. & Calc. III	4
Math.	245 240	Ser. & Diff. Equa.	4
Phys.	265 310	Engg. Physics I	5
Phys.	265 311	Engg. Physics II	5
Ap. M.	510 220	Strength of Matls.	3
Ap. M.	510 305	Statics	
E. E.	530 419	Elec. Cir. & Mach.	4
		Electives	11

Milling Science and Management

B. S. in Milling Science and Management

FRESHMAN

Fall Semester

		Course	*Sem. Hrs.*
Gn. Ag.	035 100	Agr. in Our Society	2
Gr. Sc.	045 100	Prin. of Milling	3
Chem.	221 210	Chemistry I	5
Engl.	229 100	English Comp. I	3
Math.	245 100	College Algebra	3
Ph. Ed.	261 011	Physical Education	0
			16

Spring Semester

Chem.	221 230	Chemistry II	3
Engl.	229 120	English Comp. II	3
Math.	245 105	Plane Trig.	3
Ph. Ed.	261 011	Physical Education	0
Spch.	281 105	Oral Comm. I	2
M. E.	580 213	Graphical Comm. I	3
		or	
Arch.	105 207	Arch. Graph. I	2
		Option A, B, or C	3
			16 or 17

SOPHOMORE

Fall Semester

Gr. Sc.	045 210	Flow Sheets	2
Bot.	213 121	Biology I	4
Ec. So.	225 110	Economics I	3
		Option A, B, or C	7
			16

Spring Semester

Gr. Sc.	045 400	Milling Tech. I	4
Bact.	213 450	Micro.	4
		Humanities Elec.	6
		Option A, B, or C	2
			16

JUNIOR

Fall Semester

Agron.	015 260	Mkt. Grad. Cereals	3
		Social Sci. Elec.	3
		Option A, B, or C	11
			17

Spring Semester

Gr. Sc.	045 650	Qual. Wheat & Flour	3
		Option A, B, or C	14
			17

SENIOR

Fall Semester

Gr. Sc.	045 630	Exp. Baking I	4
		Option A, B, or C	13
			17

Spring Semester

Entom.	030 100	Milling Entom.	4
		Option A, B, or C	13
			17

OPTION A (Administration)

Ag. Ec.	010 130	Grain Marketing	3
Biochem.	020 120	Introd. Org. & Biol. Chem.	5
Gr. Sc.	045 610	Flour & Feed Anal.	5
Chem.	221 230	Chemistry II Lab	2
Econ.	225 120	Economics II	3
Econ.	225 430	Money & Banking	3
Math.	245 350	Elem. Dig. Comp. Tech.	2
Phys.	265 211	Gen. Physics I	4
Stat.	285 320	Elem. of Stat.	3
Stat.	385 510	Stat. Qual. Control	3
B. A.	305 273	Intro. to Accounting	5
B. A.	305 305	Manag. Accounting	3
B. A.	305 325	Business Law I	3
B. A.	305 342	Sales Mgmt.	3
B. A.	305 410	Business Finance	3
		Electives	13

OPTION B (Chemistry)

Biochem.	020 421	Gen. Biochemistry	3
Biochem.	020 422	Gen. Biochemistry Lab	2
Gr. Sc.	045 610	Flour & Feed Anal.	5
Gr. Sc.	045 620	Adv. Wheat & Flour Test.	3
Chem.	221 271	Chemical Analysis	4
Chem.	221 400	Desc. Phys. Chem.	3
Chem.	221 431	Organic Chem. I	3
Chem.	221 432	Organic Chem I Lab	2
Chem.	221 450	Organic Chem. II	3
Chem.	221 451	Organic Chem. II Lab	2
Math.	245 220	Anal. Geom. & Calc. I	4
Math.	245 221	Anal. Geom. & Calc. II	4
Phys.	265 310	Engg. Physics I	5
Phys.	265 311	Engg. Physics II	5
		Electives	15

OPTION C (Operations)

Biochem.	020 120	Introd. Org. & Biol. Chem.	5
Gr. Sc.	045 210	Adv. Flow Sheets	2
Gr. Sc.	045 670	Milling Tech. II	4
Gr. Sc.	045 720	Adv. Flour & Feed Tech.	3
Gr. Sc.	045 730	Fl. & Fd. Mill Constr.	3
Chem.	221 230	Chemistry II Lab	2
Math.	245 220	Anal. Geom. & Calc. I	4
Math.	245 221	Anal. Geom. & Calc. II	4
Math.	245 222	Anal. Geom. & Calc. III	4
Phys.	265 310	Engg. Physics I	5
Phys.	265 311	Engg. Physics II	5
Ap. M.	510 220	Strength of Matls.	3
Ap. M.	510 305	Statics	3
E. E.	530 419	Elec. Cir. & Mach.	4
		Electives	12

Curriculum in Biochemistry

B. S. in Biochemistry

FRESHMAN*

Fall Semester

		Course	*Sem. Hrs.*
Chem.	221 210	Chemistry I	3
Chem.	221 211	Chemistry I Lab.	2
Math.	245 220	Anal. Geom. & Calc. I	4
Engl.	229 100	English Comp. I	3
Spch.	281 105	Oral Communication	2
Ph. Ed.	261 011	Physical Education	0
Biochem.	020 100	Biochem. Orientation	1
			15

* Students requiring Algebra and Trigonometry must take these courses during the freshman year or during the summer school prior to their freshman year. If students take Algebra and Trigonometry during the fall and spring semester of the freshman year, they must enroll in Physical Chem. I and II lectures during the summer between the junior and senior years if they wish to finish in four (4) years.

Spring Semester

Chem.	221 230	Chemistry II	3
Chem.	221 271	Chemical Analysis	4
Math.	245 221	Anal. Geom. & Calc. II	4
Engl.	229 120	English Comp. II	3
Ph. Ed.	261 011	Physical Education	0
			14

SOPHOMORE

Fall Semester

Math.	245 222	Anal. Geom. & Calc. III	4
Chem.	221 431	Organic Chem. I	3
Chem.	221 432	Organic Chem. I Lab.	2
Phys.	265 310	Engg. Physics I	5
			14

Spring Semester

Chem.	221 445	Chemical Separations	2
Chem.	221 450	Organic Chem. II	3
Chem.	221 451	Organic Chem. II Lab.	2
Phys.	265 311	Engg. Physics II	5
			12

JUNIOR

Fall Semester

Chem.	221 585	Physical Chem. I Lec.	3
Biochem.	020 655	Biochem. I	3
Biochem.	020 656	Biochem. I Lab.	2
			8

Spring Semester

Chem.	221 595	Physical Chem. II Lec.	3
Chem.	221 598	Physical Chem. II Lab.	2
Biochem.	020 665	Biochem. II	3
Biochem.	020 666	Biochem. II Lab.	2
			10

SENIOR

Fall Semester

Modern Language**			3 or 5
Chem.	221 666	Instrumental Analysis	4
Stat.	285 520	Statistical Methods I	3
			10

Spring Semester

Modern Language**			3 or 4
Subtotal			86
Restricted Electives:			
		Biology	16
		Social Science	6
		Humanities	6
Nonrestricted Electives:			6
Total hours			120

Sufficient electives should be taken each semester so that the total semester load will be 16-17 hours.

Curriculum in Dairy Foods Processing

B. S. in Agriculture

FRESHMAN

Fall Semester

		Course	*Sem. Hrs.*
Gn. Ag.	035 100	Agr. in Our Society	2
Chem.	221 110	General Chemistry	5
Engl.	229 100	Engl. Comp. I	3
Dy. & Pl. Sci.	025 201	Prin. of An. Sci.	3
Dy. & Pl. Sci.	025 202	Dairy Sci.	1
Ph. Ed.	261 011	Physical Education	0
			14

Spring Semester

	020 120	Introductory Organic and Biological Chemistry	5
Ec. So.	225 100	Economics I	3
Engl.	229 120	Engl. Comp. II	3
Math.	245 100	College Algebra	3
Ph. Ed.	261 011	Physical Education	0
			14

SOPHOMORE

Fall Semester

Bact.	213 220	General Microbiology	4
		Biological Science[1]	4
Math.	245 150	Plane Trigonometry	3
Spch.	281 105	Oral Communications	2
		Elective	4
			17

Spring Semester

Dy. & Pl. Sci.	025 400	Mkt. Milk & Dy. Insp.	4
Bact.	213 615	Dairy Bacteriology	4
		Biological Science[1]	4
		Social Science[2]	3
Dy. & Pl. Sci.	025 220	Dairy Prod. Eval. I	2
			17

JUNIOR

Fall Semester

Dy. & Pl. Sci.	025 681	Dairy Foods Proc. I	2
Dy. & Pl. Sci.	025 510	Dairy Technology	3
Ag. E.	010 455	Dairy Mechanics	3
		Descriptive Physics	4
		Humanities	3
			15

Spring Semester

Dy. & Pl. Sci.	025 683	Dairy Foods Proc. III	2
		Humanities[2]	3
		Options[3]	5
		Communications Elec.	3
		Elective	3
			16

SENIOR

Fall Semester

Dy. & Pl. Sci.	025 682	Dairy Foods Proc. II	2
Dy. & Pl. Sci.	025 685	Dairy Foods Proc. Lab A	1
Stat.	285 320	Elements of Statistics	3
		Option	7
		Food Proc. Elective	3
			16

Spring Semester

Dy. & Pl. Sci.	025 684	Dairy Foods Proc. IV	2
Dy. & Pl. Sci.	025 686	Dairy Food Proc. Lab B	1
Ag. Ec.	010 245	Prin. of Agr. Mktg.	3
Dy. & Pl. Sci.	025 500	Dairy Seminar	1
Dy. & Pl. Sci.	025 695	Dairy Plant Mngt.	2
Dy. & Pl. Sci.	025 670	Quality Control of Dairy Products	3
		Option	5
			17

Additional Elective Courses

SCIENCE OPTION

Quantitative Analysis	4
Organic Chemistry	5
Biochemistry	5
General Physics II	4
Analytical Geometry & Calculus I	4
Analytical Geometry & Calculus II	4
Microbiology of Foods	5
Sanitary Bacteriology Lab	2
Prin. of Quantitative Microbiology	5
Principles of Nutrition	4

ADMINISTRATION OPTION

Economics II	3
Introductory Accounting	5
Business Law I	3
Managerial Accounting	3
Sales Management	3
Marketing	3
Personnel Administration	3
Business Finance	3
Business Policy	3
Administration	3
Principles of Accounting	3
Taxation I	3

FOOD PROCESSING OPTION

Foods II	3
Experimental Baking I	4
Experimental Baking II	4
Quality of Wheat & Flour	3
Elements of Meats Processing	2
Meat Selection & Utilization H. E.	2
Poultry Products Technology	3
Meats Processing	1
Dairy Prod. Eval. II	1

Curriculum in Natural Resources Conservation and Use

B. S. in Agriculture

This curriculum provides for a balanced program in communications, mathematics, and the 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: (1) Soil and Water Conservation, (2) Economics of Conservation, and (3) Conservation of Recreation Areas. A

** The modern language requirement may be satisfied by a minimum of six hours of one of the following: German, Russian or French.

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).

2. See List of Humanities and Social Sciences Electives, page 28.

3. Suggested elective courses are listed on page 28.

Number semester hours required for graduation 126.

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

Course	*Sem. Hrs.*
Agri. in Our Society	2
Chemistry I	5
Engl. Comp. I	3
College Algebra	3
American Government	3
Physical Education	0
	16

Spring Semester

Course	*Sem. Hrs.*
Engl. Comp. II	3
Plane Trigonometry	3
Oral Com. I	2
General Botany	4
Chem. II Rec.	3
Physical Education	0
	15

SOPHOMORE

Fall Semester

Economics I	3
Physical Geology	3
Plant Science	4
General Physics I[1]	4
	14

Spring Semester

Soils	4
Prin. of Ag. Economics	3
General Zoology	4
Option and Electives	5
	16

JUNIOR

Fall Semester

Animal Sciences	4
General Psychology	3
Math. or Stat.	3 or 4
Humanities	3
Option and Electives	2
	15 or 16

Spring Semester

Humanities	3
Environmental Biology	4
Economic Entomology	3
Option and Electives	6
	16

SENIOR

Fall Semester

Pop. & Human. Ecology	3
Econ. Geography	3
Option and Electives	10
	16

Spring Semester

Microbiology	4
Option and Electives	12
	16

OPTION A: Soil and Water Conservation[2]

Chemistry II Lab	2
General Organic Chemistry	5
Select courses from four of the following areas:	
Soil Mgmt. and Moist. Cons. or Mgmt. or Irrig. Soils	2 or 3
Soil Dev. and Classif.	3
Soil Fert. or Chem. Prop. Soils	3
Range Mgmt. I, Turf Mgmt., or Forest Practice	3
Soil Physics	3
Calc., Quan. Anal., Physics II, or Hydrology	3 or 4
Electives	15-17
	35

OPTION B: Economics of Conservation[3]

Economics II	3
Production Economics	3
Land Economics	3
Land and Res. Conser.	3
Agricultural Policy	3
Rural Sociology	3
Electives	17
	35

OPTION C: Conservation of Recreation Areas[4]

Gen. Organic Chemistry	5
Forest Conser.	3
Turf Management	2
Arboriculture	3
Landscape Design	3
Community Recreation	3
Electives	16
	35

Agricultural Business

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 technically trained personnel in increasing numbers. A farm background may or may not be required. 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 below several programs that will prepare young people for some of the jobs in this vast complex. See page 145 (College of Business Administration and page 27 (College of Agriculture) for details of these programs and degree requirements. Academic years listed are estimates.

1. A Bachelor of Science degree in some discipline within the College of Agriculture (see majors and curriculums on p. 26), followed by a Master's degree in Business Administration (see p. 233). 5½ 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. 145). 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 145). 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.

1. For options B and C, Descriptive Physics in lieu of General Physics I.

2. Students enrolling in this option will be advised through the Agronomy Department.

3. Students enrolling in this option will be advised through the Agricultural Economics Department.

4. Students enrolling in this option will be advised through the Horticulture and Forestry Department.

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 on the left below, with exceptions and variations footnoted, can be transferred to any of the professional programs listed on the right and a degree earned in four semesters by capable students with good academic records.

Course	*Sem. Hrs.*
English I & II	6
Speech	2
Other communications such as Journalism or a second speech course	3[1,2]
College Algebra	3
Trigonometry	3[3]
Calculus	5[4]
Chemistry (Inorganic)	8[5]
Organic Chemistry	3[6]
Economics I	3[2]
General Physics	5[7]
Humanities	6
Social Sciences	6[1]
General Botany	5[8]
General Zoology	5[9]
	63

Professional Programs in Agriculture

1. Agricultural Economics: B. S., M. S., Ph. D.
2. Agricultural Education (teaching); B. S., M. S.
3. Agricultural Journalism; B. S.
4. Agricultural Mechanization; B. S., M. S.
5. Agronomy (Crops and Soils); B. S., M. S., Ph. D.
6. Animal Science & Industry; B. S., M. S., Ph. D.
7. Bakery Science & Management; B. S., M. S., Ph. D.
8. Biochemistry; B. S., M. S., Ph. D.
9. Dairy Foods Processing; B. S., M. S.
10. Dairy Production; B. S., M. S.
11. Entomology; B. S., M. S., Ph. D.
12. Feed Science & Management, B. S., M. S., Ph. D.
13. Milling Science & Management; B. S., M. S. Ph. D.
14. Horticulture; B. S., M. S., Ph. D.
15. Horticultural Therapy; B. S.
16. Natural Resources Conservation & Use; B. S.
17. Plant Pathology; B. S. M. S., Ph. D.
18. Poultry Science; B. S., M. S.
19. Pre-Forestry (2 years)
20. Pre-Veterinary Medicine (2 years)

2-Year Programs in

Retail Floriculture
Nursery and Landscape Management

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.

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,* Pine,* Schnittker,* Schruben,* Scoville,* Sjo,* Sorenson,* Trieb,* and Whitehair;* Associate Professors Buller,* Erickson, Knight,* Koudele,* Richards, and Thomas; Assistant Professors Baker, Biere, Brinkman, Figurski, Frazier, Langemeier,* McReynolds, Niernberger, Norman, Olsen, Olson, Overley, Schlender, Smythe, Treat, Vacin, Walker, 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 35.

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 sub-professional 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

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 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.

7. 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.

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

010 130. Grain Marketing. (3) I. Price influences and relationships. buying and selling problems, domestic and export trade; grain trade organization and regulation. Three hours rec. a week. Pr.: Econ. 110.

010 150. Livestock Marketing. (3) II. A study of factors affecting livestock prices, methods of marketing and market agencies; particular emphasis on use of marketing knowledge by producers in farm and ranch management, and problems of livestock marketing and processing firms. Three hours rec. a week. Pr.: Econ. 110.

010 201. Principles of Agricultural Economics. (3) I, II. A study of economic principles, with emphasis on their application to the solution of agricultural problems. The course treats problems encountered in the operation of farms and agribusiness firms as well as problems of concern to the agricultural industry in its relationship to other sectors of the United States economy and selected foreign countries.

010 221. Farm Management. (3) I, II. Organization and management of the farm, with special emphasis on principles and methods of analyzing factors which affect production and marketing decisions. Three hours rec. a week. Pr.: Econ. 110, Ag. Ec. 201, Math. 100.

010 222. Farm Planning Laboratory. (1) I. A review of accounting methods used in the keeping of farm records, tax regulations and their effect on farm organization and operation, and the use of the budget in farm planning. Two hours lab. a week. Pr.: Ag. Ec. 201.

010 231. Rural Banking. (4) II. Management of banks in rural areas including organization and personnel, sources and uses of funds, credit, and services, particularly to farmers and agricultural businesses; the role of rural banks in the U.S. banking system. Four hours rec. a week. Pr.: Econ 110 and junior standing.

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.

010 300. Agricultural Economics Summary. (2) I, II. Summarization and correlation of courses pursued in college; problems requiring application of principles and broad understanding of the field; contemporary economic developments. Two hours rec. a week. Pr.: Senior standing.

010 305. Agricultural Economy of South Asia. (3) II. A descriptive study of the system of food production and the village economy of one fifth of the world's population and the significance of this system to the commercial mechanized agriculture of the industrial nations. Three hours rec. a week. Open to all undergraduates.

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 development. Attention is directed toward principles of economic growth and national and international policies that will stimulate development. Pr.: Econ. 110.

010 410. Agricultural Policy. (3) I. A study dealing with the economic problems of agriculture, with emphasis on the influence of private and governmental policies on such problems. Attention will be directed toward analyzing the effects of different types of private and governmental policies on the agricultural industry. Three hours rec. a week. Pr.: Econ. 110.

010 411. Consumption Economics in Agriculture. (3) I. Explanation of consumer demand and factors affecting consumer purchasing patterns; special emphasis on the relation of producer decisions and market performance to consumer demand. Three hours rec. a week. Pr.: Econ. 110.

010 421. Agricultural Prices and Market Structures. (3) II. Explanation of forces determining prices for agricultural resources and products; special emphasis on marketing methods and their effects upon farm prices and products offered; methods of price analysis. Three hours rec. a week. Pr.: Ag. Ec. 245, 480, or consent of instructor.

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 operation of marketing and farm supply firms. Three hours rec. a week. Pr.: Econ. 110 and B.A. 273.

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 instructor.

010 450. Land Economics. (3) I. Principles and procedures in acquiring and transferring rights in land resources through ownership, leasing, easements, and other means; social controls over land resources, including regulation, zoning and taxation; evaluation and marketing of land resources. Three hours rec. a week. Pr.: Econ. 110.

010 451. Agricultural Finance. (3) II. Financial structure of agriculture; capital requirements for efficient operation of farms and agricultural businesses; sources of capital, with particular consideration given to credit, integration, and business organization. Three hours rec. a week. Pr.: Econ. 110.

010 470. Principles of Cooperation. (3) I. History and development of cooperatives, especially farmer marketing and purchasing cooperatives; philosophy, principles, and operating techniques essential for successful cooperatives activity; limitations and possibilities for cooperatives in the agricultural economy. Three hours rec. a week. Pr.: Econ. 110.

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. Three hours rec. a week. Pr.: Econ. 110 and Math. 100.

UNDERGRADUATE AND GRADUATE CREDIT

010 620. Production Economics I. (3) I. Economic theory, under conditions of perfect and imperfect knowledge, applied to production problems; resource and output combinations, costs, firm size, and aggregate aspects of production. Three hours rec. a week. Pr.: Ag. Ec. 201 or consent of instructor.

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.: Consult instructor.

010 670. Land and Resource Conservation. (3) II. Supply and demand for natural resources. Economics of natural resources development, use, and conservation. Present uses and future needs for natural resources.

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.

010 820. Price Analysis. (3) II. Theory and analysis of price determination under alternative structure conditions; empirical investigation of price problems. Pr.: Ag. Ec. 421 or consent of instructor.

010 821. Advanced Farm Management. (3) I. A study of management concepts and their application to the farm business. Emphasis will be upon identification and measurement of the managerial input and the effect of management upon the efficient use of resources. Pr.: Ag. Ec. 221 and 620.

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. Ec. 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.: Ag. Ec. 450 or 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. Ec. 245 and B.A. 273 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

R. V. OLSON,* Head of Department

Professors Bidwell, Bieberly,* Ellis,* Feltner,* Heyne,* Hobbs,* Jacobs,* Jones,* Mader,* Olson,* and Pittenger;* Associate Professors Atkinson, Barnett,* Casady,* Harper, Hyde,* Liang,* Murphy,* Nilson, Paulsen,* Peterson, Powers,* Russ,* Sloan, Sorensen,* Teare,* Vanderlip,* Wassom,* Whitney,* Wilkins, Wilkinson,* Withee,* and Woodruff; Assistant Professors Axelton, Dicken, Edleblute, Kanemasu,* Lundquist, McMaster, Moore, Nickell,* Overley, Owensby,* Raney, Skidmore,* Swallow, Tobin, and Walter; Instructors Burchett, Dickerson, Gronau, Gruver, and Lyles; Emeritus: Professors Anderson,* Clapp, Cleavinger, Laude,* Lind and Zahnley.**

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 busi-

ness and industry. Flexibility in programs of study is maintained in order 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 medium-rolling 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.

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 three-hour 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 three 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.: Millg. 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. Influence of soil-forming agencies on soil characteristics and methods of classifying and mapping soils; field trips. Two hours rec. and three hours lab. a week. Pr.: Gl. Gg. 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 264 401.)

015 410. Range Management I. (3) II. Establishment, management, and utilization of tame and native pastures. 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. Pr.: Dependent on problem. 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. Prerequisite depends on the problem assigned.

015 630. Soil Problems. Credit arranged. I, II, S. Prerequisite depends on the problem assigned. 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) II. 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 1970-71 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. 300 or 444.

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. An advanced course dealing with genetic principles. 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 and 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. (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 1970-71 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) I. Offered 1970-71 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 1971-72 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 1970-71 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 1970-71 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. Two hours rec. and three hours lab. a week. Pr.: Agron. 660, Math. 222, Phys. 211.

015 920. Soil Genesis. (2) II. Offered 1970-71 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, Good,* Koch,* Moyer, Richardson,* E. Smith,* and Wheat;* Associate Professors Brent,* Drake,* Francis, Harbers,* Hines,* Kiracofe,* Kropf,* McAdams, McKee, W. Smith,* Tuma,* and Zoellner; Assistant Professors Ahlswede, Allen,* Ames,* Phar, Schalles,* and Westmeyer; Instructors Hoover and Melton; Emeritus: Professors Aicher, Aubel, Mackintosh, McCormick, and Weber.*

Courses in the Department of Animal Science and Industry give the student instruction in the selection, breeding, feeding, manage-

ment, 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 comparison 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 resumé 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-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 work-study 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.

005 650. 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.

005 660. 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 santitation, 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 Beecher,* 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 225). The department also participates in interdepartmental programs in animal nutrition leading to the Doctor of Philosophy degree (see Animal Nutrition, page 225) and in Food Science leading to Master of Science and Doctor of Philosophy degrees (see Food Science, page 226).

The Department of Biochemistry strives to develop scientists with a strong background in Chemistry and Biochemistry capable of independent research and teaching. To accomplish 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 a two semester comprehensive coverage of biochemistry. For one semester course, enroll in Biochem. 421. Pr.: *Quantitative chemical analysis, one year of organic chemistry, differential and integral calculus.

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, amino 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.: *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,

* Non-majors lacking these prerequisites should obtain consent of instructor before enrollment.

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 1970-71 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: Professors Martin* and Payne.**

Undergraduate Study

A wide application of science to the problems of poultry production, milk 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 processing the student studies the science of manufacturing, distributing and merchandising milk and milk products, including fluid milk, ice cream, butter-concentrated products and cheese. Teaching and research facilities include a modern automated dairy-processing plant.

The Avery Poultry Research Center, comprising 10 new buildings having a 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 for experimental work. In addition, modern laboratory and teaching facilities are available for both poultry and dairy training in Leland 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 that 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.

* Non-majors lacking these prerequisites should obtain consent of instructor before enrollment.

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.

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) I. Offered in odd 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.

026 660. 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, Bact. 220, and junior standing.

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. Metbolism, 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 Anat. 801.)

Genetics Seminar. (See A. S. I. 630.)

Entomology

HERBERT KNUTSON,* Head of Department

Professors Knutson, Harvey,* Hopkins,* Horber;* Associate Professors Elzinga,* Gates, Mills,* Pitts,* Rettenmeyer,* and Thompson;* Assistant Professors Blocker,* 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 students, such as 200, 211, and (2) professional courses which include most of the remainder. They provide training for research, resident and extension teaching and administration in the services of colleges, experiment stations, health services, other 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 temperature- and humidity-controlled rooms for rearing insects and laboratories for use of radio-

isotopes. 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 are also 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-products 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 at 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 and their near relatives; insect and rodent pests of flour mills, elevators, granaries, warehouses and bakeries and standard methods of mill and granary sanitation. Laboratory emphasizes study of the important grain and mill insects. 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-products 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. Offered 1970-71 and alt. years. Physical, chemical and biological properties of insecticides and acaricides; formulations and methods of preparation and analysis. One lec. and 4 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 taxonomic 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 to 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 1970-71 and alt. years. Physiological and biochemical action of insecticides; symptoms and treatment in mammals and insects; insect resistance to insecticides. One hour lec. and 4 hours lab. a week. Pr.: Entom. 656 or consent of instructor.

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.

035 398. 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,* MacMasters,* Pfost,* Schoeff, Shellenberger,* Tsen,* Ward,* and Wilcox; Associate Professor Lineback;* Assistant Professors Miller* and Robinson;* Instructors Balding and Phillips.*

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 related activities.

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. 213, or Arch. 207.

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, clean-

ing, conditioning plant, and a 200 hundred weight flour mill, with instrumentation and air conditioning. Two hours lec. and six hours lab. a week. Pr.: Gr. Sc. 100 and 210.

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.: Bact. 220 or minimum of eight hours of biological science; 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. 444 or Biochem. 421 and Gr. Sc. 610.

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

Horticulture is a science, a business, a profession, an art, an industry, and a 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 agriculture, science, production, services, business and industry, and horticultural therapy.

The agricultural 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 agricultural 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 agricultural 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 agricultural 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. 31) is available for students interested in floral arrangement and retail flower shop management. A two-year short course in Nursery and Landscape Management (p. 31) prepares young people for work in nurseries, garden centers, parks, and similar enterprises.

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.

040 200. 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.

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) II. Offered in the spring of 1971 and alt. years thereafter. 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. Offered fall, 1971 and alt. years. 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. Offered in the fall and a Summer Workshop 1972 and alt. years thereafter. 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. Offered in the spring and a Summer Workshop 1971 and alt. years thereafter. 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. Offered spring, 1972 and alt. years thereafter. 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. Offered fall, 1971 and alt. years. 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. Offered fall, 1972 and alt. years. 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. Offered spring, 1971 and alt. years. 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. Offered spring, 1971 and alt. years. 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. Offered spring, 1970 and alt. years. 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. Offered spring, 1971 and alt. years. 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. Offered in the fall of 1970 and alt. years thereafter. 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.

040 855. Controlled Plant Environment. (3) II. Offered spring, 1972 and alt. years. 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. Offered fall, 1971 and alt. years. Physiological, ana-

tomical 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

Professors Hansing, King, and Schafer;* Associate Professors Dickerson,* Edmunds,* Stuteville,* and Willis; Assistant Professors Browder,* Burleigh,* Johnson,* 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 (p. 30). 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 1970-71 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 1971-72 and alt. years. Diseases of cereal, forage, and fiber crops; their causes, symptoms, life histories, host-parasite 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 mammalian 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 1970-71 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 1970-71 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 and 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 1971-72 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

GLENN H. BECK, Vice President for Agriculture (on Leave)
FLOYD W. SMITH, Director and Acting Vice President
KEITH HUSTON, Assistant Director
LOWELL BRANDNER, Editor
MRS. 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 to 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, Agronomy, Animal Science and Industry, Biochemistry, Biology, Chemical Engineering, Chemistry, Business Administration, Counseling Center, Economics, Entomology, Dairy and Poultry Science, Grain Science and Industry, Geology and Geography, Home Economics, Horticulture and Forestry, Nuclear Engineering, Physics, Plant Pathology, Political Science, Statistics and Computer Science, Sociology and Anthropology, and Veterinary Medicine.

Research of the various departments is conducted in eight divisions of the Kansas Agricultural Experiment Station. These 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 $6.7 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. 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 the use of experiment station researchers.

Results of research are published in scientific journals, station bulletins, circulars, pam-

phlets, leaflets, 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.

Branch Agricultural Experiment Stations

Fort Hays Branch Station

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 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

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

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

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

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 the station 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 are operated by the Department of

Horticulture and Forestry in Northeast Kansas (Wathena), Wichita, and Southeast Kansas (Chetopa).

The Kansas Water Resources Research Institute

HYDE S. JACOBS, Director

Cooperating with 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. However, the Regents stipulated that Kansas State University and the University of Kansas were to be full partners in the Institute so that maximum benefit would accrue 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 both 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.

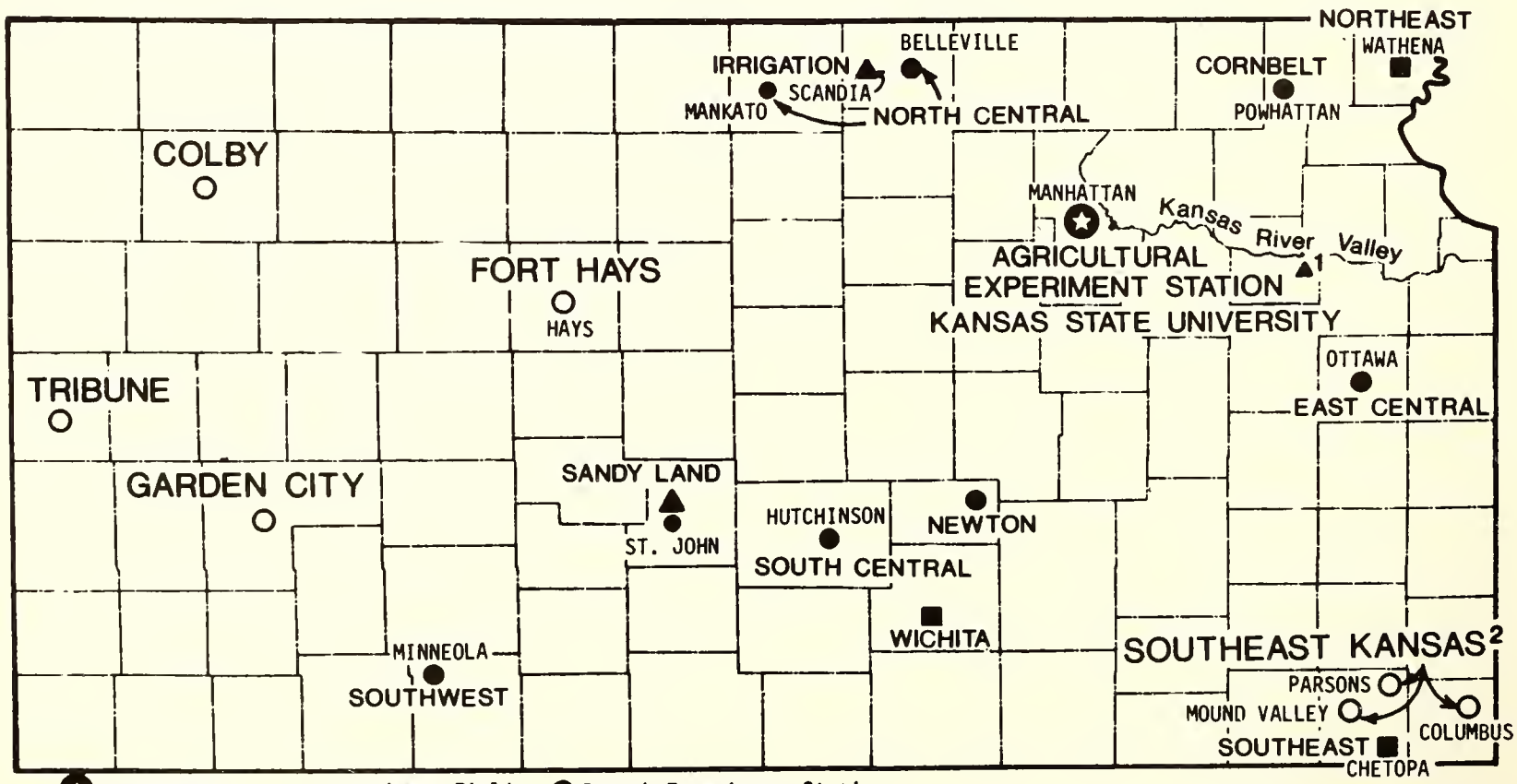
Evapotranspiration Laboratory

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

The Food and Feed Grain Institute

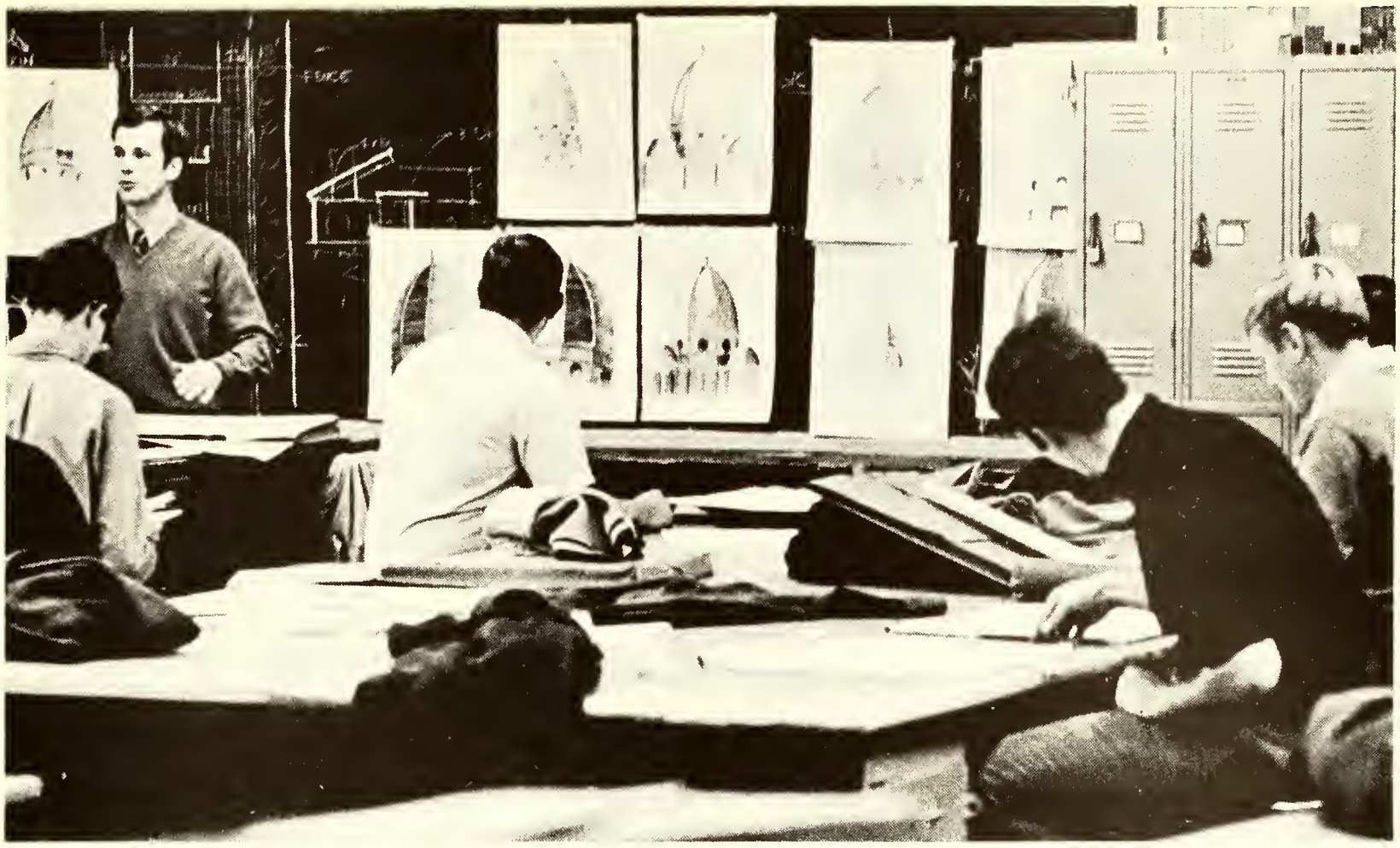
WILLIAM J. HOOVER, Director
LEONARD W. SCHRUBEN, Associate Director

The Institute is based on the faculty in the Grain Science and Industry Department and draws on 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.



Headquarters ● Experiment Field ○ Branch Experiment Station
▲ Irrigation Experiment Field ■ Horticultural Experiment Field

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



The College of Architecture and Design

EMIL C. FISCHER, Dean
ROBERT P. EALY, Associate Dean
F. GENE ERNST, 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 facilities provide a stimulating environment for professional development.

The College of Architecture and Design consists of five administrative Departments of Architecture, Construction Science, Interior Architecture, Landscape Architecture and Regional and Community Planning. Bachelor's degrees are offered in each of the following areas:

Architecture—Curriculum on page 58
Architectural Structures—Curriculum on page 59
Interior Architecture—Curriculum on page 60
Landscape Architecture—Curriculum on page 60
Building Construction—Curriculum on page 59

General descriptions of these curriculums, course offerings and graduate programs are presented on pages 61-66.

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 224.

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	Humanities
Art History	Modern Language
Business Administration	Philosophy
English	Psychology
Geology and Geography	Sociology and Anthropology
History	

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 counselled and take a number of professionally related courses which underlie all of the design disciplines. During this pre-professional period a student will demonstrate his professional aptitude and accumulate sufficient credit hours to permit an evaluation of his academic record.

Upon completion of the pre-professional two-year Basic Studies program, **each student** will be evaluated and screened 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) pre-architecture 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 transfer should be directed to the Assistant Dean of the College.

Curriculum in Architecture

Bachelor of Architecture

FIRST YEAR

Fall Semester

		Course	Sem. Hrs.
Engl.	229 100	Engl. Comp. I	3
Arch.	104 211	Fund. Design I	2
Arch.	104 207	Arch. Graph. I	2
Math.	245 220	Anal. Geom. & Calc.	4
L. A.	110 200	Landscape Des.	3
Ph. Ed.	261 011	Physical Ed.	0
Arch.	104 110	Arch. Lecture	0
		Elective	2
			16

Spring Semester

Engl.	229 120	Engl. Comp. II	3
Spch.	281 105	Oral. Comm. I	2
Arch.	104 212	Fund. Design II	2
Arch.	104 208	Arch. Graph. II	2
Hist.	241 101	West. Civ. I	3
Psych.	273 110	Gen. Psych. or Intro.	
Soc.	277 211	to Soc.	3
Ph. Ed.	261 011	Physical Ed.	0
			15

SECOND YEAR

Fall Semester

Phys.	265 211	Gen. Phys. I	4
Arch.	104 321	Design Anal.	4
Phil.	241 150	Elem. Logic	3
		Elective	3
			14

Spring Semester

Phys.	265 212	Gen. Phys. II	4
Arch.	105 374	Hist. of Arch. I	2
Arch.	104 322	Prin. Envir. Des.	4
Ap. M.	510 205	App. Mech. A.	3
		Elective	3
			16

THIRD YEAR

Fall Semester

Arch.	105 431	Arch. Design I	5
Con. Sci.	106 434	Thermal Systems	3
Ap. M.	510 220	Str. Materials A.	3
Ap. M.	510 224	Str. Matls. Lab.	1
Arch.	105 433	Arch. Constr. I	3
Arch.	105 375	Hist. Arch. II	2
			17

Spring Semester

Arch.	105 432	Arch. Design II	5
Arch.	105 421	Timber Structure	2
Arch.	105 420	Theory of Structure	3
Con. Sci.	106 435	Lighting Systems	2
Arch.	105 434	Arch. Constr. II	3
Arch.	105 378	Hist. of Arch. III	2
			17

FOURTH YEAR

Fall Semester

Arch.	105 542	Arch. Design III	5
Arch.	105 422	Theory Struc. II	4
Con. Sci.	106 436	Sanitation Sys.	3
		Elective	3
Arch.	105 379	Hist. Arch. IV	2
			17

Spring Semester

Arch.	105 542	Arch. Design IV	5
Arch.	105 428	Theory of Stuc. III	4
Con. Sci.	106 437	Acoustic Systems	2
Arch.	105 413	Environ. Seminar	3
		Elective	3
			17

FIFTH YEAR

Fall Semester

Arch.	105 651	Arch. Design V	5
Plan.	109 215	Intro. to Plan.	3
Arch.	105 653	Prof. Practice	2
		Elective	6
Arch.	105 654	Inspect. Trip	0
			16

Spring Semester

Arch.	105 652	Arch. Design VI	5
Plan.	109 635	City Plan. I or	
Plan.	109 645	Urban Design I	3
		Elective	7
			15

Number of hours required for graduation, 160.

Twenty-seven 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

FIRST YEAR

Fall Semester

		Course	*Sem. Hrs.*
Engl.	229 100	Engl. Comp. I	3
Chem.	221 210	Chemistry I	5
Math.	245 220	Anal. Geom. & Cal. I	4
Arch.	104 207	Arch. Graph. I	2
Arch.	104 211	Fund. Design I	2
Ph. Ed.	261 011	Physical Education	0
Arch.	104 110	Arch. Lecture	0
			16

Spring Semester

		Course	*Sem. Hrs.*
Engl.	229 120	Engl. Comp. II	3
Chem.	221 230	Chemistry II	3
Math.	245 221	Anal. Geom. & Cal. II	4
Arch.	104 208	Arch. Graph. II	2
Arch.	104 212	Fund. Design II	2
Con. Sci.	106 210	Intro. Constr. Prog.	2
Ph. Ed.	261 011	Physical Education	0
			16

SECOND YEAR

Fall Semester

Phys.	265 310	Engr. Phys. I	5
Math.	245 222	Anal. Geom. & Cal. III	4
C. E.	525 212	El. Survey Engr.	3
Arch.	104 321	Design Analysis	4
			16

Spring Semester

Phys.	265 311	Engr. Phys. II	5
Math.	245 240	Series & Diff. Eq.	4
Ap. M.	510 305	Statics	3
Arch.	104 322	Prin. Envir. Design	4
			16

THIRD YEAR

Fall Semester

Ap. M.	510 415	Mech. of Materials	3
Ap. M.	510 418	Mech. Matls. Lab.	1
Arch.	105 433	Arch. Const. I	3
Ap. M.	510 412	Dynamics	3
Arch.	105 431	Arch. Design I	5
Spch.	281 105	Oral Comm. I	2
			17

Spring Semester

C. E.	525 331	Stat. Deter. Str.	3
Arch.	105 421	Timber Str.	2
Arch.	105 434	Arch. Const. II	3
Arch.	105 432	Arch. Design II	5
Econ.	225 110	Econ. I	3
			16

FOURTH YEAR

Fall Semester

C. E.	525 332	Stat. Indet. Str.	3
C. E.	525 422	Soil Mech. I	3
Con. Sci.	106 335	Sanitation Systems	3
Arch.	105 301	Apprec. Arch.	3
		Elective	4
			16

Spring Semester

Arch.	105 422	Thry. Str. II	4
Con. Sci.	106 434	Thermal Systems	3
M. E.	560 413	Thermodynamics I	3
Con. Sci.	106 336	Acoustic Systems	2
		Human. Elective	3
			15

FIFTH YEAR

Fall Semester

Arch.	105 428	Thry. Str. III	4
Con. Sci.	106 435	Lighting Systems	2
Arch.	105 653	Prof. Practice	2
Ap. M.	510 471	Fluid Mech.	3
		Elective	3
C. E.	525 426	Foundations	3
			17

Spring Semester

Arch.	105 680	Thry. Str. IV	3
Arch.	105 410	Senior Project in Arch Str.	3
E. E.	530 403	El. Cir. & Cont.	4
		Human. Elective	5
			15

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

FRESHMAN

Fall Semester

		Course	*Sem. Hrs.*
Engl.	229 100	Engl. Comp. I	3
Math.	245 220	Anal. Geom. & Cal. I	4
Spch.	281 105	Oral Comm. I	2
Arch.	104 207	Arch. Graph. I	2
Psy.	273 110	Gen. Psychology	3
or			
Soc.	227 211	Intro. Soc.	
Ph. Ed.	261 011	Physical Education	0
Arch.	104 110	Arch. Lecture	0
			14

Spring Semester

Engl.	229 120	Engl. Comp. II	3
C. E.	525 212	El. Survey Engr.	3
Arch.	104 208	Arch. Graph. II	2
Phys.	265 211	Gen. Phys. I	4
Con. Sci.	106 210	Intro. to Constr. Programming	2
		Elective	2
Ph. Ed.	261 011	Physical Education	0
Con. Sci.	106 116	Constr. Sem.	0
			16

SOPHOMORE

Fall Semester

Phys.	265 212	Gen. Phys. II	4
Arch.	105 433	Arch. Const. I	3
Geol.	234 100	Gen. Geology	3
Con. Sci.	106 250	Site Constr.	3
Econ.	225 110	Econ. I	3
Con. Sci.	106 116	Constr. Seminar	0
			16

Spring Semester

Con. Sci.	106 313	Constr. Drawing	3
Ap. M.	510 205	Appl. Mech. A	3
Arch.	105 301	Apprec. Arch.	3
B. A.	305 275	Fund. of Acctg.	4
		Elective	3
Con. Sci.	106 116	Const. Sem.	0
			16

JUNIOR

Fall Semester

Ap. M.	510 220	Str. Materials A	3
Ap. M.	510 224	Str. Matls. A Lab.	1
Con. Sci.	106 440	Constr. Prob. I	3
Con. Sci.	106 436	Sanitation Syst.	3
Comm.	305 425	Business Law I	3
		Elective	4
Con. Sci.	106 116	Constr. Sem.	0
			17

Spring Semester

Con. Sci.	106 421	Timber Str.	2
Con. Sci.	106 420	Thry. Str. I	3
Con. Sci.	106 435	Lighting Syst.	2
Con. Sci.	106 437	Accoustic Syst.	2
Arch.	105 653	Pro. Practice	2
Stat.	285 320	El. Statistics	3
		Elective	3
Con. Scl.	106 116	Constr. Sem.	0
			17

SENIOR

Fall Semester

Con. Scl.	106 422	Thry. Str. II	4
Con. Sci.	106 441	Constr. Estim.	3
Con. Sci.	106 442	Constr. Man. I	3
Con. Scl.	106 434	Thermal Syst.	3
		Elective	4
Con. Sci.	106 116	Constr. Seminar	0
			17

Spring Semester

I. E.	550 401	Indust. Man.	3
Con. Sci.	106 428	Thry. Str. III	4
Comm.	305 630	Industrial Rel.	3
Con. Sci.	106 443	Constr. Man. II	3
		Elective	4
Con. Scl.	106 116	Constr. Seminar	0
			17

Number of hours for graduation, 130.

There are 21 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

Fall Semester

		Course	*Sem. Hrs.*
Engl.	229 100	Engl. Comp. I	3
Arch.	104 211	Fund. Des. I	2
Arch.	104 207	Arch. Graph. I	2
L. A.	110 200	Landscape Design	3
Art	209 100	Design I	2
Psych.	273 110	Gen. Psych. or	
Soc.	297 211	Intro. Soc.	3
Ph. Ed.	261 011	Phy. Ed.	0
Arch.	104 110	Arch. Lecture	0
			15

Spring Semester

Engl.	229 120	Engl. Comp. II	3
Art	209 200	Design II	2
Arch.	104 212	Fund. Design II	2
Arch.	104 208	Arch. Graph. II	2
Hist.	241 101	West. Civ. I	3
Spch.	281 105	Oral Comm. I	2
Ph. Ed.	261 011	Phy. Ed.	0
		Elective	2
			16

SECOND YEAR

Fall Semester

Phys.	265 211	Gen. Phys. I	4
M. L.	253 131	French I	5
Arch.	104 321	Design Analysis	4
C. & T.	611 340	Int. Design II	3
			16

Spring Semester

C. & T.	611 640	Int. Des. III	3
Econ.	225 110	Econ. I	3
Arch.	104 322	Prin. Envir. Des.	4
Phys.	265 212	Gen. Phys. II	4
		Elective	2
			16

THIRD YEAR

Fall Semester

Arch.	105 431	Arch. Design I	5
Int. Arch.	107 307	Des. Workshop I	3
Arch.	105 433	Arch. Const. I	3
Arch.	104 374	Hist. Arch. I	2
C. & T.	610 260	Textiles	3
			16

Spring Semester

Arch.	105 432	Arch. Des. II	5
Int. Arch.	107 308	Des. Workshop II	3
Arch.	105 434	Arch. Const. II	3
Arch.	104 375	Hist. Arch. II	2
Con. Sci.	106 434	Thermal Systems	3
			16

FOURTH YEAR

Fall Semester

Int. Arch.	107 541	Int. Arch. Des. I	4
Int. Arch.	107 309	Finishing	2
Con. Sci.	106 435	Lighting Systems	2
Arch.	104 378	Hist. Arch. III	2
C. & T.	611 740	Hist. Fab. Des.	3
		Elective	3
			16

Spring Semester

Int. Arch.	107 542	Int. Arch. Des. II	4
B. A.	305 440	Marketing	3
C. & T.	610 645	Hist. Furn. Des.	3
Con. Scl.	106 437	Acoustic Systems	2
Arch.	104 379	Hist. Arch. IV	2
		Elective	3
			17

FIFTH YEAR

Fall Semester

Int. Arch.	107 651	Int. Arch. Des. III	5
Arch.	105 654	Inspection Trip	0
Int. Arch.	107 653	Cont. Des. Prac.	2
B. A.	305 425	Bus. Law I	3
		Elective	6
			16

Spring Semester

Int. Arch.	107 652	Int. Arch Des. IV	5
Int. Arch.	107 683	Cont. Furn. Des.	4
		Elective	7
			16

Number of hours for graduation, 160.

Twenty-three hours are electives. Only four hours 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

Fall Semester

		Course	*Sem. Hrs.*
L. A.	110 200	Landscape Design	3
Arch.	104 207	Arch. Graphics I	2
Arch.	104 211	Fund. Design I	2
Engl.	229 100	Engl. Comp. I	3
Bot.	215 210	Gen. Botany	4
Ph. Ed.	261 011	Phys. Ed.	0
		Elective	2
L. A.	110 201	L. A. Assembly	0
			16

Spring Semester

Arch.	104 208	Arch. Graphics II	2
Arch.	104 212	Fund. Design II	2
Engl.	229 120	Engl. Comp. II	3
Hist.	241 101	Hist. West. Civ. I	3
Math.	245 150	Pl. Trig.	3
Soc.	277 211	Intro. Soc.	3
Ph. Ed.	261 011	Phys. Ed.	0
L. A.	110 201	L. A. Assembly	0
			16

SECOND YEAR

Fall Semester

Geog.	235 150	Phys. Geog. I	4
Arch.	104 321	Design Anal.	4
Hort.	040 260	Plant Mat. I	3
Arch.	105 221	Nat. of Arch. Mat. & Des.	3
Spch.	281 105	Oral Com. I	2
L. A.	110 201	L. A. Assembly	0
			16

Spring Semester

Arch.	104 322	Prin. Envir. Dsgn.	4
C. E.	525 212	El. Survey Engr.	3
Hort.	040 270	Plant Mat. II	3
Arch.	105 222	Elem. of Arch. Constr.	3
L. A.	110 204	Lnd. Ar. Delin. Tec.	2
L. A.	110 201	L. A. Assembly	0
			15

THIRD YEAR

Fall Semester

L. A.	110 442	Pltg. Design I	3
L. A.	110 431	Land Arch. Design I	4
L. A.	110 433	Hist. Th. Land Arch.	3
L. A.	110 471	Land Const. I	3
Soc.	277 531	Urban Soc.	3
L. A.	110 201	L. A. Assembly	0
			16

Spring Semester

L. A.	110 443	Pltg. Design II	3
L. A.	110 432	Land Arch. Dsgn. II	4
L. A.	110 472	Land Const. II	3
Hort.	040 410	Land Hort.	3
B. A.	305 425	Bus. Law I	3
L. A.	110 201	L. A. Assembly	0
			16

FOURTH YEAR

Fall Semester

L. A.	110 543	Pltg. Design III	3
L. A.	110 541	Land Arch Dsgn. III	4
Plan.	109 215	Intro. to Plan.	3
L. A.	110 547	Land. Const. III	3
L. A.	110 501	L. A. Seminar	1
		Elective	3
			17

Spring Semester

L. A.	110 542	Land Arch. Dsgn. IV	4
C. E.	525 618	E. Photo. Int.	3
L. A.	110 544	Com. Planning	3
An elective in Plant Science			3
		Elective	2
L. A.	110 501	L. A. Seminar	1
L. A.	110 546	L. A. Insp. Trip	0
L. A.	110 545	Pro. Intern.	0
			16

FIFTH YEAR

Fall Semester

L. A.	110 651	Land Arch. Design V	5
L. A.	110 656	Des. Park & Rec.	3
Psych.	273 465	Psych. of Art	3
		Elective	4
L. A.	110 501	L. A. Seminar	1
			16

Spring Semester

L. A.	110 652	Land Arch. Dsgn. VI	5
L. A.	110 654	Sen. Proj. L. A.	3
L. A.	110 653	Prof. Practice	2
		Elective	5
L. A.	110 501	L. A. Seminar	1
			16

Total hours required for graduation, 160.

Nineteen hours are electives. Of these only four hours of Military Science may be counted.

Architecture

FRED D. MILES,* Head of Department

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

For Curriculum, see pages 58-61.

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 well-equipped 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. 131.

104 321. Design Analysis. (4) I. Exercises in the analysis and synthesis of design principles related to three-dimensional 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. Twelve 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. Architectural 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. 651.

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. (0) Required. I, II. An Inspection Trip is made to a major metropolitan center to enable students to study outstanding examples of Design and Construction. Pr.: Senior Classification.

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 Professor Jahnke; Assistant Professor Bissey,* and Blackman.*

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 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. Sci. 210, concurrent with Geol. 100. 3 hours per week.

106 313. Construction Drawings. (3) II. Field layout problems. Emphasis on construction procedures, site topography, and shop drawings. Building construction and landscape architecture majors. Pr.: Arch. 433, C. E. 212, or C. E. 212 taken concurrently.

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 special 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 and 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. The solution of practical problems normally encountered in the erection of buildings, layouts, design of form work and scaffolding; materials storage and handling; job organization demonstrations, research and drawings. Three hours lec. a week. Pr.: Con. Sci. 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. Business and management procedures of construction contracting. Three hours a week. Pr.: Arch. 653 and Con. Sci. 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. 442.

UNDERGRADUATE AND GRADUATE CREDIT

106 680. Theory of Structures IV. (3) I. 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; 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 232.

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. 232.

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 vertical-horizontal 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 commercial 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;* Assistant Professors Barnes* and Day;* Instructor Ownby; Lecturer Oblinger; 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 361 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 land-planning 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 CREDIT

110 100. General Landscape Design. (3) I, S. An introductory course in the fundamental principles of landscape design, and an apreciation 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. 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 week. 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. 471. 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. Twelve 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. 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 of all fourth-year landscape architecture majors. A two- to five-day trip to visit professional offices and completed projects in the region. Faculty member will be in charge.

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 resumé is required. Two hours rec. a week. Fifth-year classification.

110 654. Senior Project in Landscape Architecture. (3) I, II, S. Investigation of a landscape architectural problem of regional significance. Designed as a terminal project for landscape architecture majors. Studio time by appt. Pr.: 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 archi-

tecture 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* and McGraw;* Assistant Professors Ernst and Weisenberger; Adjunct Lecturers Eurman, Halligan, and Oblinger.*

Study leading to the two-year professional graduate degree Master of Regional and Community Planning has been offered on an interdepartmental basis since 1957 by the Department of Regional and Community Planning in cooperation with the Departments of Architecture, Civil Engineering, Economics, Geography and Geology, 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 interdepartmental 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 minor options and electives.

The following list indicates a suggested minor in Planning:

- Introduction to Planning
- Planning and Development Codes
- City Planning I
- Urban Design I
- Housing and Renewal
- Urban Visual Analysis
- Introduction to Economics and Urban Regional Economics
- Urban Geography
- Introduction to Sociology and Urban Sociology
- 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 Planning

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 and/or 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 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 laws 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 methodolgy 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 reviewed 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 Regional Planning Services

VERNON P. DEINES, Director
LELAND R. EDWARDS, 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 1961-67 some 1500 individuals in 60 Kansas communities have received the six-lesson short course in "Community Development" with sponsorship from cities, counties or local civic groups. During 1967-69 some 800 community leaders from 60 communities participated in the short courses and meetings held by the Center. 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 questionnaires. 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 self-help housing and public relations in planning. These studies are reported in the 1968-69 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
ORVAL EBBERTS, Assistant Dean
MARJORIE ADAMS, Assistant Dean
JOHN P. MURRY, Assistant to the Dean
SAM GEORGE, Assistant to the Dean

The College of Arts and Sciences through its 21 departments and two divisions 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 service in 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 with others, 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, offers summer reading of selected important books in natural sciences, social sciences, and humanities with an examination in early fall. Pr.: 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]	B. S.[1]	B. of Music	B. S. in Music Education B. S. in Physical Education
Anthropology	Anthropology	Music	Music
Art			Physical Education
Biology	Biology		
Chemistry	Chemistry		
Economics	Economics		
English			
General (Area Major)	General (Area Major)		
Geology	Geology		
Geography	Geography		
History	History		
Mathematics	Mathematics		
Modern Language			
Music			
Philosophy	Physics		
Political Science	Political Science		
Psychology	Psychology		
Sociology	Sociology		
Speech	Speech		
Statistics and	Statistics and		
Computer Science	Computer Science		
Technical Journalism	Technical Journalism		
Pre-Professional	Pre-Professional		
Physical Therapy	Physical Therapy		
Pre-Medicine	Medical Technology		
	Pre-Elementary Education[2]		
	Pre-Secondary Education[2]		
Pre-Dentistry	Pre-Dentistry		
Pre-Law	Pre-Law		
	Pre-Medicine		
	Pre-Nursing[3]		
	Pre-Pharmacy[4]		
Pre-Social Work	Pre-Social Work		
	Pre-Veterinary[5]		

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, History, Political Science, Psychology, Sociology and Anthropology, Technical Journalism, and Division of Geography (excluding Geography 150 and 151).

Three courses, including one course above the introductory level (400 level or above)

G. Natural Science from Division of Biology, Division of Geography (courses 150 and 151 only) and Departments of Chemistry, Geology, Mathematics, Physics, or Statistics and Computer Science.

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.

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 152).

2. Requirements for a degree to be completed in the College of Education (See page 153).

3. Requirements for a degree to be completed in a professional school of nursing.

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. (Pre-Veterinary medicine requirements may also be completed in the College of Agriculture. See page 28).

*** Each department and division within the College of Arts and Sciences may offer either the B. S. or A. B. degree or both the B. S. and A. B. degrees.

* Credit for Intermediate Algebra may not be applied toward a degree.

** No more than three courses in history to fulfill E and F.

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, History, Modern Languages, Music, Philosophy, Political Science, Psychology, Sociology and Anthropology, Speech, Technical Journalism or Division of Geography (excluding Geography 150 and 151).

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 foreign language).

D. Natural Science from Division of Biology, Division of Geography (courses 150 and 151 only) and Departments of Chemistry, Geology, Mathematics, Physics, or Statistics and Computer Science.

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 Music Degree

128 hours required for graduation

The student in this curriculum is offered the option of majoring in instrument, voice, or Theory and Composition. These options give the student the opportunity for personalized major instruction in voice, piano, violin, organ, or other instruments and the opportunity to minor in another of these fields.

I. General Requirements

A. English Composition I and II

B. Oral Communication I

C. Physical Education (or marching band or varsity sports)

Two courses

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 108.

General Curriculum

(Undeclared majors)

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. degree (p. 70) or B. S. degree (p. 71) 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: 64 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,

*** Each department and division within the College of Arts and Sciences may offer either the B. S. or A. B. degree or both the B. S. and A. B. degrees.

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 or 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. Pre-Veterinary requirements may also be completed in the College of Agriculture (See p. 28).

Suggested Schedule of Pre-Veterinary Medicine Requirements

Fall Semester	
English Composition I	3
College Algebra	3
Chemistry I	5
Social Science elective or Principles of Animal Science	3
Oral Communications I	2
Basic Physical Education	0
	16
Spring Semester	
English Composition II	3
Chemistry II	3
* Principles of Biology	5
* or General Zoology	4
Plane Trigonometry	3
Social Science elective or Principles of Animal Science	3
Basic Physical Education	0
	16 or 17
Fall Semester	
Chemical Analysis	4
Heredity and Evolution	2
or Genetics	3
General Physics I	4
Social Science elective or Principles of Animal Science	3
Animal Husbandry	1
Dairy or Poultry Science	1
	16
Spring Semester	
General Physics II	4
Humanities electives	6
Dairy or Poultry Science	1
General Organic Chemistry	5
	16

64 semester hours required for admission to College of Veterinary Medicine.

B. Pre-Medicine Curriculum: Fulfill General Requirements for the A. B. (p. 70) or B. S. degree (p. 71) 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. 70) or the B. S. degree (p. 71) 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.

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

* College of Veterinary Medicine recommends Principles of Biology but either is acceptable.

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. 71), 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 Pre-Secondary 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 (page 154). Prior to acceptance in the College of Education, students are advised by College of Education advisors in the Dean's Office of the College of Arts and Sciences and by advisors in their major fields. When students are accepted into the College of Education they are reassigned to advisors in the College of Education and retain their advisors 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 (53) semester hours are required for application to enter the College of Education and admission to the Teacher Education Program. (page 152)

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. Pre-Elementary Education students fulfill requirements for the B. S. in Elementary Education Degree in the College of Education (page 153). Prior to acceptance into the College of Education, Pre-Elementary Education students are advised by the College of Education advisors 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 advisors in the College of Education.

Students should make application to the Teacher Education Program during the sophomore year. Fifty-three (53) semester hours are required for application to enter the College of Education and admission to the Teacher Education Program. (page 152)

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.

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. 130 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 obtained 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, and Wall.

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 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 3 credit hours each, over a period of four semesters. All cadets in the POC receive $50.00 a month, a $134.00 uniform allowance 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 in addition will receive the $50.00 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 $180.00, 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 one-semester 1 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 IA. (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 officer 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. 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

OSCAR V. LARMER,* Head of Department

Professor Garzio; Associate Professors Larmer* and Tomasch;* Assistant Professors Craigie,* Deibler,* O'Shea and Vogt;* Instructors Abraham, Bell, Gibbs, Mantle, Pachero, Renata J. Replogle, Rex Replogle, Winegeardner, and Wells; Emeritus: Professor Barfoot; Associate Professors Harris, Hill, and Morris; 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, (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 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)
- (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)

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

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 two-thirds 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.

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.

209 265. Ceramics I. (2) I, II, S. Introduction to basic hand building techniques in both earthenware and stoneware clays; decoration of both two- and three-dimensional ceramic forms; student participation in stacking and firing in kilns. Six hours lab. Pr.: Art 100 or equiv.

209 270. Metalcrafts and Jewelry. (2) I, II, S. Design and execution of contemporary jewelry in precious metals, including setting of semi-precious and precious stones. Six hours lab. May be taken for credit three semesters. Pr.: Art 100.

209 290. Lettering. (2) I, II. Study of traditional lettering forms, including Roman, Gothic, Text, Script, and some contemporary adaptations of these. Pr.: Art 100, 190.

209 399. Honors 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.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

209 400. History of South Asian Art. (3) I, II. History of Indian art (including Islamic art) from the twelfth to the nineteenth century A. D. and history of art of Ceylon, Nepal and Indo-China.

209 406. Problems in Art I. (1-3) I, II, S. Work offered in drawing, painting, sculpture, printmaking, ceramics, crafts, 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, including the disadvantaged, physically handicapped, mentally retarded and emo-

tionally disturbed. Six hours lab. Pr.: Elementary Education or Art Major and Psychology 110. Same as Educ. 315.

209 420. History of Indian Art. (3) I, II. History of Indian art from c.3000 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 problems. 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 15th and 16th 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, 15th 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 metal, 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. Oil Painting II. (3) I, II, S. Cont. of Painting I. Emphasis on development of personal attitudes in formal structural relationships of line, color, and shape. Nine hours lab. May be taken for six semesters. Pr.: Art 246.

209 665. Ceramics II. (3) I, II, S. Advanced work on potter's wheel, with consideration to study of clay bodies and glaze calculation; consideration of kiln designs and firing procedures. Nine hours lab. May be taken for credit three semesters. Pr.: Art 265.

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 visual materials. Pr.: Art 265.

209 680. 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. Problems in Teaching Art. 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, Educ. 550 or equiv.; 12 credit hours in art.

209 790. Greek Art History. (3) I, II, S. Study of the art of classical Greece, from its Aegean origins through the Hellenistic period. Pr.: Art 195, 196.

209 799. Problems in Art History. 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.

209 845. Oil Painting III. Credit arranged. I, II, S. Advanced study, with emphasis on original investigation leading to professional competence in painting. Pr.: Consent of instructor.

209 865. Ceramics V. (3) I, II. Study of glaze materials; advanced work and experimentation in glaze calculation. One hour lec. and six hours lab. May be taken for two semesters. 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. Research 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 BARRETT, Head of Department

Professor Fitzsimmons; Athletic Director Barrett; Assistant Professors Dodds and Knorr; Instructors Morgan and Wardell; Coaches Brasher and Gibson; Assistant Coaches Branch, Elliott, Frazier, Montgomery, Powell, Pryor, Robertson, and Jackson; Administrative Assistants Head, Wall, and Kidd.

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, swimming, wrestling, and cross country.

Intercollegiate competition is open to all men students and is coached by a staff who are specialists in their respective sports.

Division of Biology

L. E. ROTH, Director
T. M. BARKLEY, Associate Director
J. S. WEIS, Assistant Director

Professors Ameel, Consigli,* Eisenstark,* Gier,* Hansen,* Harris,* McMahon,* Pady,* Pittenger,* Roth,* Tiemeier,* and Wimmer*; Associate Professors Anderson,* Barkley,* Buck, Fina,* Fisher,* Goss,* Hulbert,* Kramer,* Marzolf,* Reyes, Robel,* and Zimmerman;* Assistant Professors Doezema, Ferguson, Fretwell,* Iandolo,* Klaassen, Kowal, Lockhart,* Weis,* Williams, Wilson;* Emeritus: Professors Frazier,* Gainey,* Goodrich,* Guhl;* Associate Professors McCracken,* Newcomb.**

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 will be 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 advisor 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 advisor, 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 are also 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 also 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 advisor. 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 hrs. of microbiology courses to be chosen in consultation with the student's advisor. 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 3 options: Fisheries Biology, Wildlife Biology, and Conservation. Students in each of the 3 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 are also 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, i.e., Molecular Biology and Genetics, Microbiology, Physiology and Organismic Biology, and Environmental Biology. Graduate studies are also 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. (5) I, II. An introductory course centered on the unifying principles common to all levels of biological organization, from molecule, to cell, to organism, and to the population, and emphasizing the theory of natural selection, the gene theory of inheritance and physiological regulation, and the concept of the ecosystem. This course and Biology 201, Organismic Biology, are the equivalent of General Zoology and General Botany. Three hours lec., one hour rec., and 3 hours lab. 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 non-biology majors. Three hours lec. per week.

215 201. Organismic Biology. (3) I. The animal phyla and plant divisions, illustrating their taxonomy and functional adaptations that affect their survival. Two hours lec. and three hours lab. per week. Pr.: Bio. 198 or equiv.

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.

215 230. 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.

215 398. 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. Embryology. (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. Two hours rec. and three hours lab. per week. Pr.: Bio. 198 or 205.

215 425. Human Physiology. (4) I, II, S. Functions of various organ systems of the body. Directed toward non-biology majors. Three hours rec. and two hours lab. per week. Pr. 198 or 205.

215 430. Wildlife Conservation. (3) I. 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. (4) II. Structure and function of ecosystems. Abiotic and biotic interrelationships; energetics; population dynamics; community structure and regulation; biogeography; and succession. Three hours lec. and three hours lab. per week. Pr.: one course in biology and junior standing.

215 535. Cell Biology. (4) I. Chemistry, structure and function of cellular components and relationships to energy, transport, movement, division and growth. Three hours lec. and one three-hour lab. per week. Pr.: 8 hours biology and Chemistry 351 or equiv.

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 seed plants. Three hours lec. and one two-hour lab. 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.

215 614. Ornithology. (3) II, S. Lecture, laboratory, and field studies in identification and adaptation of birds. Two hours rec. and three hours lab. per week. Pr.: Bio. 201 or 205.

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.

215 632. 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.

215 634. 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.

215 660. 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. Principles of immunology; demonstration of antigen antibody reactions; serodiagnosis of human diseases. Three hours rec. and six hours lab. per week. Pr.: Bio. 610 or equiv.

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.

215 695. Social Behavior in Vertebrates. (2) II or S. Animal behavior from the viewpoint of social dominance and group organization; contributions of social behavior in the classes of vertebrates. Pr.: Bio. 198 or 205 and junior standing.

215 696. Fisheries Management. (4) I in odd years. Three hours rec. and three hours lab. per week. Pr.: Bio. 541.

215 700. 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.

215 705. 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.

215 715. 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.

215 720. 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. I, II, S.

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.

215 806. Experimental Endocrinology. (3) II. One hour rec. and six hours lab. per week. Pr.: Bio. 621 or consent of instructor.

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.

215-812. 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.

215 820. Plant Physiological Technique. (2) II. Six hours lab. per week. Pr.: Bio. 600 and a course in biochemistry.

215 825. Microbial Metabolism. (3) II in even years. An advanced treatment of metabolic activities of microorganisms. Pr.: Bio. 500.

215 826. Microbial Metbolism Laboratory. (2) II in even years. One hour rec. and six hours lab. per week. Pr.: Bio. 825 or concurrent enrollment.

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.

215 835. 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.

215 850. 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 Andrews, Daane,* Lambert,* McDonald,* Meloan,* Moser,* Schrenk,* and Silker;* Associate Professors Conrow,* Copeland,* Hammaker,* Johnson,* Lanning,* McDowell,* Setser,* and van Swaay; Assistant Professors Cooks,* Danen,* Hawley,* Kotz,* Lenhert, Paukstelis,* Purcell,* and Seitz;* Emeritus: Professor Lash, 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-four Ph. D. chemists representing a broad range of specialization in the chemistry field. The department offers programs leading to the B. S. (and 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 well equipped with modern facilities and instruments.

Undergraduate Study

Chemistry graduates from K. S. U. are sought by chemical industries and graduate schools and by high schools as chemistry teachers. Also, a significant number of our 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 hr.; Org. II (450), 3 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 hr.; 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:** 7 courses from the Departments of Art, Economics, English, History, Modern Languages, Music, Philosophy, Political Science, Psychology, Sociology and Anthropology, Speech, Tech-

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.

nical Journalism or Geography. Courses must include:
a. German: German I and II or Tech. German I and II.
b. Philosophy: I 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. Item 7 is modified as follows:

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 science, 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): Princ. of Secondary Ed. and Ed. Sociology, 6 hr.; Directed Teaching and teaching methods, 8 hr.

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 non-metallic 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 two-semester 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. Chemisty II. (3) I, II, S. Completion of the two-semester 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 and/or 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

221 799. 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

221 666. 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. (0-1) 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 chronopotentiometry, controlled-potential and constant-current coulometry, electrochemical thin layer techniques, rotating disk, and electrochemical instrumentation. Three lectures a week. Pr.: Chem.[4]

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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.

3. In the fall semester, the Chemistry Department conducts an accelerated program which provides the opportunity for students with good preparation in high school chemistry to earn credit in both Chemistry I (Chem. 210) and Chemistry II (Chem. 230). Credit in Chemistry I 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 per week. Students taking Chemistry I in this way are placed in a special section of Chemistry II, thus allowing completion of both Chemistry I and Chemistry II during the first semester.

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).

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.

221 601. 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 magnetic properties of their complexes. Three hours lec. a week. Pr.: Chem. 597, 610.

GRADUATE CREDIT

221 802. Graduate Seminar in Inorganic Chemistry. (0-1) 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 and compounds for students in technical curriculums, particularly in biological science, including pre-veterinary, pre-medical, 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.

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 applications. 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

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).

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. Physical 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.: Chem.[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.

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* and Delehanty; Assistant Professors Gormely, Greenwood,* Nafziger,* Olson and Rao;* Instructors Bradley, Hazlett and Thomas.*

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 70) 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; B. A. 272 or 273; Stat. 321 or 521.

Secondary Education Certification. A student majoring in economics may also prepare for teacher certification at the secondary level (see page 154). This program leads to the Bachelor of Science degree (see page 71). 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 154).

Industrial Relations and Manpower Studies Options. An economics or sociology major 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, psychological, and social aspects of labor-management relations and manpower studies by taking the following courses as parts of either a terminal university program or a foundation for graduate study: Econ. 620, 627; Soc. 541, 643; Psych. 515, 625; B. A. 530, 630, 632.

Graduate Study

Graduate study leading to the degrees Master of Arts and Doctor of Philosophy is offered

* The College of Arts and Sciences section of the Department of Economics; see also College of Agriculture. Courses in Agricultural Economics are offered by the College of Agriculture; courses in Accounting and Business Administration are offered by the College of Commerce.

4. All chemistry courses numbered 600 or above require the following as minimum prerequisites: Organic Chem. 11 (Chem. 450), Organic Chem. 11 Lab. (Chem. 451), Physical Chem. 11 (Chem. 595), and Physical Chem. 11 Lab. (Chem. 598).

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, economic systems, 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 Commerce, with the Agricultural and Engineering Experiment Stations, and with the various state agencies.

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 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; 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; prolems 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.

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

225 610. Public Finance. (3) I, II, S. Examination of federal, state, and local tax structures; sources of revenue and problems of tax equity; introductory analysis of tax shifting and incidence, fiscal policy, intergovernmental fiscal relations and optimum allocation of public goods. Pr.: Econ. 110.

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 labor-management 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.

225 636. 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

225 805. 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 post-Keynesian 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 analysis—growth 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,* Nichols,* Pennel,* and White;* Assistant Professors Brondell,* Conrow, Evans, Gillespie, Glenn,* Houser, Johnston,* Koch,* Laman,* McGhee,* Nyberg,* Petrullo,* 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 Engl. 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 6 to 12 hours of English literature electives, from 6 to 9 hours of American literature electives and up to 6 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 6 to 12 hours of American literature electives, from 6 to 12 hours of English literature electives

and up to 6 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 advisors 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) is also 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; 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 and 245 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 emphasis 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 also 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 studied. 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.

229 345. Introduction 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 attendance 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 transformational-generative. 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. Folk 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 non-Chaucerian 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.

229 651. Shakespearean Drama. (3) I, II, S. A study of selected plays, with attention to 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 writings 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.: Egl. 120, 125 or 126.

229 744. Twentieth Century American Novel. (3) I, S. American fiction from 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 Ph. 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.

229 920. 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 Departments of Speech and Modern Languages

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.

Course Offered Jointly with the Department of Modern Languages

UNDERGRADUATE AND GRADUATE CREDIT

229 610. Dante. (3) I. Same as Modern Languages 610.

Geology and Geography

PAGE C. TWISS,* Head of Department

Geology

Professors Beck, Chelikowsky,* Shenkel,* and Twiss;* Associate Professors Brookins* and Walters;* Assistant Professors Chaudhuri,* Riseman,* Vian,* 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 that are 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 (pp. 70, 71), 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 pp. 70, 71, the following must be completed: Geol. 100, 430, 460, 461, 470, 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 pp. 70, 71, 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 (pp. 70, 71), the Teacher Certification requirements (p. 155) 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 (pp. 70, 71) 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, 60-degree 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 Geology. (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 rocks. 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 I. (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 emhpasis 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, oxidation-reduction, 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 oc-

currence, 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 non-geology 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 Pb, 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 S, O, 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 Mineralogy. (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.

Geography Division

W. R. SIDDALL,* Head of Division

Professor Stacey; Associate Professors Siddall* and Stover;* Assistant Professors Bussing, Kromm,* 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 70) consist of a minimum of 28 hours in geography. Included in this total must be Geog. 150, 151, 250, 260, and 350, plus a minimum of 11 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 71).

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 790 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 Division 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

235 110. 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. 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 poltitical 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) I. Theory, interpretation, and design and drafting of maps, with emphasis on presenting quantitative data.

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.)

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

235 600. Geography of Anglo-America. (3) II. 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) I in odd years. 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 approaches will be treated. Emphasis will be placed on interpretation and evaluation of techniqeus employed in spatial analysis. Pr.: Statistics 520, or consent of instructor.

235 780. Seminar in Cultural-Economic Geography. (1-3) 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 innnovations 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) I in even years. 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.

235 980. Research in Geography. Credit arranged. I, II, S. Pr.: Registration in Graduate School, with sufficient training to carry on the line of research undertaken.

History

Executive Committee

HOMER E. SOCOLOFSKY, Chairman

GEORGE M. KREN

KENNETH W. JONES

Professors Brooks, Carey,* Coffman,* Higham,* Sageser,* Socolofsky,* Sweedlun,* and Wilcoxon;* Associate Professors Bright, Crawford,* Greene,* Kren,* Linder,* and Page;* Assistant Professors Donovan,* Ferguson,* Golin, Gray, Hagan, Jones,* and McMahon; Emeritus: Professor Parrish,* 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 or 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 must offer two seminars, one to be taken the first semester, and the year's course in historiography and demonstrate reading proficiency in an approved foreign language. In addition to a written thesis or report, they must pass a written and oral examination covering their fields of concentration.

For the Doctor of Philosophy degree, candidates must present four fields in history and one 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 130.

It also publishes The British Studies Intelligencer semi-annually 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, the latter 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.

241 201. 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 pro-seminar 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 instructor.

241 609. Medieval Institutions. (3) I, II. A study of the important institutions of Europe during the Middle Ages, with special attention to the Christian Church, manorialism, feudalism and the rise of the universities. Pr.: Junior standing.

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 century 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.

241 643. 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. Religion, Society and Politics in Modern Britain. (3) II. A description and analysis of religious thought and institutions in Britain from the seventeenth century onward, with emphasis on the role of religion and the churches in politics and society. 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 1801. (3) I, II, and alt. S. Rise and fall of Kievan Russia, the Mongol occupation, the ascendancy of Moscow and the beginnings of the Russian Empire. Pr.: Junior or senior standing, or consent of instructor.

241 668. Nineteenth Century Russia. (3) I, II, and alt. S. Political, social, economic and intellectual developments in Russia and her conduct of foreign policy from Alexander I to the Russian Revolution of 1917. Pr.: unior or senior standing, or consent of instructor.

241 671. The Russian Revolution and the Soviet Regime. (3) I, II, and alt. S. The Revolution of 1917 and the subsequent development of the Soviet State in society. Pr.: Junior or senior standing, or consent of instructor.

241 674. Russian Intellectual History. (2) II. A study of intellectual developments in Russia from 1762. Pr.: Hist. 684 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 of resurgence of Chinese power. Pr.: Junior or senior standing.

241 680. South Asia I. (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 Europan 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.

241 688. 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.

241 708. 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.

241 719. 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.

241 728. History of American Engineering. (3) I, II, S. Examination of the men and institutions of American engineering, the rise of professionalism, and the relation of engineering to industry, science, and society.

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 emphasis 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.

241 761. 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. Foundations of Modern America. (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. Intensive 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.

241 820. 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. Studies in the History of Science. (3) I or II. An intensive examination of problems in the history of science. Emphasis will be placed upon the relationship between scientific changes and intellectual-institutional developments. 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.

Mathematics

JOHN E. MAXFIELD,* Head of Department

Professors Dixon, Fuller,* Hsu,* Kirmser,* Marr,* Maxfield,* Parker,* Stamey,* and Stromberg;* Associate Professors Lee,* Sloat, and Yee;* Assistant Professors Greechie,* M. Grillet,* P. Grillet,* Marsden,* Miller,* Moretz,* Russell, Pigno, Spears,* and Williams;* Instructors Cammack, Hatzenbuhler, Ratcliffe, Samuelson, Schelp; Emeritus: Professors Babcock* and White;* Associate Professors Janes 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 Spaces I, II	6
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
		21

(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:

Math. 512, 513	Intro. to Modern Algebra I, II	6
Math. 577, 578	Elem. Topology I, II	6
Math. 603	Intro. to Linear Algebra	3
Math. 621, 622	Analysis I, II	6
		21

(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:

Math. 617	The Real Number system	3
Math. 511	Intro. to Algebraic Systems	3
or		
Math. 512	Modern Algebra I	
Math. 475	Modern Geometry	3
Math. 620	Intro. to Analysis	3
Math. 691	Topics in High School Math.	3
		15

In addition, six hours of electives should be selected from

Math. 513	Modern Algebra II	3
Math. 573	Foundations of Geometry	3
Math. 470	History of Mathematics	3

For a student who expects to enter a graduate school the following courses are appropriate to his program:

Math. 577, 578	Elementary Topology I, II
Math. 603	Intro. to Linear Algebra
Math. 604	Intro. to Theory of Groups
Math. 621, 622	Analysis I, 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 Schools
Educ. 616	Educational Sociology

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	9
Math. 761, 762	Numerical Analysis I, II	6
Math. 512	Intro. to Modern Algebra I	3
or		
Math. 621	Analysis I	
		21

(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. 221. 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 1½ 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 1½ 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.

245 230. 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 E^n, Gradient Potential Functions, Line Integrals, Taylor's Formula, Multiple Integrals, Linear Spaces, Applications to Functions on E^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 expan-

sions, 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 permutaiton 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, neightborhood, 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 non-Euclidean geometries). Pr.: Math. 513.

245 672. Differential Geometry I. (3) I. Curve theory via moving frames, ruled surfaces, curvatures of 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; Clifford-Klein'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 one or more of the following topics; primes in residue classes, ramifications of Galoisian extensions, Diophantine equations, Gaussian 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, H^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. Adavnced 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.: 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 E^n, function spaces, complete spaces, introduction to homotopy theory. Pr: 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, O-symmetry, 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, semi-normed 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 co-

homology 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. Rees-Sushkevitsch 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.

245 951. 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, Gregory, Hollis, Livermore, Riley, Todd, Kish; Instructors Edwards, Arnold.

Kansas State University offers the General Military Science curriculum to undergraduates. This curriculum is designed to give all students who complete the four-year 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. These articles are the property of the United States and must be returned at the end of each school year or upon withdrawal from the University. In the Basic Course, students receive one credit hour per semester.

The third and fourth years constitute the Advanced Course, in which enrollment is selective and voluntary. Students should consult the Department of Military Science for conditions which govern selection for the Advanced Course. In the Advanced Course, students receive a total of eight semester hours credit.

As part of the Freshman ROTC curriculum, students will be required to take and satisfactorily complete an academic class presented by another department. The elective course must be selected from one of the following general academic areas: (1) Effective Communication; (2) Science Comprehension; (3) General Psychology; and (4) Political Development and Political Institutions. Enrollment in English Composition I, IA or II satisfies this requirement. Since English Composition I and II are required of all students at Kansas State University, transfer students receiving credit for English Composition I and II will be required to substitute another course in lieu thereof.

Under present regulations, freshmen in the first-year Basic ROTC are subject to screening by a board of officers after conclusion of the first semester, with a view to selection for Deferment Agreement within established quotas. Those who show the greatest promise as potential officer material may be granted a Deferment Agreement, provided they agree to apply for enrollment in the Advanced Course at the appropriate time.

A student can earn an Army 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 Summer Camp prior to enrolling as a junior. Students in the Advanced Course must complete a Summer Camp between junior and senior years or at the end of senior year.

As part of the Advanced ROTC Course, in

the first semester of the junior year and the second semester of the senior year, students will take an elective course presented by another department. The elective subject must be for three semester hours credit and must be from one of the following general academic areas: (1) Effective Communications; (2) Science Comprehension; (3) General Psychology; and (4) Political Development and Political Institutions. The Department of Military Science, in conjunction with the student's faculty adviser, will evaluate and approve the elective subject selected. Consideration will be given in the value of the subject in furthering the professional qualification of the student as a prospective commissioned officer in the United States Army. In the event that a particular subject was required in the student's normal academic curriculum during his freshman and sophomore years, electives must be selected either from another general area or an advanced subject in the same area.

Students enrolled in the Advanced Course must sign a Deferment Agreement. The Deferment Agreement exempts the student from selective service induction in return for a promise to accept a reserve 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 36½ hours of dual and solo flight instruction. Successful completion of this training will qualify students for Federal Aviation Administration Private Pilot's Certificate. Students enrolling in 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 both two-year and four-year scholarships. These scholarships pay tuition and fees, up to $100.00 per year for books and special fees, and pay the student a subsistence of $50.00 per month. A student must apply for and be approved for a four-year scholarship prior to coming to the University. The two-year scholarships for the Advanced Course are available only to students who have completed the Basic ROTC Course. Applications for the two-year scholarships are made in the second semester of the sophomore year.

Any male student may apply at least four hours of ROTC credit toward his degree without being required to take more credits than his non-ROTC colleagues in the same curriculum.

Basic Course

UNDERGRADUATE CREDIT

249 113. Military 1A. (1) I. Organization of the Army and ROTC; United States Army and National Security. Conc. enrollment in English Composition I, IA or II, or an approved substitute. Two hours a week.

249 114. Military 1B. (1) II. Map and aerial photograph reading; leadership laboratory (drill and command). Conc. enrollment in English Composition I, IA or II, or an approved substitute. One hour rec. and one hour leadership lab. a week.

249 125. Military 2A. (1) I. American military history; leadership laboratory (drill and command). Two hours rec. and one hour leadership lab. a week.

249 126. Military 2B. (1) II. Military teaching principles; introduction to basic tactics and techniques; leadership laboratory (drill and command). Two hours rec. and one hour leadership lab. a week.

Advanced Course

UNDERGRADUATE CREDIT

249 233. Military 3A. (1) I. Principles of leadership; leadership laboratory (drill and command). Conc. enrollment in an approved course. One hour rec. and one hour leadership lab. a week.

249 234. Military 3B. (3) II. Branches of the Army; military teaching principles; small unit tactics and communications; counterinsurgency; leadership laboratory (drill and command). Four hours rec. and one hour leadership lab. a week.

249 243. Military 4A. (3) I. Operations; logistics; counterinsurgency; Army administration; military law; leadership laboratory (drill and command). Four hours rec. and one hour leadership lab. a week.

249 244. Military 4B. (1) II. The role of the United States in world affairs; service orientation; leadership laboratory (drill and command). Conc. enrollment in an approved course. One hour rec. and one hour leadership lab. a week.

Modern Languages

FRITZ MOORE,* Acting Head of Department

Professor Moore; Associate Professors Beeson* and Coates;* Assistant Professors Bennett, Brann, C. Miller,* Reiling,* Ron, and Vazquez;* Instructors Alexander, Baysden, Driss, McCain, McGraw, M. Miller, Shopmaker, C. Terrill, J. Terrill, and Swietlicki. Emeritus: Professor Limper;* Associate Professors Munro* and Pettis.**

Undergraduate Study

Students majoring in languages should enroll for the Bachelor of Arts degree (see page 70).

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 col-

lege 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 four-year 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. The candidate must demonstrate a reading knowledge in an additional foreign language.

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 I. (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 or 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

253 421. German V. (3). Reading of selected prose and drama from the nineteenth and twentieth centuries. Pr.: Mod. L. 225 or equiv.

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 audio-lingual aids. Pr.: Mod. L. 426 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 German 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 audio-lingual 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.

UNDERGRADUATE AND GRADUATE CREDIT

253 610. Dante. (3). An in-depth study of the **Divine Comedy** in translation, using Dante as an exponent of medieval thought. (Same as Engl. 610.)

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.

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 **Aeneid**. Pr.: Mod. L. 450 or equiv.

253 501. Horace. (3). A critical study of the major works of Horace. Pr.: Mod. L. 451 or equiv.

253 502. Roman Comedy. (3). A study of the techniques of Roman comedy. Pr.: Mod. L. 501 or equiv.

UNDERGRADUATE AND GRADUATE CREDIT

253 641. Juvenal. (3). A study of the satires of Juvenal. Pr.: Mod. L. 502 or equiv.

253 642. Survey of Latin Literature. (3). Primarily a study of authors not stressed in other courses. Pr.: Mod. L. 641 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.

253 245. 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 Spanish-American 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

LUTHER O. LEAVENGOOD,* Head of Department

Professors Leavengood, Steunenberg,* and Walker;* Associate Professors Jussila,* Pelton,* and Shull;* Assistant Professors Caine,* Gutana, Jackson, Polich, Roby,* Sidorfsky,* Sloop,* and Walker;* Instructors Barton, Hewett, and Walker; Temporary Instructors Ellis and Lemmon.*

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 71 and 110.

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, 506, 507 (Theory of Music), and 651, 652 (Music History and Music Literature), are required in each field. If the field is Music Literature, the program also calls for Music 401, 402 (Theory of Music), and six semester hours selected from Music 609, 661, 662, 663, 664 (Music History and Literature), and Applied Music in one course selected from Music 252 through 287 to the extent of eight semester hours. If the field is Music Theory, the program calls for Music 401, 402, 501, 502 (Theory of Music), two semester hours chosen from Music 609, 661, 662, 663, 664 (Music History and Literature), and eight semester hours of Applied Music in Music 270 (Piano). If the field is Applied Music, other than the basic requirements, the program calls for two semester hours selected from any other courses above which are in the 600 series, and 16 hours of Applied Music in either Music 270 or 278. The major in music in the Curriculum in Humanities is not intended to prepare students to teach in the public schools of Kansas.

Prerequisities in applied music for students taking a 30-semester-hour major in the Bachelor of Music degree program are the same as for candidates for the Bachelor of Science degree in Music Education. See page 71 for requirements for this degree.

For a minor, the following courses are required: Music 100, 201, 202 (Theory of Music), and one applied music course selected from Music 252 through 287 to the extent of four semester hours. Music 050 (Applied Music) is required for two semesters.

Students who intend to be certified to teach music in the public schools of Kansas as a secondary teaching subject must take in addition to the courses required for a minor in music the following courses: For grade school supervisors and choral directors, Music 412, 413 (Music Education), and two years in a choral organization; for band and orchestra directors, Music 413, 630 (Music Education), and two years in band or orchestra.

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, but students should have a knowledge of notation and the fundamentals of 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 two credits a semester will be granted for Applied Music as an elective.

Program in Applied Music

A four-year program with options in instrument and voice is offered in applied music. The curriculum is designed to give the student an opportunity for specialized training in voice, piano, organ, stringed, woodwind, or brass instrument. The student who completes the program in applied music is awarded 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 Phys. 126. In the instrumental option, Music 501, 502 (Theory of Music) are required. In addition, music electives totaling eight semester hours in the vocal option, and four semester hours in the instrumental major are required.

Requirements in General Education are stated on page 71. In the vocal option, these are supplemented by a total of three semester hours in a first language and at least two semester hours in a second language.

In the vocal option, 32 semester hours of voice (Music 287), four semester hours of piano (Music 270) and four semester hours of Vocal Ensemble (Music 290) are required. In the instrumental option, 32 semester hours of the major instrument (piano, organ, stringed, woodwind, brass, percussion) and four semester hours in Instrumental Ensemble (Music 288) are required. If piano or organ is not the major instrument, one of either must be chosen as one of the minors.

For the major in Theory and Composition the basic courses in General Education in the Instrumental Option are required. In addition the following courses are required: Piano (8 hrs.), Music 601 and 602 (6 hrs.), Music 603 and 604 (6 hrs.), Music 605 (4 hrs.), Music electives (7 hrs.), General electives (16 hrs.).

Participation in a musical organization to the extent of eight semester hours at a rate of one semester hour per semester is required of all students in the applied music program. Music 050 is required for each semester of the course.

Requirements for Entrance and Graduation

Preliminary examination in piano and the major applied field must be taken by all students majoring in music regardless of what curriculum is selected. The above examinations are compulsory before any enrollment is made. For dates of examinations, consult the calendar.

General Information

Regular attendance at student and faculty recitals, choral and orchestral concerts, and the artist series is required of all music majors. A minimum of fifteen recitals per semester is required for graduation.

All students enrolled in music must have the consent of their instructor in order to perform in public or on the radio.

Practice room privileges are included in the tuition for students who are regularly enrolled in college. All others pay the fee stated on page 113.

The various courses in voice or instrument are divided into grades. Students majoring in either the program in Applied Music or the program in Music Education must satisfy the following requirements for entrance in order to receive credit for the work and complete the grade indicated under each major before graduation.

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 stringed instruments must pass grade 6 of the major instrument upon entrance and grade 1 for piano and complete grade 10 of the major instrument and grade 3 in piano.

Woodwind and Brass Majors: Students majoring in woodwind or brass instruments must pass grade 4 upon their major instrument upon entrance and complete grade 8 by the end of the senior year. In addition, all instrument 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. 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 6 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 stringed instruments must pass grade 3 upon 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.

Woodwind and Brass Majors: Students majoring in woodwind or brass instruments must pass grade 1 upon their major instrument and grade 1 of the piano curriculum upon entrance. They must complete grade 5 and the major instrument and grade 3 of the piano curriculum by the end of the senior year.

Outlines of each of the curriculums in music may be secured upon request from the head of the Department of Music. In each case, the major instrument should be specified.

Graduate Study

Graduate work leading to the degree Master of Science and Master of Arts is offered in the Department of Music.

Prerequisite to work in the graduate program is the completion of a four-year undergraduate curriculum leading to the degrees B. Mus., B. Mus. Ed., or B. S. in Music Education, with graduation requirements substantially equivalent to those of the music curriculums in this University.

For the degree Master of Science, either music education or applied music may be chosen as a field of concentration, carrying a minimum of 16 semester hours. In the field of music education such cognate courses as psychology of music, problems in music and research in music may be used for partial fulfillment of this requirement. In the field of applied music a graduate recital and a master's report are required.

Electives to the extent of eight 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 four semester hours in applied music, provided proficiency warranting enrollment for graduate credit can be shown at time for enrollment, are required.

For the degree Master of Arts, the fields of concentration may be in music literature, carrying a minimum of 16 semester hours, including a master's report. In addition, six semester hours of Advanced Analysis and four semester hours of applied music are required. A minor carrying a minimum of six 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, S. Elementary instruction in the theory of music. Three hours rec. a week. Not open to music students.

257 201. Theory of Music I. (3) I, S. An integrated course comprising ear training, sight singing, keyboard assignments and the principles of diatonic harmony. Five hours rec. a week.

257 202. Theory of Music II. (3) II, S. Cont. of Music Theory 201. Five hours rec. a week. Pr.: Music (Theory) 201.

257 150. Music Listening Laboratory. (1) I, II, S. A direct listening laboratory. Includes recorded musical works of all major periods and style; also live music from the major University organizations and faculty artist recitals. Limited to non-music majors. Two sessions a week.

257 303. General Principles of Harmony. (3) I. 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, S. Intensified study of chord connections; choral harmonization; non-harmonic tones and chromatic harmony; cont. of integrated work in ear training and keyboard harmony; clef transpositions. Four hours rec. a week. Pr.: Music (Theory) 202.

257 305. Theory of Music IV. (3) II, S. Cont. of Music 160. Four hours rec. a week. Pr.: Music (Theory) 304.

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. Cont. of Music 170. Contrapuntal composition in three or four voices, analysis of the fugue. Pr.: Music (Theory) 401.

257 501. Instrumentation and Orchestration I. (2) I, S. Instruments of the band and orchestra studied with relation to tone, range, and function. Pr.: Music (Theory) 304.

257 502. Instrumentation and Orchestration II. (2) II, S. Simple and familiar compositions scored for ensemble, including full orchestra. Pr.: Music (Theory) 501.

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. Cont. of Music 506. Emphasis upon the study of the larger forms of musical composition. Pr.: Music (Theory) 506.

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. (Choral) 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; practical application of conducting skills by working with one of the large choral organizations. Pr.: Music (Theory) 516.

257 521. Composition I. (2) I, S. Composition in the small forms for piano, voice, and instruments, development of style conception. Pr.: Music (Theory) 402, or consent of the instructor.

257 522. Composition II. (2) II, S. Cont. 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. (3) I and alt. S. Combination of harmony, counterpoint, and form as used in compositions in their historical setting. Pr.: Music (Theory) 506 or consent of the instructor.

257 602. Advanced Analysis II. (3) II and alt. S. Modern chord structures, atonality, polytonality, form used in contemporary compositions. Pr.: Music (Theory) 601.

257 604. Composition III. (2) Offered on demand. Cont. of Composition II. An exploration of larger forms of music. Pr.: Music (Theory) 522.

257 605. Composition IV. (2) Offered on demand. Cont. of Composition III. Pr.: Music (Theory) 604.

Courses in Music History and Literature

UNDERGRADUATE CREDIT

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 curriculums other than music. Pr.: Music (Mus. Hist. and Lit.) 250.

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 curriculums other than music. Pr.: Music (Mus. Hist. and Lit.) 250.

257 245. Programmatic Music. (2) Offered on demand. The presentation of a number of programmatic compositions with non-musical sources from which they are derived. The course is designed for students majoring in curriculums other than music. Pr.: Music (Mus. Hist. and Lit.) 250.

257 250. Appreciation of Music. (2) Offered on demand. 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 students majoring in music or music education. 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. Cont. of Music 421. Pr.: Music (Mus. Hist. and Lit.) 421.

UNDERGRADUATE AND GRADUATE CREDIT

257 609. Music of the Twentieth Century. (2) Offered on demand. The historical aspect in musical analysis of composition since the romantic period. Pr.: Music (Mus. Hist. and Lit.) 422 (Theory) 506.

257 613. Afro-American Music (3) II, S. Negro Music of the New World viewed in a culture historical framework. Examination of the social conditions under which African and European music styles came into contact in the New World and the ways in which they blended to form the unique styles of calypso, blues and jazz.

257 651. Music Literature I. (2) I, S. Style characteristics of music as revealed through a careful analysis of the music of different periods. Pr.: Music (Music History and Lit.) 422, (Theory) 305.

267 652. Music Literature II. (2) II, S. Cont. of Music 651. Pr.: Music (Music History and Lit.) 651.

257 661. Bach and Handel. (2) In alt. years. A comparison of the musical styles of Bach and Handel as revealed by a careful analysis of representative

works. Pr.: Music (Music History and Lit.) 652, or senior standing and consent of the instructor.

257 662. Haydn and Mozart. (2) In alt. years. A comparison of the musical styles of Haydn and Mozart as revealed by a careful analysis of representative works. Pr.: Music (Music History and Lit.) 652, or senior standing and consent of the instructor.

257 663. Beethoven. (2) In alt. years. A study of Beethoven's musical style through the careful analysis of selected works. Pr.: Music (Mus. History and Literature) 652, or senior standing and consent of the instructor.

257 664. Music of the Romantic Period. (2) In alt. years. A study of musical trends in the nineteenth century through the analysis of works by representative composers. Pr.: Music (Mus. History and Lit.) 652, or senior standing and consent of the instructor.

257 799. Problems in Music. Credit arranged. I, II, S. Pr.: Background of courses needed for problem undertaken.

GRADUATE CREDIT

257 801. Graduate Seminar in Music. (2) I, S. Library procedures, research methods and practice in preparing scholarly papers.

257 999. Research in Music. Credit arranged. I, II, S. Pr.: Registration in the Graduate School, with sufficient training to carry on the line of research undertaken.

Courses in Music Education

UNDERGRADUATE CREDIT

257 205. Music for Elementary Teachers. (3) II, S. Pr.: Music (Theory) 100.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

257 412. School Music I. (3) I, II, S. Methods and materials for teaching music in kindergarten, primary and intermediate grades. Pr.: Music (Theory) 202, or consent of the instructor.

257 413. School Music II. (3) I, II, S. Methods and teaching materials suitable for junior and senior high school. Pr.: Music (Music Education) 412, or consent of the instructor.

UNDERGRADUATE AND GRADUATE CREDIT

257 606. Survey of Choral Literature. (2) I, S. Repertoire of mixed, male and women's choral ensembles techniques for effective program building. Pr.: Graduate standing or consent of instructor.

257 607. Choral Administration, Methods, and Techniques. (2) II, S. Administration and organization of the choral program; study and discussion of methods and techniques used for effective choral presentation. Pr.: Senior standing or consent of instructor.

257 612. The Junior High Music Program. (3) S. A methods course dealing with the particular problems of this age group such as the changing voice, the importance of the general music class, and the planning and selecting of music literature for the junior high voice. Pr.: Consent of instructor.

257 621. Workshop in Junior High School Vocal Music. (1) S. Survey of the methods, materials, and the teaching techniques of vocal music for the junior high school.

257 622. Workshop in Elementary Music. (1) S. Organizing old and new materials for various levels of elementary music, correlation of academic subjects with the music program.

257 623. Workshop in Secondary Vocal Music. (1) S. Choral techniques and interpretation of Baroque, Classical, Romantic, and Modern styles.

257 624. Workshop in Instrumental Music. (1) S. Teaching techniques, methods, and materials for the woodwind, brass, string, percussion, and marching band.

257 625. Workshop in Piano Pedagogy. (1) S. Methods, materials, and teaching techniques for all grade levels.

257 626. High School Music Theory. (3). Offered on demand. The High School Theory Course, its objectives and content: ear training techniques and development of creative work; Music History and Appreciation in a high school program. Pr.: Mus. 305.

257 627. Music Theory in the Junior College I. (3). Given in alternate summers and on demand. A course presenting a thorough review of music fundamentals and the methods of presenting sight singing, ear training, part writing, and keyboard harmony to first year classes in Music Theory in the Junior College. Pr.: Graduate standing or the consent of the instructor.

257 628. Music Theory in the Junior College II. (3). Given in alternating summers or on demand. Methods for presenting elementary counterpoint, contemporary harmonic 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 the instructor.

257 630. Instrumental Administration, 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.

257 660. Survey of Writings on Music and Music Education. (3) II, S. A survey of writings in the fields of aesthetics, criticism, psychology of music, and philosophy of music education. Pr.: Graduate standing or consent of instructor.

Courses in Applied Music

UNDERGRADUATE CREDIT

257 050. Recital Attendance. (0) I, II.

257 111. Concert Choir. (1) I, II. Membership by tryout.

257 115. Band. (1) I, II. Membership by tryout.

257 121. Collegiate Chorale. (1) I, II, S.

257 125. K-State Singers. (1) I, II. Membership by tryout.

257 130. Orchestra. (1) I, II. Membership by tryout.

257 135. Varsity Men's Glee Club. (1) I, II, S. Membership by tryout.

257 140. Women's Glee Club. (1) I, II. Membership by tryout.

257 203. Voice Class. (1) I, II, S. Basic rudiments of voice production and fundamentals of singing. Not open to majors in voice and non-music majors.

257 206. Piano Class I. (0) I, II, S. Instruction in the rudiments of playing the piano. Open to students without previous study. Required of music majors who do not meet entrance requirements in piano.

257 208. Piano Class II. (1). I, II, S. Continuation of Music 206.

257 208. Piano Class III. (1). I, II, S. Continuation of Music 207.

257 209. Piano Class IV. (1). I, II, S. Continuation of Music 208.

257 233. Wind Techniques and Materials. (2) I, S. The fundamentals of playing and methods for teaching wind instruments.

257 234. String Techniques and Materials. (2) II, S. The fundamentals of playing and methods for teaching string instruments.

The following undergraduate courses in Applied Music offered each semester and summer carry from 0 to 4 credits, with a maximum of 32 hours in any one applicable to a degree. The fees for these courses are listed on this page.

257 252.	**Baritone**	**257 270.**	**Piano**
257 254.	**Bassoon**	**257 272.**	**Saxophone**
257 256.	**Clarinet**	**257 275.**	**Trombone**
257 258.	**Double Bass**	**257 276.**	**Trumpet**
257 260.	**Flute**	**257 278.**	**Tuba**
257 262.	**French Horn**	**257 280.**	**Viola**
257 264.	**Oboe**	**257 282.**	**Violin**
257 266.	**Organ**	**257 284.**	**Violoncello**
257 268.	**Percussion**	**257 287.**	**Voice**

257 288. Instrumental Ensemble. (1) I, II, S. Three hours lab. a week. Elective for selected students.

257 290. Vocal Ensemble. (1) I, II, S. Two hours lab. a week. Elective for students of superior vocal talent.

257 291. Madrigal Singers. (1) I, II.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

257 403. Piano Proficiency. (0) I, II, S. Required for graduation of majors in the curricula in Applied Music, Music Education, and Humanities, with a major in Music.

257 475. Opera Workshop. (0-6) I, II, S. Courses may be repeated until six semester hours of credit have been earned. 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 the opera. Offered jointly by the Departments of Music and Speech. Vocal ensemble credits may be earned in this course. Same as Speech 475.

257 530. Advanced String Techniques and Materials. (2) I, II, S. Playing and teaching skills beyond fundamentals, and presentation of materials suitable for private and public school instruction at the secondary level. Pr.: Music (Applied) 234.

257 531. Advanced Woodwind Techniques and Materials. (2) I, II, S. Playing and teaching materials suitable for private and public school instruction at the High School level. Required of string and brass majors for graduation in Music Education. 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 literature for the pipe organ by Renaissance and Baroque composers. Open to students having an advanced study of the pipe organ. Pr.: Music (Applied) 266.

257 638. Literature for Pipe Organ II. (2) II, S. Cont. of Music 637, with emphasis on literature by Romantic and Modern composers. Open to students having an advanced study of the pipe organ. 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 fundamentals technique; selection of teaching materials, and outlining courses of study. For students in the Curriculum in Applied Music. Taught in divisions according to the major. Two hours rec. a week.

257 644. Practice Teaching in Applied Music. (1) II. Practice teaching in private classes for students in Applied Music. Pr.: Music (Applied) 642.

GRADUATE CREDIT

257 802. Repertoire in the Fields of Applied Music. (2). A required course for graduate students majoring in Applied Music, taught in divisions according to the field of the specific major. May be repeated for credit.

257 852.	**Baritone**	**257 870.**	**Piano**
257 854.	**Bassoon**	**257 872.**	**Saxophone**
257 856.	**Clarinet**	**257 875.**	**Trombone**
257 858.	**Double Bass**	**257 876.**	**Trumpet**
257 860.	**Flute**	**257 878.**	**Tuba**
257 862.	**French Horn**	**257 880.**	**Viola**
257 864.	**Oboe**	**257 882.**	**Violin**
257 866.	**Organ**	**257 884.**	**Violoncello**
257 868.	**Percussion**	**257 887.**	**Voice**

Fees in Music

Private Music Lessons and Practice Facilities

University students enrolled in the Applied Music or Music Education curriculums 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 curriculums 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.
Practice piano, 1 hour daily per semester—$5.
Practice organ:
- Two-manual, 1 hour daily per semester—$10.
- Two-manual, 2 hours daily, summer session—$10.
- Three-manual, 1 hour daily per semester—$20.
- Three-manual, 2 hours daily, summer session—$20.

Philosophy

B. R. TILGHMAN,* Head of Department

Professor Miller; Associate Professors Scheer* and Tilghman;* 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, 451, and 770. 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 in the history of philosophy and two of the following areas: logic, philosophy of science, social and political philosophy, metaphysics, theory of knowledge, ethics, aesthetics; 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, truth-tables, and calculus of propositions, classes and relations.

250 175. 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.

259 398. 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.

259 452. Philosophy Since 1800. (3) I. A survey of the major philosophical developments during the 19th and 20th centuries.

259 505. Ethics for Scientific Researchers. (3) II. A systematic approach to the normative problems arising from scientific research and technological advancement. Pr.: Junior or senior standing in a science curriculum and consent of 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 17th and 18th 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-American 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 Thoery. (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.

259 770. Seminar in Philosophy. (2-3). A study of some selected philosopher or philosophical problem. Required for graduation of all undergraduate philosophy majors. Pr.: Two courses in philosophy. May be taken more than once for credit.

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

259 810. 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. (2-5).

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

THOMAS M. EVANS,* Head of Department

Professors Evans and Geyer;* Associate Professor Wauthier;* Assistant Professors McKinney, Snyder,* and Thompson;* Instructors Bolan, Gench, Laurie, Merriman, 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. Transfer students entering this University are excused from this requirement providing prior credit in courses equivalent to 011 has been granted. All university students, after completion of 011 or equivalent, are also encouraged to enroll in 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 well-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 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,** F. & N. 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.

* Option on Ph. Ed. 216 and 241.
** Option on Biol. 205, 215, and 425.

Courses in Physical Education for Men and Women

UNDERGRADUATE CREDIT

261 011. Basic Team Sports. (0) I, II, S. Activities offered: Swimming, Trampolining, Gymnastics and Tumbling. Calisthenics and Weight-conditioning Exercises, Wrestling, Adaptive Physical Education, Individual and Team Sports, Modern and Social Dance and Recreational Activities. Assignments to these activities will usually follow a motor ability test. Required of all freshmen.

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.

261 012. 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)

261 206. Introduction to Physical Education. (1) I. Introductory survey of the field and study of the principles of health and physical education.

261 290. Kinesiology. (2) II. Mechanics of movement; body movements analyzed and principles involved applied to the teaching of physical education. Pr.: Biol. 215.

261 341. Life Saving and Water Safety Instruction. (1) I, II. Methods of teaching swimming and lifesaving. Upon satisfactory completion of this course a certificate is awarded by the American Red Cross as a senior lifesaver and a water safety instructor. Three hours lab. a week. Pr.: Advanced Swimming.

261 351. Rhythms for Elementary and Secondary Schools. (2) II. Fundamental rhythms and music, methods and materials for teaching folk, square, and social dance in elementary and secondary schools. Four hours lab. a week.

261 356. 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 daily living, professional, parent, and community responsibilities.

261 375. 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.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

261 481. Teaching Health in Elementary and Secondary Schools. (2) II. Materials and methods of teaching health in elementary, junior and senior high schools. Pr.: Ph. Ed. 356; Biol. 215, 425.

261 486. Administration of Health and Physical Education in Elementary and Secondary Schools. (3) I, II. Policies and procedures in organization and administration, with emphasis on elementary and secondary school health and physical education. Pr.: Junior standing.

261 570. Methods in Physical Education in Elementary Schools. (2) II, S. Methods of teaching and organization of material for a progressive elementary school physical education program. Pr.: Ph. Ed. 380.

UNDERGRADUATE AND GRADUATE CREDIT

261 600. Physiology of Exercise. (2) II, S. Effects of exercise on the tissues, systems, and organs of the body.

261 610. Tests and Measurements in Physical Education. (3) I, S. A study of capacity, achievement, knowledge, and skill tests, for purposes of classification and measurement of school progress.

261 615. Community Recreation. (2) II, S. A study of organization and administration of municipal recreation programs including club work for youth, camping, playgrounds and indoor recreation centers. Pr.: Ph. Ed. 230, Psych. 110.

261 620. Administration of Physical Education in Colleges and Universities. (2) I, S. Study of policies and procedures in the organization and administration of the total program of physical education, with special emphasis from the standpoint of colleges and universities.

261 630. Curriculum Construction 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 Physical Education. (2). A study of Physical Education teaching methods applied to instruction at the secondary school level; organization of teaching materials and management of Physical Education classes.

261 675. Seminar in Physical Education. Credit arranged. Recent trends and problems in physical education. Pr.: Senior standing and consent of instructor.

261 700. Seminar in Health Education. Credit arranged. Recent trends and problems in health education. Pr.: Ph. Ed. 486 and consent of instructor.

261 799. Problems in Physical Education. Credit arranged. Pr.: Background of courses needed for problem undertaken.

GRADUATE CREDIT

261 820. Supervision of Physical Education. (2) II, S. A study of the objectives, organization, and methods of supervision for elementary and secondary schools. Pr.: Educ. 477, Ph. Ed. 486.

261 840. Administration of School Health Education Program. (2) I, S. A study of the organization and administration of health service, health instruction, and health environment for primary and secondary schools; health councils. Pr.: Ph. Ed. 481.

261 860. Advanced Athletic Coaching. (1-3). Underlying principles and psychology of major sports strategy, the designing of plays, methods of teaching and controlling players; special problems of management connected with selecting, handling equipment, and making trips. Three hours maximum credit. Pr.: For advanced students with graduate standing and one year of coaching experience.

261 999. Research in Physical Education. Credit arranged. Pr.: Sufficient training to carry on the line of research undertaken.

Courses for Men

UNDERGRADUATE CREDIT

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.

261 225. History of Physical 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 Function 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 Schools. (1) II. Practice and teaching methods in calisthenics; 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 and activities on gymnasium apparatus and pyramids for use on apparatus. Three hours lab. a week.

261 245. Swimming for Elementary and Secondary Schools. (1) I, II, S. Methods of teaching swimming, water safety, theory and practice of "drown-proofing," diving, Red Cross swimming strokes; competitive swimming, its stroke theory and meet organization.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

261 415. Techincs of Basketball. (2) I. Study of rules, theory, and practices; methods of coaching. Pr.: Sophomore standing.

216 420. Technics of Baseball. (2) I. Study of rules, theory, and practices; methods of coaching. Pr.: Sophomore standing.

261 426. Technics of Track and Field. (2) II. Study of rules, theory, and practices; methods of coaching. Pr.: Sophomore standing.

261 430. Technics of Football. (2) II. Study of rules, theory, and practices; methods 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 high 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 Physical Education. (2) I. Supervised students assist in physical education class and officiate in intramural games. Six hours lab. a week.

261 461. Adapted Physical Education. (3) I, II. Developmental, Remedial and Corrective Physical Education. Emphasis placed on adaptations designed to meet the needs of individuals requiring special attention beyond the regular physical education program. Pr.: Biology 215, 245; Ph. Ed. 261 290 or consent of instructor.

Courses in Physical Education for Women

BARBARA GENCH, In Charge

Recreational swimming is offered on Mondays, Tuesdays and Thursdays at 4:30 o'clock for women registered in college.

For a major, a student should enroll in one of the curriculums in physical education. (See page 70.) For a minor, a student should enroll in the following courses: Ph. Ed. 306, 320, 331, 351, 356, 366 or 515; 380, 481, 570 and 575, 526, 555, 566,* and 580.*

UNDERGRADUATE CREDIT

262 051. Basic Beginning Swimming. (0) I, II, S. Activities offered: Swimming, Body Mechanics, Individual and Team Sports, Modern Folk and Social Dance, and Recreational Activities. Assignment to swimming follows a swimming test. Required of all freshmen two semesters.

262 052. Basic Int. Swimming. (0).

262 053. Basic Adv. Swimming. (0).

262 054. Basic Beginning Bowling. (0).

262 055. Basic Adv. Bowling. (0).

262 056. Basic Beginning Modern Dance. (0).

262 057. Basic Tumbling and 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 Sports. (0).

262 064. Basic Fitness and Conditioning. (0).

262 065. Basic Billiards and Table Tennis. (0).

262 066. Basic P. E. for Freshman majors. (0).

262 067. Basic P. E. for Sophomore majors. (0).

* Optional.

The following undergraduate 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 Swimming (1)
262 155. Intermediate Swimming (1)
262 156. Advanced Swimming (1)
262 157. Synchronized Swimming (1)
262 158. Intermediate Modern Dance (1)
262 159. Advanced Modern Dance (1)
262 160. Recreational Sports (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 Gymnastics (1)

262 065. Physical Education W Lectures. (0) I, II. Required of women enrolled in the Curriculum in Physical Education for Women. Orientation and general survey of health, physical education, and recreation.

262 306. Tumbling and Recreational Sports. (2) I. Theory and practice of tumbling and recreational sports. One hour rec. and three hours lab. a week.

262 320. Recreational Leadership W. (2) II in even years. Principles and methods of organizing communities for leisure activities.

262 325. Track and Field W. (1) II. Methods of teaching Track and field. Two hours lab each week.

262 331. Individual Activities. (2) II. Methods of teaching tennis, badminton, and archery. One hour rec. and three hours lab. a week. Pr.: Ability to play tennis, badminton, and archery.

262 360. Dance Composition. (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 credit.

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.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

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. Health Examinations and First Aid. (3) II. Methods of giving health examinations, analysis of normal body mechanics, postural deviations; first aid emergency treatment. Two hours rec. and three hours lab. a week. Pr.: Biol. 215, 425, 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.

262 566. 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.

262 580. Swimming. (2) II in alt. years. Methods of teaching swimming. One hour rec. and three hours lab. a week. Pr.: Semester each of beginning and intermediate swimming.

Physics

ROBERT B. LEACHMAN,* Head of Department

Professors Bark, Cardwell,* Curnutte,* Dale,* Dragsdorf,* Ellsworth,* Leachman,* and Williams;* Associate Professors Bhalla,* Crawford,* Hathaway,* Legg,* Seaman,* Shore,* and Spangler;* Assistant Professors Brown, Cocke,* Eck,* Evans,* Folland,* Lee,* Macdonald,* Morrison,* and Tumolillo;* Instructor Green; Lecturers Fontenla, Hammaker, Kregar; 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 15.)

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.

265 211. 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 II. (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 semiconductor 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.: Phys. 432.

265 640. Introductory Quantum Mechanics I. (3) I. Methods of quantum mechanics and solution 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; equilibrium 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 instabilities; 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, Chamberlin, Herzon, Linford,* and Richter;* Visiting Assistant Professors Clemente and Jones; Emeritus Professor: Iles; Diplomat-in-Residence (1969-70): Bennett.*

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 should 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 careers—including 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 program (see detailed information under South Asia Center, page 130).

Armed Forces and Society. Political science and several other departments offer coordinated coursework in military phenomena and security processes—ranging 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 freshman or sophomore year. The third fundamental course, Political Behavior (269 301) or an acceptable substitute, should normally be taken during 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 must 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 sophomore—majors, 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 non-majors 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 sub-national 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.

269 677. 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 opinion.

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.

269 713. 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 antquity to the sixteenth century.

269 753. Political Thought: Since the 16th Century. (3). Study of the development of Western political thought from the 16th 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).

269 845. 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 Danskin, Langford,* Perkins,* Phares,* Rohles,* Samelson,* and Sinnett;* Associate Professors S. C. Brown,* Mitchell,* Rappoport,* and Thompson;* Assistant Professors Christ,* Frieman, Griffitt,* Handel* 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—e.g., medicine, law, theology, business, teaching, and engineering.

The undergraduate major requires Stat. 320 or 520 and a minimum of 24 hours of course work, including Psych. 110, 440, 720, 775 and either Psych. 409 or 410. 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. 70.

Students interested in the industrial relations field should take relevant electives in Economics, Commerce, 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 seven areas of general-experimental and personality-social psychology. These areas are: sensation and perception; physiological psychology; animal learning and behavior; human learning; social psychology; personality; and human performance. 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.

273 399. 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.

273 409. Experimental Psychology I. (4). Laboratory investigation of the sensory and perceptual processes. Two hours rec. and four hours lab. a week. Pr.: Psych. 110 and Stat. 320 or 520.

273 410. Experimental Psychology II. (4). Laboratory investigation of learning and motivation. Two hours rec. and four hours lab. a week. Pr.: Psych. 110 and Stat. 320 or 520.

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 influence. 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.

273 570. 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.

UNDERGRADUATE AND GRADUATE CREDIT

273 611. Introduction to Physiological Psychology. (4). A survey of basic concepts and experiments in the study of physiological correlates of behavior, including sensory and motor processes, learning, motivation and emotion. Three hours rec. and three hours lab. a week. Pr.: Biol. 205 and Psych. 110 or consent of instructor.

273 625. Engineering Psychology. (3). The role of behavioral factors in the design and operation of machines and equipment. Pr.: Psych. 110, Stat. 320 or 520 and consent of instructor.

273 700. Psychological Measurement. (4). A review of the logic and methodology underlying the construction of psychological measuring instruments from the psychophysical estimate of threshold to the scaling of complex psychological variables. Three hours rec. and two hours lab. a week. Pr.: Psych. 110 and Stat. 520.

273 705. Quantitative Methods in Psychology. (3). Examination of the nature of statistical inference in psychological research: hypothesis testing and statistical estimation, including a survey of non-parametric methods; consideration of correlational techniques useful with different kinds of psychological data. Pr.: Stat. 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 different approaches to the study of personality. Pr.: Any of the following: Psych. 409, 410, 700 and consent of instructor.

273 775. History of Current Trends. (3). A review of the contributions of individuals and intellectual movements to the development of modern psychology. A survey of theoretical systems currently of influence. Pr.: Psych. 110; either nine additional hours of psychology or consent of instructor; senior standing.

273 790. Topics in Psychology. Credit arranged. I, II, S. Pr.: Psych. 110 and consent of instructor.

273 799. Problems in Psychology. Credit arranged. I, II, S. Pr.: Psych. 110 and consent of instructor.

GRADUATE CREDIT

273 800. Advanced Measurement. (3). The logic of measurement, scaling theory, psychophysics and psychometrics, and problems in classification and prediction. Pr.: Psych. 700.

273 801. Logic and Methods of Psychology. (3). Methods of psychological research including general scientific and theoretical problems. Emphasis on methods of empirical investigation in such representative areas as learning, motivation, perception, and personality-social. Pr.: Consent of instructor.

273 805. Experimental Design in Psychology. (3). Introduction to techniques of research planning and experimental design, including critical evaluation of selected experiments. Pr.: Psych. 705 or Stat. 521 or consent of instructor.

273 808. Advanced Physiological Psychology. (3). A study of the neural and endocrinological correlates of behavior. Pr.: Psych. 611 and consent of instructor.

273 809. Sensory Processes. (3). Experimental study of sensory and perceptual processes, with emphasis on recent developments in the field. Pr.: Psych. 409 or consent of instructor.

273 810. Motivation and Learning. (3). Experimental study of learning and motivation, with emphasis on recent developments in the field. Pr.: Psych. 410 or consent of instructor.

273 811. Vision. (3). Principal facts of space and color perception, with emphasis on specification and measurement of stimulus conditions; the constancies; elementary principles of refraction; color blindness and other visual anomalies. Lectures and demonstrations. Pr.: Psych. 409 or 809 or consent of instructor.

273 812. Perception. (3). Various systematic approaches to perception, with emphasis on experimental and quantitative data. The role of perception in affectivity, motivation, and personality theory is stressed. Pr.: Psych. 809 or consent of instructor.

273 814. Human Learning and Retention. (3). Analysis of processes involved in human learning, transfer and retention, with emphasis on current developments in the field. Pr.: Psych. 810 or consent of instructor.

273 815. Experimental Analysis of Behavior. (3). Every other year or upon sufficient demand. The use of operant conditioning techniques in the study of sensory processes, chaining, stimulus control and punishment; applications to psychopharmacology, unusual environments, and psychotherapy. Pr.: Psych. 810.

273 820. Personality Theory. (3). A comparative examination of contemporary theories of personality structure. Pr.: Psych. 720 or consent of instructor.

273 821. Experimental Study of Personality. (3). Analysis and discussion of experimental results in personality research, particularly as they relate to theories of personality. Empirical work in such areas as anxiety, defense mechanisms, perception, needs, and development will be covered. Pr.: Psych. 820.

273 822. Psychopathology. (3). A systematic review of behavior disorders, their etiology and treatment. Pr.: Psych. 405 and 720 or 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 Professor Taylor;* Assistant Professors Dushkin, C. Flora,* J. Flora,* Hiebert,* Long,* Miley,* O'Brien,* Orbach,* H. Ottenheimer, M. Ottenheimer, Peters;* Lecturer Shanline; Emeritus: Professor Hill;* Associate Professor Edelman.**

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 pages 70 and 71). 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 155.) 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 (pages 70, 71) are: 24 semester hours of sociology beyond the elementary course, including Soc. 410, 620, and 710 and two of the following: Soc. 430, 440, 450, and 460. Soc. 211 should be taken to satisfy the three hours required in sociology in the A. B. degree program (page 70). Nine hours of electives in sociology are to be taken, all at or above the 500 course level. Students enrolled in the Pre-Professional Program in Social Work will be required to take 26 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.

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 baccalaureate 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 ex-

amination 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.

277 399. Honors Seminar in Sociology. (1-3) I, II. Readings and discussion of selected topics. Open to non-majors 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 present-day 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 of 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.

277 560. Criminology. (3) I, II, some S. Nature, extent, and causes of crime; programs for prevention and treatment. Pr.: Soc. 211 or consent of instructor.

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 in Social Research. (3) I, II. Development, use, and interpretation of findings of the case method, social survey, and other techniques of social investigation. Pr.: Soc. 211, Stat. 320 or consent of instructor and junior standing.

277 630. Advanced Rural Sociology. (3) II. The development of rural sociology; comparative rural life in the United States and other countries through the use of case studies of rural social organization and cultures. Pr.: Soc. 130.

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.

277 660. 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.

277 701. 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 potentia-

lities, 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 cross-national 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 disorganization. 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 present-day 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 anthropolgists engage in teaching or research at the university level or work in applied areas such as the designing of garments or equipment for the military, 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, e. g., 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 cross-cultural 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 A. B. and B. S. degrees with a major in anthropology (pp. 70, 71) 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) I. 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

278 400. Culture and Personality. (3) Anthropological contributions to personality study; cross-cultural comparisons of personality types; means of personality formation in nonliterate and folk cultures; culture change and personality. Pr.: Three hours of anthropology or consent of instructor.

278 405. 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.

278 460. Linguistic Anthropology. (3) The functions of language as an aspect of culture; diversity, distribution, and dynamics of language; linguistics in anthropology. Pr.: Three hours of anthropology or consent of instructor.

278 500. Archaeology of the Old World. (3) Origin and evolution of human culture and technology; the major prehistoric sequences of Asia, Africa, and Europe; emphasis on period of plant and animal domestication and the European sequences. Pr.: Anthro. 200, 260, 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.

278 530. Race and Culture. (3) The biological meaning of race; the interrelationships of biological and cultural traits in human evolution; processes of racial formation of man; methods of classifying human races; cultural inheritance; the distinction of race, culture, personality, and intelligence; a review of modern racism; race as an evolutionary episode.

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 anthropology; evolutionism, historicalism, diffusionism, functionalism, configurationalism, philosophical and psychological approaches; contemporary methodolgy and theory. Pr.: Anthro. 200 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 relate 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 European music styles came into contact in the New World and the ways in which they blended to form the unique style of calypso, blues and jazz. Pr.: Anthropology 200 or consent of instructor.

278 618. Religion in Culture. (3) 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.

278 620. Senior Seminar. (3) Review and integration of the several aspects of anthropology. Pr.: Senior standing and 15 hours of anthropology.

278 622. Special Topics in Anthropology. (3) Offered on sufficient demand. Variable topics within cultural anthropology, anthropological linguistics, archaeology, or physical anthropology. Pr.: Relevant anthropology courses or consent of instructor.

278 625. Independent Reading and Research in Anthropology. (1-3) Guided reading and research on a specific anthropological topic of student interest, leading to preparation 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 Canada and the United States; culture contact and change among surviving groups.

278 632. Indians of Middle America. (3) Description and comparison of Tarahumara, Aztec, Maya, Cuna, and other civilizations and non-literate cultures

of Mexico, Central America, and the Caribbean ring. Culture contact and change in surviving tribes.

278 634. Indian Cultures of South America. (3) A survey of the nature and 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 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.

278 650. Cultures of Africa. (3). Description and comparison of the aboriginal cultures of Africa south of the Sahara. Culture contact and change.

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 empires of the Maya, Aztec, Tarascans, and their neighbors; relationships with the Southeastern and Southwestern United States. Pr.: Anthro. 200, or 260, or consent of instructor.

278 720. Archaeological Field Methods. (3). Archaeological site survey, site excavation, and laboratory analysis of sites and artifacts from the Manhattan, 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 archaeological excavations; techniques, methods, and procedures in a field research situation. The laboratory work of cleaning, cataloging, analyzing and preliminary report preparation of materials recovered. Credit may be received twice for this course if the area or problem involved are different. Pr.: Anthropology 200 or 260 or consent of instructor.

278 741. Fossil Man and Human Evolution. (3). Human origins and evolution as indicated by fossil evidence; interpretation of man-apes, Pithecanthropus, 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 South Asia Center is described under the heading "Interdisciplinary Programs" on page 73 of this catalog.

The core of the Center's area offerings is the **Introduction to the Civilizations 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

010 305. Agricultural Economy of South Asia. (3) II. A descriptive study of the system of food production and the village economy of one-fifth of the world's population and the significance of this system to the commercial mechanized agriculture of the industrial nations. Three hours recitation a week. Open to all undergraduates.

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.

253 470. 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.

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 Hinduism, 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, 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 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, religion, culture, languages and literature, geography, social and political structure and ideas. (Offered also as Anthro. 406, Econ. 406, Geog. 406, Pol. Sci. 406, and Soc. 406.) Pr.: May be required depending upon the department for which course is being offered.

UNDERGRADUATE AND GRADUATE CREDIT

225 682. Strategy of Economic Development. (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 or 430.

235 735. Geography of Asia. (3). Relationships between Oriental land resources, agriculture, industry, and population; trends in economic and political de-

velopment 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 Ceylon-prior 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). Continuation 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,* and Engler;* Associate Professors Burke,* Climenhaga,* Flanagan;* Assistant Professors Carlson, Cleary, Hinrichs,* Lowe,* Ollington, Rainbolt,* Ritchey, Van Tassel,* Wistrand;* Instructors Aseneta, Barnes, T. Dace, McCarthy, Thoms; Emeritus: Given* and Hill.**

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 9 hours in other areas within the department.

Graduate Study

In the Department of Speech major work is offered 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. 74.

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: A, 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. 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.

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

281 455. 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 English/French, 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 transformational-generative theory of grammar. The varying schools of thought are con-

* 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.

sidered, 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).

281 676. 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 transformational-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 9 may be in audiology. A maximum of 6 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 advisor.

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

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.

281 630. Speech Pathology in the Public Schools. (3) Survey of the disorders of speech and hearing in children, their educational implications, and the organization and administration of public school clinical speech services.

281 632. Speech and Language Development. (3) Study of the characteristic sequences of speech and language development. Variables which influence developmental rate are discussed in detail. Significant findings are integrated and classified through application of linguistic methodology.

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. Speech and Language Training for MR. (3) Research, theory, evaluative and remedial procedures for speech and language training of the mentally retarded.

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.

281 721. 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.

281 742. 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 repeated for a maximum of six hours credit. Pr.: Major in Audiology or Speech Pathology.

281 761. Practimum 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 of speech and language, including cerebral palsy and aphasia. 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 six hours with change in topic.

Courses in Theatre and Interpretation

UNDERGRADUATE CREDIT

281 145. Introduction to Theatre. (3) Consideration of the basic elements of theatre: aesthetics, dramatic literature, theatre technology, and producing organizations.

281 235. Stage Movement. (3) An investgation 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 Intrepretation 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 selected 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.

281 472. 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

281 607. 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 Avant-Garde 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 full-length plays. May be repeated to 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 to 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 to 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.

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 to 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. Avanced Technical Production. (3) A lecture-laboratory course in advanced technical theatre problems of organization, planning, and execution of scenery, costumes, and lighting. May be repeated to 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 achitectural form, with particular emphasis on the effect of the physical environment on the play. Pr.: Spch. 255.

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 to 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, Balazs, Eisenstein, Spottiswoode, and others.

GRADUATE CREDIT

281 815. Seminar in Theatre. (3) Special problems in theatre research.

Statistics and Computer Science

HOLLY C. FRYER,* Head of Department

Professors Feyerherm and Fryer;* Associate Professors Conover,* Nassar,* Rizvi,* and Weinberg;* Assistant Professors Dayton,* Fisher, Grosh, Milliken,* Kemp,* Perng,* Walker, Waller,* and Unger; Instructors Iman and Nelson.*

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 century. 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 computers, digital computers and now electronic digital computers. Calculations which were impossible or even unthought of 20 years ago are now routine.

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 wishing to major in statistics may seek a Bachelor of Arts degree by satisfying the general requirements of that degree (p. 70) 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. 71) and completing the aforementioned courses in mathematics and

statistics. The student should consult someone in the Department of Statistics and Computer Science about this choice before enrolling.

A person wishing to major in computer science may (1) for the Bachelor of Arts degree undergraduates fulfill general requirements and complete Math. 221 or 301, Math. 505, Stat. 520 and 521, Comp. Sci. 315, 385, 425, and 525; six additional hours in computer science, logic, linguistics, and/or statistics, or (2) for the Bachelor of Science degree undergraduates fulfill general requirements, the additional course requirements for the Bachelor of Arts degree as indicated above, plus Math. 221, 222, and 240.

Graduate Study

The Department of Statistics and Computer Science 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

285 320. 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.

285 521. 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. years. Design, 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 dosage-response 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. Theory 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.

285 760. 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, variance-component, and mixed models. Pr.: Stat. 860.

285 865. Multivariate Analysis. (3) I in alt. years. Likelihood estimates, vectors of random variables; Holtelling's 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.

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.

286 385. 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.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

286 410. COBOL. (3) Elements of data processing in the cobol language. Applications. Pr.: Comp. Sci. 315.

286 425. Computer Organization and Programming. (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.

286 505. 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.

286 525. Introduction to Information Structures. (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.

UNDERGRADUATE AND GRADUATE CREDIT

286 610. List Processing Languages. (3) II, S. Alternate years. The nature and mechanics of typical list processing languages e.g. LISP and IPL/V will be presented with their characteristic advantages and disadvantages. Pr.: Comp. Sci. 385.

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. 385 or 425 or consent of instructor.

286 620. Programming Systems. (3) I, S. Languages for writing software, design of assembly systems, macro-instructions, operating systems (monitors), interrupt systems, storage allocation, and multiprogramming. Pr.: Comp. Sci. 385 and 525.

286 630. Practicum in Digital Computer Consulting. (3) Supervised experience in consulting with students regarding their programs for digital computations. Location and correction of errors in programs. Improving efficiency programs. One hour of lecture, six hours laboratory per week. Pr.: Comp. Sci. 525 and Stat. 625.

286 631. Advanced Digital Computer Programming. Supervised experience in writing computer programs including the original creation and documentation of substantial programs. One hour of lecture, six hours of laboratory per week. Pr.: Comp. Sci. 525 and Stat. 625.

286 635. Nonnumeric Programming. (3) I, II, S. Use of computers in problems not involving numerical analysis; combinatorial problems learning mechanisms, heuristic programs, and pattern recognition. Pr.: Comp. Sci. 385 and 525.

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.: Math. 222, Comp. Sci. 425 and 610.

286 701. Automata Theory. (3) I. Alt. 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. (3) Alt. years. Formulation of syntax-directed and table-driven techniques used in compiler design. Various alternative techniques. Environment of a compiler, conversational compilers. Pr.: Comp. Sci. 525 and 640.

286 712. Seminar in Computer Science. (1) I, II, S.

286 798. Topics in Computer Science. Credit arranged. I, II, S.

GRADUATE CREDIT

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. 610.

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.

286 815. Special Topics in Computer Science. (2-4) I, II, S. Study in selected areas of artificial intelligence, computational linguistics, linear and non-linear programming, theorem providing by computer, models of intelligent processes, and the like. Pr.: Consent of the instructor.

Technical Journalism

DERYL R. LEAMING,* Head of Department

Professor Howe; Associate Professors Leaming and Macy; Assistant Professors Applegate, Dennis, Eaton, Mrozinski, Oukrop and Rush; Emeritus: Professors Ellis, Hostetter and Lashbrook; Associate Professors Amos and Whan.*

The Department of Technical Journalism 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 32; those interested in Home Economics and Journalism should note requirements on page 201.

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 four-year 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 ACEJ-accredited 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

289 106. 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.

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.

289 306. 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. (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. For non-journalism students.

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. [illegible].

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 non-majors. 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 CREDIT

290 132. 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 radio-television concentration.

290 330. Advanced Radio Production. (2) Advanced theory and techniques of modern radio production including 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 radio-television 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.

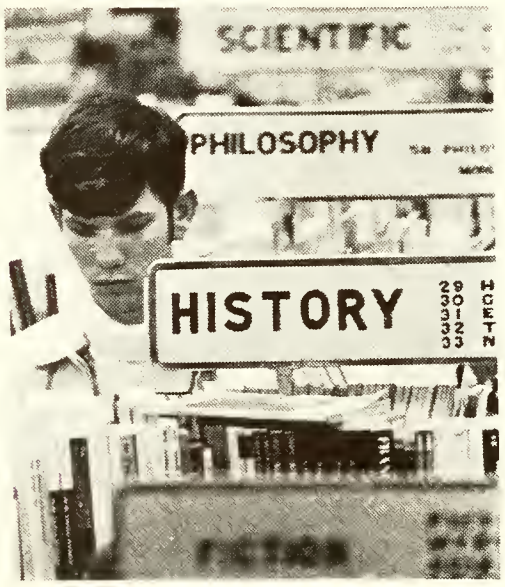
290 692. Broadcasting Law. (3) A study of the major laws and legal decisions which affect broadcasting. Primary attention given to the Communications Act and the Federal Communications Commission's Rules and Regulations: other laws relating to broadcasting and broadcast management considered. Pr.: Junior 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.



The College of Business Administration

ROBERT A. LYNN,* Dean
EUGENE J. LAUGHLIN,* Associate Dean
MILDRED E. BUZENBERG, Assistant Dean

Professors Clark, Jones,* Laughlin,* and Lynn;* Associate Professors Allen,* Barton-Dobenin,* Coleman, Eriksen,* Fox,* Gilkison,* Gugler,* Mulanax,* and Richards; Assistant Professors Buzenberg, Gudgell, King, Rapp, Riley, Schwalje, Thiessen, Tuxbury and Vaden; Instructors Hollinger and Robbins.*

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 university 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 that 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 advisor 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 A.C.T. 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 September 1, 1967, and all students graduating after September 1, 1972.

Communications

229 100	English Composition I	3
229 120	English Composition II	3
281 106	Oral Communications Ia	3
	Communication Electives	2-3
		11-12

Social Science

269 220	American Government	3
273 110	General Psychology	3
277 220	Introduction to Sociology	3
		9

Quantitative

245 100	College Algebra	3
285 320	Elements of Statistics	3
245 340	Intro. to Analytic Processes	3
285 321	Business and Economic Stat.	3
286 315	Fund. of Computer Programming	3
		15

General Electives

	Social Science	6
	Humanities	6
	Natural Science*	6
	Social Science, Humanities or Natural Sciences	6
		24

Business and Economics

305 275	Fundamentals of Accounting	4
305 305	Managerial Accounting	3
225 110	Economics I	3
225 120	Economics II	3
305 400	Management Concepts	3
305 405	Business Finance	3
305 425	Business Law I	3
305 440	Marketing	3
305 600	Business Policy	3
305 602	Business and Society	3
	Economics Electives	6
	Field of Specialization (see "Fields of Specialization" below)	12
	Business Electives	6
		55

Other

	Physical Education (two semesters)	0
	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 advisor.

Finance

Required

305 505	Investments	3
305 615	Financial Management	3

PLUS

Six Credit Hours Selected from the Following Course Work

305 312	Insurance	3
305 507	Financial Institutions	3
305 617	Controllership	3
225 410	Intermediate Macroeconomics	3
225 420	Intermediate Microeconomics	3
225 430	Money and Banking	3
225 621	Public Finance	3
225 681	International Trade	3

Management

Required

305 601	Advanced Management	3
305 631	Org. Behavior and Admin.	3

PLUS

Six Credit Hours Selected from the Following Course Work

305 431	Personnel Administration	3
305 610	Bus. Measure. and Forecasting	3
305 630	Industrial Relations	3
225 620	Labor Economics	3
273 435	Social Psychology	3
550 451	Work Measurement	3

General Business

Twelve credit hours may be chosen from among the courses listed under the finance, industrial relations, management and marketing fields of specialization. At least 6 of the 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.

Industrial Relations

Required

305 629	Wage and Salary Admin.	3
305 630	Industrial Relations	3

PLUS

Six Credit Hours Selected from the Following Course Work

305 431	Personnel Administration	3
305 530	Labor Legislation	3
305 631	Org. Behavior and Admin.	3
305 632	Cont. Issues in Labor Rel.	3
225 620	Labor Economics	3
225 627	Cont. Manpower Problems	3
550 451	Work Measurement	3

Marketing

Required

305 545	Consumer Behavior	3
305 640	Marketing Research	3

PLUS

Six Credit Hours Selected from the Following Course Work

305 343	Sales Communication	3
305 540	Retailing	3
305 542	Sales Management	3
273 435	Social Psychology	3
289 320	Principles of Advertising	3

* Students must take at least one scientific laboratory.

Secretarial Science

Required

305 236	Transcription I	3
305 237	Office Practice and Tech.	3
305 238	Office Machines Lab	0
305 301	Office Management	3
	Any course offered by the College of Business Administration numbered 400 or above	3
		12

PLUS

Credit must be earned in the following course work. Such course work, however, will not be counted toward satisfying the "Field of Specialization" requirement of 12 credit hours.

305 230	Typewriting I	3
305 231	Typewriting II	3
305 235	Shorthand I	4

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 September 1, 1967 and graduating after September 1, 1972.

Communications

229 100	English Composition I	3
229 120	English Composition II	3
281 106	Oral Communications Ia	3
	Communication Electives	2-3
		11-12

Social Science

269 220	American Government	3
273 110	General Psychology	3
277 220	Introduction to Sociology	3
		9

Quantitative

245 100	College Algebra	3
285 320	Elements of Statistics	3
245 340	Intro. to Analytic Processes	3
285 321	Business and Economic Stat.	3
286 315	Fund. of Computer Prog.	3
		15

General Electives

	Social Science	3
	Humanities	6
	Natural Science*	6
	Social Science, Humanities or Natural Science	6
		21

Business and Economics

305 238	Office Machines Lab	0
305 275	Fundamentals of Accounting	4
225 110	Economics I	3
225 120	Economics II	3
305 400	Management Concepts	3
305 405	Business Finance	3
305 425	Business Law I	3
305 440	Marketing	3
305 600	Business Policy	3
305 602	Business and Society	3
	Economics Electives	6
	Business Electives	6
		40

Accounting

305 361	Cost Accounting	3
305 371	Intermediate Accounting I	3
305 461	Advanced Cost Accounting	2
305 472	Intermediate Accounting II	3
305 481	Taxation I	3
	Accounting Electives	6
		20

Other

Physical Education (two semesters)	0
Free Electives	9-10
Total hours required for graduation	126

A Suggested Freshman Year Program for the Degree,

Bachelor of Science in Business Administration

Fall Semester

		Course	*Sem. Hrs.*
Engl.	229 100	Engl. Comp. I	3
Math.	245 100	College Algebra	3
P. Sci.	269 220	Amer. Government	3
		Natural Sciences and/or Humanities	6-7
Ph. Ed.	261 011	Basic Phys. Educ.	0
			15-16

Spring Semester

Engl.	229 120	Engl. Comp. II	3
Spch.	281 106	Oral Comm. Ia	3
Psych.	273 110	General Psych.	
Soc.	277 220	or Intro. to Sociology	3
		Natural Sciences and/or Humanities	6-7
Ph. Ed.	261 011	Basic Phys. Educ.	0
			15-16

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 (page 154). During the four years, the advisor 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 advisors in the College of Education.

Students must make application to the Teacher Education Program during the sophomore year. Fifty-three (53) semester hours are required for application to enter the College of Education and admission to the Teacher Education Program. (page 152).

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, 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.

Dual Degree in Business Administration

The dual degree program allows a student to earn the Bachelor of Science in Business Administration 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 non-business degree and the

* Students must take at least one scientific laboratory.

College of Business Administration, and 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 non-business degree.

The following requirements are effective for all students entering the program after September 1, 1969, and all students graduating after September 1, 1974. 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 non-business degree or in addition to it.

		Sem. Hrs.
305 275	Fundamentals of Accounting	4
305 305	Managerial Accounting	3
225 110	Economics I	3
225 120	Economics II	3
305 425	Business Law I	3
286 315	Fundamentals of Computer Prog.	3
305 400	Management Concepts	3
305 405	Business Finance	3
305 440	Marketing	3
305 600	Business Policy	3
305 602	Business and Society	3
	Field of Specialization	12
	Business Electives	3
		49

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 the 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 the last two years of undergraduate work in an institution whose requirements for the bachelors degree are substantially equivalent to those of Kansas State University.

Applicants with grade averages in the final two years of undergraduate work 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 Associate Dean of the 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.

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 through 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 graduate committee.

		Sem. Hrs.
800	Behavioral Management Theory	3
820	Decision Theory of the Firm	3
830	Legal and Social Environment of Business	3
840	Marketing Systems Analysis	3
850	Research Methods in Business	3
851	Business Operations Analysis	3
860	Accounting Controls for Business	3
861	Financial Controls for Business	3
	Total required core	24

OPTION A:

Required core	24
Elective area*	6
Written comprehensive exams required	0
Hours required for graduation	30

* Elective areas include, but are not necessarily limited to, the following: Computer Science; Economics; Finance; Management; Marketing; Operations Research (Industrial Engineering); Political Science; Psychology; Sociology; Statistics.

OPTION B:

Required core	24
Master's thesis	6
Oral defense of thesis required	0
Hours required for graduation	30

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.

OPTION A

670	CPA Problems	3
671	CPA Review	2
672	CPA Law	2
681	Auditing II	3
800	Behavioral Management Theory	3
820	Decision Theory of the Firm	3
830	Legal and Social Environment	3
850	Research Methods in Business	3
861	Financial Controls for Business	3
870	Accounting Theory I	3
871	Accounting Theory II	3
	Written comprehensive exams required	0
	Hours required for graduation	31

OPTION B

800	Behavioral Management Theory	3
820	Decision Theory of the Firm	3
830	Legal & Social Environment of Bus.	3
840	Marketing Systems Analysis	3
850	Research Methods in Business	3
851	Business Operations Analysis	3
860	Accounting Controls for Business (or elective in finance)	3
861	Financial Controls for Business	3
870	Accounting Theory I	3
871	Accounting Theory II	3
	Written comprehensive exams required	0
	Hours required for graduation	30

Courses in Business and Accounting

UNDERGRADUATE CREDIT

305 000. Honors Program.

305 201. Fundamentals of Business for Professional People. (2) I, II. 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.

305 210. 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.

305 230. Typewriting I. (3) I, II, S. The technique of touch typewriting, care of the machine, and skill in operation. Pr.: Ability to type 35 words per minute.

305 231. Typewriting II. (3) I, II. Cont. of Typewriting I. Pr.: 305 230.

305 235. Shorthand I. (4) I, II, S. Fundamentals of Gregg Shorthand. Meets five hours each week. Pr.: 305 230 or concurrent enrollment.

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.: 305 235.

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.: 305 236 and conc. enrollment in 305 238.

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.: 305 275.

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.: 225 110.

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) II. 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.: 305 275.

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.: 305 275.

305 399. Honors Seminar in Business. (1) I, II. Readings and discussions on selected topics. A maximum of four hours credit may be obtained.

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.: 245 100 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, 285 320 and 305 305 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. Cont. of Business Law I. Coverage includes corporations, property—real and personal, sales and commercial paper. Pr.: 305 425.

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.: 225 110 and junior standing.

305 461. Advanced Cost Accounting. (2) I, II. Budgetary control with standard costs; cost and profit analyses for decision-making purposes. Pr.: 305 305 or 361.

305 471. Advanced Accounting. (3) II. Accounting for partnerships, installment sales, consignments, consolidated statements, and other special topics. Pr.: 305 371.

305 472. Intermediate Accounting II. (3) I, II, S. Statement analysis and special problems peculiar to the corporate form of organization. Pr.: 305 371.

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.: 305 481.

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.: 245 340 or 220, 285 320 and 305 405.

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.: 305 405.

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.: 305 425.

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.: 305 440.

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.: 305 440.

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.: 305 440.

305 575. Accounting Internship. (3) II. Provides six weeks of practical diversified public accounting experience for accounting majors. The course objective is a broader educational experience for participating students. Pr.: 305 471, 480, 680, and consent of instructor.

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; 305 400, 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.: 245 340 or 220, 285 320 and 305 400.

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.: 285 320 or consent of instructor.

305 615. Financial Management. (3) II. Analysis of problems in advanced financial planning and control. Pr.: 245 340 or 220, 285 320 and 305 405.

305 617. Controllership. (3) I. Emphasis on control of operation through cost analysis, internal and external reporting, and income determination concepts. Pr.: 305 305 or 361 and 371.

305 629. Wage and Salary Administration. (3) I. Installation and administration of wage and salary programs including objectives, organization, quantitative and non-quantitative evaluation, wage surveys, rate ranges, incentive programs, profit sharing, worker resistance, and compensation issues. Pr.: 285 320.

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, social-psychological, and sociological variables crucial in understanding and predicting behavior in individuals and groups; emphasis on empirical research. Pr.: 305 400 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-mangaement field. Pr.: 305 630 or 225 620.

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.: 305 440.

305 660. International Business. (3) II. Examination of business decision parameters and strategy in foreign environment. Emphasis on aspects dilffering 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.: 305 471 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.: 305 471 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.: 305 425 and 426 or their equiv.

305 680. Auditing I. (3) I, II. Theory and procedure used in balance sheet audits. Pr.: 305 472.

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.: 305 680 and consent of instructor.

305 798. Problems in Business Administration. Credit arranged. I, II, S. Background of courses needed for the problem undertaken.

305 799. Problems in Accounting. Credit arranged. I, II. S. Background of courses needed for the problem undertaken.

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.: 305 400 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, 285 320 and 305 305.

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.: 305 440.

305 841. Seminar in Marketing. (3) On sufficient demand. Study of current liiterature, marketing theory, and intensive investigation of various problem areas. Pr.: 305 440 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.: 285 320 and 305 400.

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 multistrategy 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 decisions are evaluated within the framework of changing economic conditions. Pr.: 225 120 and 305 305.

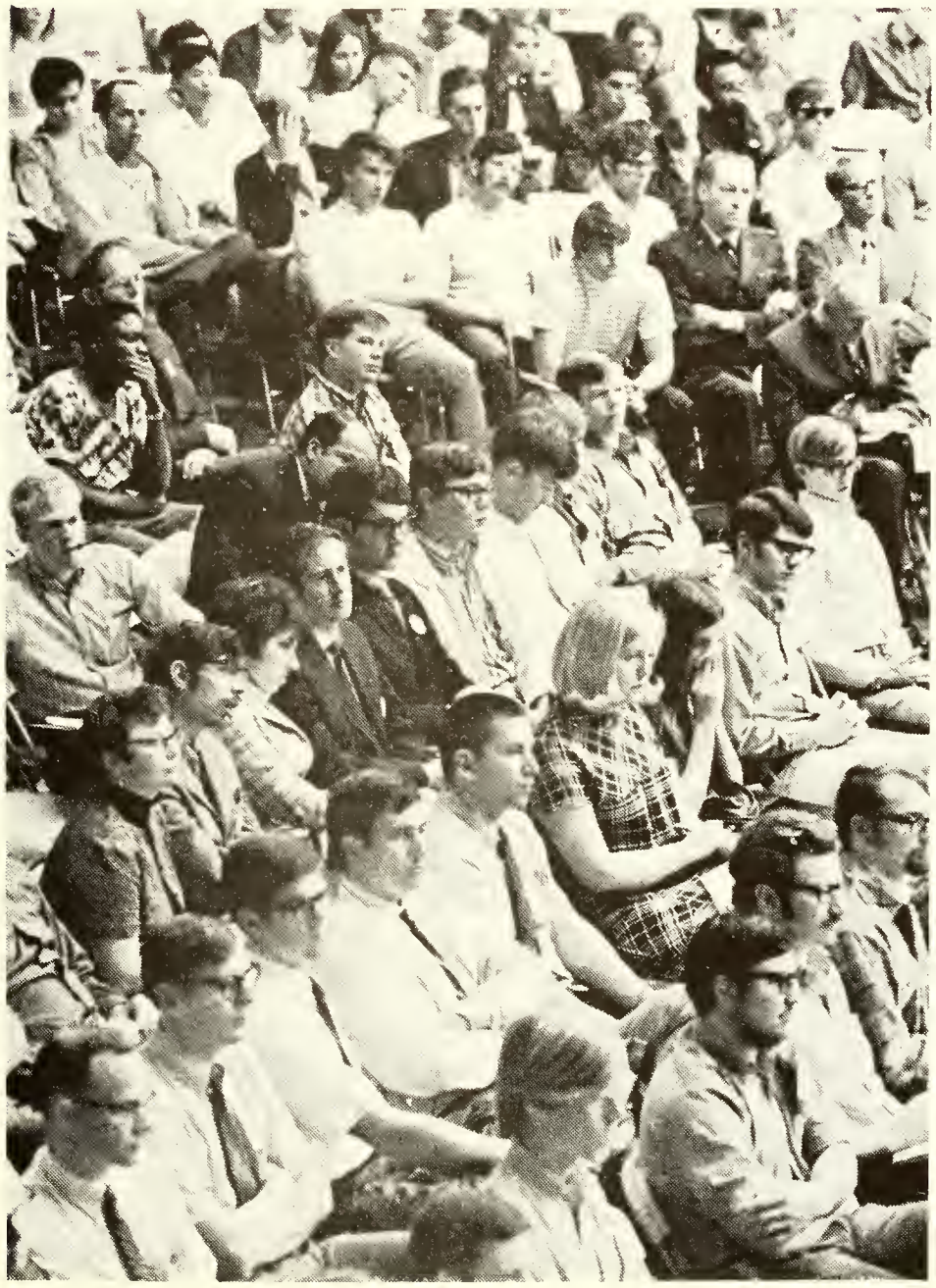
305 861. Financial Controls for Business. (3) II. The data necessary to judge economic flexibility and risk of investment proposals, cost of capital and capital structure are evaluated under static and dynamic assumption regarding money and capital markets. Pr.: 305 405.

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.



The College of Education

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 in-service training; 8) providing graduate programs for positions in education at the graduate level.

The College of Education cooperates fully with all colleges and departments of the University. This cooperation is essential for a complete preparation of school personnel who require contact with all aspects of the academic community.

The Kansas State University Teacher Education Programs are accredited by: Kansas State Board of Education, North Central Association of Colleges and Secondary Schools, National Council for Accreditation of Teacher Education.

Center for Extended Services and Studies

O. KENNETH O'FALLON, Director

The Center 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 resources of the College of Education and Kansas State University can be directed 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.

Staff for the operation of the Center is identified and maintained through the assignment of time of individual 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.

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.

The 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.

The Teacher Education Programs consist of:

1. General Education Studies (page 153 or 154)
2. Professional Studies (this page or 154)
3. Major Area

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 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 November 1 or March 1 of the sophomore year, but not later than the semester in which they can earn 53 semester hours.
2. Transfer students may apply at the same time of enrollment or pre-enrollment, but should apply by November 1.

Academic Standards Committee: The Academic Standards Committee of the College of Education must approve the Application for Admission to the Teacher Education Programs.

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 the previously attended institutions.
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.
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, 135, 200, 472 or 526.
5. Recommendation by the advisor or advisors.
6. Clearance by the Dean of Students.

Admission to 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 the spring semester of the senior year. Courses and variations by majors are included in the Professional Semester as shown below:

Elementary Professional Semester

Elementary School Reading (C & I 474)	3 hrs.
Educational Sociology (A & F 616)	3 hrs.
Teaching Participation in Elem. School (C & I 475)	8 hrs.
	14 hrs.

The majority of secondary education majors enroll in the following courses in their Professional Semester.

Secondary Professional Semester

Teaching Participation in Sec. School (C & I 477)	8 hrs.
Principles of Secondary Education (C & I 451)	3 hrs.
Educational Sociology (A & F 616)	3 hrs.
Methods of Teaching in Sec. School (C & I 476)	2 hrs.
	16 hrs.

The following are exceptions to the Secondary Professional Semester:

Agricultural Education Professional Semester

* Teaching Participation in Sec. School (C & I 477)	8 hrs.
* Vocational Education (A & O 702)	3 hrs.
Courses in Major (Ag E 351 & 405)	5 hrs.
	16 hrs.

Home Economics Education Professional Semester

* Teaching Participation in Sec. School (C & I 477)	8 hrs.
* Curriculum in Home Economics (A & O 750)	3 hrs.
Courses in Major (F. Ec. 360, 365, Gn. HE 300)	5 hrs.
	16 hrs.

Music Education Professional Semester

* Teaching Participation in Elem. Music (C & I 417)	4 hrs.
* Teaching Participation in Sec. Music (C & I 418)	4 hrs.
* Principles of Secondary Education (C & I 451)	3 hrs.
* Educational Sociology (A & F 616)	3 hrs.
Courses in Major (Music 501)	2 hrs.
	16 hrs.

Forms for admission to the Professional Semester will be obtained from and returned to the same College of Education advisor.

* Other courses common to the secondary Professional Semester are taken prior to this Professional Semester sequence.

"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."

Students must apply even though all admission requirements are not satisfied 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.

All students enrolled in the Professional Semester will be affected by the following information. Special attention should be given to the ensuing statements.

Admission Requirements:

a. Applications by secondary students for Teaching Participation must be signed by both the teaching field advisor and the education advisor.
b. Elementary students need only the signature of the Elementary Education advisor on the applications.
c. Educational Psychology II must be completed prior to admission to Teaching Participation.
d. Elementary students must complete a minimum of four (4) specialized content method courses before the clinical experience of Teaching Participation.
e. Students must have a minimum of ninety (90) hours of course work before they may enroll in Teaching Participation.
f. Students in Elementary Education must have an overall grade point average of 2.2 to be eligible for Teaching Participation.
g. Students in Secondary Education must have a 2.2 overall grade point average AND a 2.5 grade point average in the Teaching Field courses to be eligible for Teaching Participation.
h. Students with degrees from other colleges and universities who wish to qualify for the Professional Semester at Kansas State University must apply through the Office of the Coordinator of Student Teaching. Applicants must meet ALL requirements of the Teacher Education Program.
i. The Coordinator of Student Teaching will obtain clearance for students from the Dean of Students office.
j. Students will obtain clearance from Student Health through a physical examination the semester prior to the Professional Semester.

Course Requirements:

a. 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.
b. Students receiving a "pass, credit, but not for certification" or "fail" in Teaching Participation will not be recommended for certification.
c. Students must be eligible for Teaching Participation to enroll in any of the professional education courses which are a part of the Professional Semester.

Residence Requirements:

a. Students desiring to be recommended for certification must earn credit for Teaching Participation in residence.
b. Students who have had secondary methods courses in another college or university will be required to audit the course at Kansas State University.

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 pre-elementary 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 adviser in the Dean's office of the College of Arts and Sciences. The adviser is available for the purpose of 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.

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.
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.

II. Professional and Specialized Course Requirements

(62 hours):

a. Professional Education: Twenty-seven (27) hours.

	Hours
Educational Psychology I	3
Educational Psychology II	3
Principles of Elementary Education	3
Science for Elementary Schools	3
Mathematics for Elementary Schools	3
Language Arts for Elementary Schools	3
Social Studies for Elementary Schools	3
Elementary School Reading	3
Educational Sociology	3
	27

b. Additional Requirements: Twelve (12) hours.

	Hours
Music for Elementary Teachers	3
Art for Elementary Schools	3
Literature for Children	3
Personal and Community Health	3

c. Area of Concentration: Fifteen (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

d. Clinical Experiences: Teaching Participation in Elementary School—Eight (8) hours.

III. Electives

(14 hours):

Remaining hours in the degree may be taken as additional hours in the major, related courses and free electives.

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 assigned to pre-education advisers in the College of Arts and Sciences or to 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.

I. General Education Requirements:

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.
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. Electives.

II. Professional Education Requirements:

a. Educational Psychology I and II: Six (6) hours.
b. Principles of Secondary Education: Three (3) hours; Educational Sociology: Three (3) hours.
c. Methods of Teaching in the Secondary Schools: Two or three (2 or 3) hours.
d. Clinical Experiences: Teaching Participation in the Secondary School: Eight (8) hours.

III. Major

(refer to section "Secondary Education Major Fields")

IV. Electives:

Remaining hours in the degree may be taken in additional hours in the major, general education and related courses, and free electives.

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 32.

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, ceramics, sculpture, art history, metalcrafts & jewelry).

Biological Science (SED 427): Biol. 198 and 201 or 205 and 210, 425, 530, 18 hours of biological science electives; Entom. 211; Chem. 110; Geol. 100.

Business Education (SED 421): B. A. 105, 230, 231, 237, 238, 272, 301, 305, 315, 325, 326, 400, 440, 235 and 236 or 6 additional marketing hours or 6 additional finance hours, 6 hours of Business Administration electives; Econ. 430 or B. A. 405; Pol. Sci. 220; 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, 110, 420, 430, 460.

Economics (SED 428): (a) Econ. 110, 120, 410, 420, (b) Five additional courses numbered 400 or above in the department of economics in at least four branches of economics, selected with advice of student's advisor; Econ. 405 and 406 cannot be counted in the fulfillment of this requirement, (c) Pol. Sci. 110; Hist. 251, 252; Soc. 211; B. A. 272 or 273; Math 100; Stat. 320 or 520; three hours social science (Recommended: Geography 250 or 260).

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.

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 197.

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 and three hours elective; Soc. 211; three hours elective each in economics and geography.

Journalism (SED 422): Journ. 050, 235, 306, 310, 316, 330, 335, 358, 652, three hours of journalism

* The pre-education adviser in the College of Arts and Sciences is a member of the College of Education faculty.

electives; Engl. 220, 270, an advanced course in English Composition, three hours in American Literature; Phil. 150; three hours in American History.

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: 417, 420, 470, 475, 511, 512, 513, 573, 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 110.

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 115.

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 Scinece (SED 428): Pol. Sci. 110, 21 hours in political science; Hist. 101, 102, 251, 252; three hours in economics; Soc. 211.

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 second 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; Stat. 320; three hours in mathematics, logic or philosophy; three hours in economics; three hours in geography; 6 hours in history.

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.

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 if Teaching Participation is completed with a grade of "pass, recommended for certification." Students enrolled in 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 3 Year Degree Elementary Certificate, the 3 Year Degree Secondary Certificate, or the 3 Year Degree Elementary and Secondary Certificate, as established by the State Board of Education.

Students receiving a grade of "pass, but not recommended for certification" or "fail" in Clinical Experiences (Teaching Participation) will not be recommended for certification.

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 152)

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, Student Development, 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 Stu-

dent 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. **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. Course work only, but including evidence of scholarly effort such as term papers, production of art, music, designs, etc., as determined by his supervisory committee.
3. 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) Administration, Guidance, and Student Development (2) Adult and Occupational Education (3) Curriculum and Instruction.

Requirements: Applicants for the Ph. D. 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) A & F 800, and (c) A & F 904. A foreign language is not required.
3. A minimum of two regular semesters of full-time residency after admission to the doctoral program. Full time residency means that the student may be employed up to half time and must be enrolled for at least 9 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 advisor 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 the department head.

Administration and Foundations

Professors Danskin, DeMand,* Hoyt,* Moggie,* and O'Fallon;* Associate Professors Flanagan,* Kaiser,* Kasper,* Kennedy,* Laughery,* Nordin, Owens,* Roscoe,* and Sarthory;* Assistant Professors Chollar, Gildseth,* Kittleson,* and Steffen; Instructors Jones and Hudson; Emeritus: Professors Baker, Green, and Olson.*

Although emphasis in the Department is on graduate study, some courses are offered for undergraduate students.

The Foundations Area serves the undergraduate and graduate education programs. Work in the Area centers on the understanding, improvement and development of conceptual frames of reference used in designing education and making educational decisions.

Foundations of education are interdisciplinary in their sources, using particularly the behavioral and social sciences to foster an understanding of the school as one of the significant social institutions. From the behavioral sciences, education uses information about the cultural and psychological forces that shape human personality. From the so-

cial sciences, education seeks to understand the structure and functioning of society and its formal institution. History and philosophy, capstones of foundations, give perspective to the development of education and contribute a sense of cultural evaluation of the values that determine its major purposes.

The program in Special Education is designed to accommodate students who wish to specialize in teaching exceptional children. Students must complete an undergraduate teacher education program leading to certification for teaching in elementary or secondary schools. Careful planning will permit the completion of some course work in Special Education before entering a graduate program. The focus of the program is on the preparation of mentally retarded at both the elementary and secondary level. In addition a close working relationship is maintained with the Department of Speech in the preparation of supporting research in the area of Speech Pathology and Hearing Conservation.

The Guidance and Student Development Area has for its purpose the preparation of counselors and guidance personnel for schools, colleges and universities. With the increasing emphasis on the role of counselors in the modern educational program, many teachers are finding value in a basic course which gives an overview of guidance services in modern society. The guidance program is designed to prepare individuals for both leadership and research positions in the field of guidance, most often as counselor-educators in colleges and universities, as directors of guidance programs in a large city school system or directors of guidance programs at state and national levels. The focus of the student development program is preparation of admissions officers, student deans, college counselors and teachers. The programs in this Area provide unique experiences for the individual in several dimensions—student activities, student unions, residence halls, admissions, and counseling centers.

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.

UNDERGRADUATE CREDIT

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.

405 302. 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.

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, II, 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. Basic Principles of Measurement. (3) I, 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.

405 712. Use of Tests in Counseling. (3) II, 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.

GRADUATE CREDIT

405 800. Statistical Methods in Education. (3) I, alternate (even years) Summers. An introductory yet comprehensive treatment of common statistical analyses encountered in educational research. Many advanced topics are treated at an elementary level. Nonparametric alternatives to the common parametric procedures are also considered. Pr.: Nine hours of education and Stat. 320 or Stat. 520 or the equivalent.

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, II, S. A panoramic view of the problems and tasks of school-system 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) I, II, 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.

405 810. Elementary School Administration. (3) I, II, S. Aims and objectives of elementary education; organization and administration of the elementary school; pupil accounting duties and qualifications of staff; community relations and articulation with other schools. Pr.: C & I 300 and teaching experience.

405 812. The School Plant. (3) I, II, 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, II, S. 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) On sufficient demand. 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 612 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; analysis 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 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.

405 853. Educational Administration.

405 855. Guidance Services.

405 857. Social Foundations.

405 858. Special Education.

405 863. Practicum in Counseling. Credit arranged. 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) On sufficient demand. 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) On sufficient demand. 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. Economic Tools for Educational Decision-Making. (3) II. How to use tools of economic analysis to make decisions in education. A course designed for educational administrators concerned with efficiency and effectiveness in educational systems. Pr.: A & F 807.

405 885. Current Issues in Non-quantitative Research. (3) On sufficient demand. Methodologies of various forms of non-quantitative research, including historical research, philosophical inquiry, sociological analysis, and library research. Pr.: A & F 802 or equivalent.

405 904. Experimental Design in Educational Research. (3) II, alternate (odd years) Summers. 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 Theory and Practicum in Student Personnel Work. (3-6) 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.

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.

Adult and Occupational Education

ROBERT MEISNER,* Head of Department

Professors Agan, Alford,* Apel,* Johnson,* and Prawl;* Associate Professors Albracht,* Bradley,* Griffith, and Meisner;* Assistant Professor Campbell; Instructor Wissman; Emeritus: Professor Rust;* Associate Professors Baxter* and 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.

Courses in Adult and Occupational Education

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.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

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 or 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.

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.

410 700. 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 & O 702 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.

410 791. 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.

410 795. 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.

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. (3) Offered on sufficient demand. Objectives, program, facilities, procedures, and problems of adult education in a community, emphasizing the relation of school administrators and extension staff to this work. Pr.: Psy. 110 or one year of field experience; approval of the instructor.

410 822. Young Farmer and Adult Farmer Education in Agriculture. (2 or 3) I, II, S. Organization, objectives, and procedures for 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 Home Economics. (3 or 2) I, S. Philosophy and principles of effective supervision related to home economics programs; application of principles to problems met by supervisors. Pr.: A & O 750 and teaching experience.

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 rep-

resented 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.

410 890. 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.

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.

Curriculum and Instruction

ARNOLD J. MOORE,* Head of Department

Professors Dixon, Keys,* and Littrell;* Associate Professors Bartel,* Hausc,* McAnarney,* Price,* Schell,* Trennepohl,* and Utsey;* Assistant Professors Byars, Caine, Craig, James,* King, Loeb,* Paul, and Smethers; Instructors Bell, Driss, Eddy, Hazlett, 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 these cooperative programs are those currently being offered with the mathematics and physics departments.

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.

415 325. 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 transferring 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.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

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 to 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.

UNDERGRADUATE AND GRADUATE CREDIT

415 602. Audio-Visual Instruction. (2 or 3) I, II, S. Principles and techniques in the use of visual and audio-visual 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 Programs for Secondary Schools. (3) On sufficient demand. Materials and methods for teaching the reading and study skills needed by secondary students in the various subject areas. Pr.: Senior standing and consent of instructor.

415 630. Band Administration and Percussion Techniques. (3) II, S. (See Music 630).

415 662. Instructional Television. (3) On sufficient demand. The principles of instructional television: its development, programming, 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.

GRADUATE CREDIT

415 803. Curriculum Development. (3) I, II, S. An over-all 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.: C & I 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, multi-graded, 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.

425 862. 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 computer-assisted 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 experential 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.

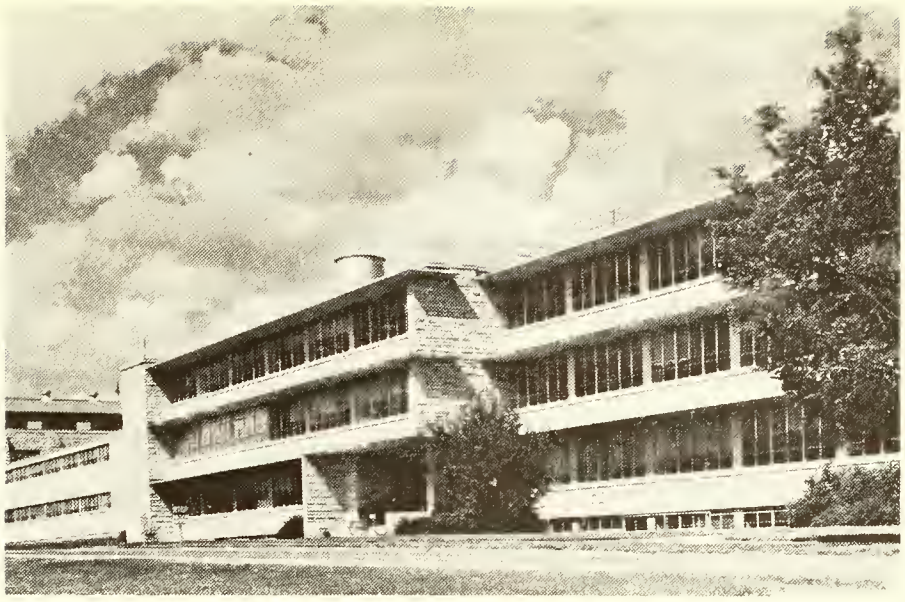
415 919. Seminar in Curriculum Development. Credit arranged. On sufficient demand. Designed for curriculum specialists. Current research and curricular innovations. Evaluation of instructional materials and curricular organization for classroom implementation. Experiences in using selected materials 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.



The College of Engineering

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 well-rounded 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 K. S. U. 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:

A general description of each of these curriculums, including a list of the faculty and departmental course offerings, is presented on pages 172 through 190. 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 above 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 219.

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.

Fall Semester

		Course	Sem. Hrs.
Engl.	229 100	Eng. Comp. I	3
Chem.	221 210	Chem. I	5
Math.	245 220	An. Geo. & Cal. I	4
G. E.	500 160	Engg. Concepts	2
		Hum. or Soc. Sci. Electives	3
Ph. Ed.	261 011	Basic Phys. Educ.	0
G. E.	500 110	Engg. Lectures	0
			17

Spring Semester

		Course	Sem. Hrs.
Engl.	229 120	Eng. Comp. II	3
Chem.	221 230	Chem. II	3
Math.	245 221	An. Geo. & Cal. II	4
Econ.	225 110	Econ. I	3
		Hum. or Soc. Sci. Electives	3
Ph. Ed.	261 011	Basic Phys. Educ.	0
G. E.	500 115	Engg. Assembly	0
			16

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 and transfer students with superior academic records will be invited to join the program. Sophomore and other upper classmen 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.

Participation in the Honors Program will not shorten the time required for graduation for most students, but should prove to be a stimulating experience. In addition to enrolling in Honors Sections in much of his course work, 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 K. S. U. and provides an excellent opportunity for interdisciplinary study.

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.

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.

Center for Effective Teaching

The College of Engineering Center for Effective Teaching is organized to further the college 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 activities are coordinated by an advisory committee of students and faculty from the College of Engineering.

COLLEGE OF ENGINEERING

Curriculum in Agricultural Engineering

B. S. in Agricultural Engineering

FRESHMAN

Fall Semester

		Course	Sem. Hrs.
Engl.	229 100	English Composition I	3
Chem.	221 210	Chemistry I	5
Math.	245 220	Anal. Geom. & Calc. I	4
M. E.	560 212	Graphical Comm. Anal. & Design I	2
I. E.	550 371	Computer Apl. Engg.	1
Ph. Ed.	261 011	Basic Phys. Ed.	0
G. E.	500 110	Engineering Lectures	0
			15

Spring Semester

		Course	Sem. Hrs.
Engl.	229 120	English Composition II or Elective	3
Chem.	221 230	Chemistry II	3
Econ.	225 110	Economics I	3
Ag. E.	505 160	Engineering Concepts	2
Math.	245 221	Anal. Geom. & Calc. II	4
Spch.	281 105	Oral Communication I	2
Ph. Ed.	261 011	Basic Phys. Ed.	0
Ag. E.	505 115	Engineering Assembly	0
			17

SOPHOMORE

Fall Semester

		Course	Sem. Hrs.
Math.	245 222	Anal. Geom. & Calc. III	4
Phys.	265 310	Engg. Physics I	5
Bio.	215 198	Prin. of Biology	5
Ag. E.	505 375	Agr. Hydrology	3
Ag. E.	505 115	Engineering Assembly	0
			17

Spring Semester

		Course	Sem. Hrs.
Math.	245 240	Series & Diff. Equa.	4
Phys.	265 311	Engg. Physics II	5
Ag. E.	505 311	Agr. Engg. Fund. I	3
Ap. M.	510 305	Statics	3
		Soc. Sci. or Hum. El.	3
Ag. E.	505 115	Engineering Assembly	0
			18

JUNIOR
Fall Semester

		Course	Sem. Hrs.
Ag. E.	505 440	Func. Req. Agr. Str.	3
Ap. M.	510 412	Dynamics	3
E. E.	530 403	El. Cir. & Controls	4
M. E.	560 413	Thermodynamics I	3
		Soc. Sci. or Hum. El.*	3
Ag. E.	505 115	Engineering Assembly	0
			16

Spring Semester

		Course	Sem. Hrs.
Ag. E.	505 446	Tractors	3
Ap. M.	510 415	Mech. of Materials	3
Ap. M.	510 418	Mech. of Materials Lab	1
Ap. M.	510 471	Fluid Mechanics	3
G. E.	500 350	Engg. Materials	2
G. E.	500 412	Engg. Materials Lab.	1
		Soc. Sci. or Hum. El.*	3
Ag. E.	505 115	Engineering Assembly	0
			16

SENIOR
Fall Semester

		Course	Sem. Hrs.
Ag. E.	505 435	Design of Agr. Mach.	3
Ag. E.	505 500	Rural Electrification	3
C. E.	525 422	Soil Mechanics or	
Agron.	015 660	Soil Physics	3
		Soc. Sci. or Hum. El.*	6
Ag. E.	505 115	Engineering Assembly	0
			15

Spring Semester

		Course	Sem. Hrs.
Ag. E.	505 480	Soil & Water Cons.	3
Ag. E.	505 466	Anal. of Agr. Struc.	3
Ag. E.	505 581	Prof. Pract. in Ag. E.	1
		Technical Elective	10
Ag. E.	505 115	Engineering Assembly	0
			17

Number of hours required for graduation 131**

COLLEGE OF ENGINEERING

Curriculum in Chemical Engineering

B. S. in Chemical Engineering

FRESHMAN
Fall Semester

		Course	Sem. Hrs.
Engl.	229 100	English Composition I	3
Chem.	221 210	Chemistry I	5
Math.	245 220	Anal. Geom. & Calc. I	4
Econ.	225 110	Economics I	3
Spch.	281 105	Oral Communication I	2
Ph. Ed.	261 011	Basic Phys. Ed.	0
G. E.	500 110	Engineering Lectures	0
			17

Spring Semester

		Course	Sem. Hrs.
Engl.	229 120	English Composition II	3
Chem.	221 230	Chemistry II	3
Chem.	221 271	Chem. Analysis	4
Math.	245 221	Anal. Geom. & Calc. II	4
		Elective***	3
Ph. Ed.	261 011	Basic Phys. Ed.	0
Ch. E.	520 115	Engineering Assembly	0
			17

SOPHOMORE
Fall Semester

		Course	Sem. Hrs.
Math.	245 222	Anal. Geom. & Calc. III	4
Phys.	265 310	Engg. Physics I	5
Chem.	221 431	Organic Chem. I	3
Chem.	221 432	Organic Chem. I Lab.	2
		Elective***	3
Ch. E.	520 115	Engineering Assembly	0
			17

Spring Semester

		Course	Sem. Hrs.
Math.	245 240	Series & Diff. Equa.	4
Phys.	265 311	Engg. Physics II	5
Chem.	221 450	Organic Chem. II	3
Ch. E.	520 215	Intro. to Proc. Anal.	4
Ch. E.	520 115	Engineering Assembly	0
			16

JUNIOR
Fall Semester

		Course	Sem. Hrs.
Chem.	221 585	Physical Chem. I	3
Chem.	221 586	Physical Chem. I Lab.	2
Ch. E.	520 415	Ch. E. Thermo.	5
G. E.	500 350	Engg. Materials	2
G. E.	500 351	Engg. Materials Lab.	1
Ap. M.	510 305	Statics	3
Ch. E.	520 115	Engineering Assembly	0
			16

Spring Semester

		Course	Sem. Hrs.
Chem.	221 595	Physical Chem. II	3
Ch. E.	520 430	Transport Phenomena	5
Ch. E.	520 422	Chem. Engg. Lab. I	2
Ap. M.	510 412	Dynamics	3
		Elective***	3
Ch. E.	520 115	Engineering Assembly	0
			16

SENIOR
Fall Semester

		Course	Sem. Hrs.
Ch. E.	520 432	Chem. Engg. Lab. II	2
Ch. E.	520 520	Process Anal. & Design	5
Ch. E.	520 530	Process Optimization	3
		Elective***	6
Ch. E.	520 115	Engineering Assembly	0
			16

Spring Semester

		Course	Sem. Hrs.
Ch. E.	520 442	Chem. Engg. Lab. III	2
Ch. E.	520 540	Ch. E. Systems Design	5
		Elective***	9
Ch. E.	520 115	Engineering Assembly	0
			16

Number of hours required for graduation 131**

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* Humanities and Social Science electives are to be selected from the list on page 171. Other electives must be chosen with the advice 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.

*** Fifteen hours of electives must be selected from the list of Humanities and Social Science electives on page 171. 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.

COLLEGE OF ENGINEERING

Curriculum in Civil Engineering

B. S. in Civil Engineering

FRESHMAN

Fall Semester

		Course	Sem. Hrs.
Math.	245 220	Anal. Geom. & Calc. I	4
Chem.	221 210	Chemistry I	5
Engl.	229 100	English Composition I	3
Arch.	105 107	Arch. Graphics I	2
		Engg. Science Elec.**	2
Ph. Ed.	261 011	Basic Phys. Ed.	0
G. E.	500 110	Engineering Lectures	0
			16

Spring Semester

		Course	Sem. Hrs.
Math.	245 221	Anal. Geom. & Calc. II	4
Chem.	221 230	Chemistry II	3
Engl.	229 120	English Composition II	3
Econ.	225 110	Economics I	3
		Engg. Science Elec.**	2
Ph. Ed.	261 011	Basic Phys. Ed.	0
C. E.	525 110	Civil Engg. Lecture	0
			15

SOPHOMORE

Fall Semester

		Course	Sem. Hrs.
Math.	245 222	Anal. Geom. & Calc. III	4
Phys.	265 310	Engg. Physics I	5
Ap. M.	510 305	Statics	3
Spch.	281 105	Oral Communication I	2
C. E.	525 212	Elem. Surveying Engg.	3
C. E.	525 115	Engineering Assembly	0
			17

Spring Semester

		Course	Sem. Hrs.
Math.	245 240	Series & Diff. Equa.	4
Phys.	265 311	Engg. Physics II	5
Ap. M.	510 415	Mech. of Materials	3
Chem.	221 250	Chemistry II Lab.	2
C. E.	525 214	Route Surveying	3
C. E.	525 115	Engineering Assembly	0
			17

JUNIOR

Fall Semester

		Course	Sem. Hrs.
C. E.	525 331	Stat. Deter. Str.	3
Ap. M.	510 412	Dynamics	3
M. E.	560 413	Thermodynamics I	3
Geol.	234 100	Physical Geology	4
Ap. M.	510 418	Mech. of Materials Lab.	1
		Hum. or Sci. El.*	3
C. E.	525 115	Engineering Assembly	0
			17

Spring Semester

		Course	Sem. Hrs.
C. E.	525 332	Stat. Indet. Str.	3
Ap. M.	510 471	Fluid Mechanics	3
C. E.	525 463	Sanit. Engg. Fund.	3
C. E.	525 422	Soil Mechanics I	3
		Engg. Science Elec.**	4
C. E.	525 115	Engineering Assembly	0
			16

SENIOR

Fall Semester

		Course	Sem. Hrs.
C. E.	525 443	Struc. Engg. in Metals	3
C. E.	525 452	Hydraulic Engineering	3
C. E.	525 411	Photogrammetry	3
C. E.	525 356	Hydrology	2
		Hum. or Soc. Sci. El.*	6
C. E.	525 115	Engineering Assembly	0
			17

Spring Semester

		Course	Sem. Hrs.
C. E.	525 444	Struc. Engg. in Concr.	3
C. E.	525 465	Sanit. Engg. Design	3
C. E.	525 471	Transportation Engg.	3
C. E.	525 426	Foundations	3
		Hum. or Soc. Sci. El.*	5
C. E.	525 115	Engineering Assembly	0
			17

Number of hours required for graduation 132***

* Humanities and Social Science electives are to be selected from the list on page 171.

** 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.

COLLEGE OF ENGINEERING

Curriculum in Electrical Engineering

B. S. in Electrical Engineering

FRESHMAN

Fall Semester

		Course	Sem. Hrs.
Engl.	229 100	English Composition I	3
Chem.	221 210	Chemistry I	5
Math.	245 220	Anal. Geom. & Calc. I	4
Econ.	225 110	Economics I	3
Ph. Ed.	261 011	Basic Phys. Ed.	0
G. E.	500 110	Engineering Lectures	0
			15

Spring Semester

		Course	Sem. Hrs.
Engl.	229 120	English Composition II	3
Chem.	221 230	Chemistry II	3
Math.	245 221	Anal. Geom. & Calc. II	4
Spch.	281 105	Oral Communication I	2
G. E.	500 160	Engineering Concepts	2
		Hum. or Soc. Sci. El.*	3
Ph. Ed.	261 011	Basic Phys. Ed.	0
E. E.	530 115	Engineering Assembly	0
			17

SOPHOMORE

Fall Semester

		Course	Sem. Hrs.
Phys.	265 310	Engg. Physics I	5
Math.	245 222	Anal. Geom. & Calc. III	4
I. E.	550 372	Comp. & Data Proc.	2
G. E.	500 350	Engg. Materials	2
		Hum. or Soc. Sci. El.*	3
E. E.	530 115	Engineering Assembly	0
			16

Spring Semester

		Course	Sem. Hrs.
Phys.	265 311	Engg. Physics II	5
Math.	245 240	Series & Diff. Equa.	4
E. E.	530 391	Circuit Theory I	3
Ap. M.	510 305	Statics	3
M. E.	560 212	Graph. Com. Anal. & Des. I	2
E. E.	530 115	Engineering Assembly	0
			17

JUNIOR

Fall Semester

		Course	Sem. Hrs.
E. E.	530 404	Circuit Theory II	4
E. E.	530 497	Electromag. Theory I	3
E. E.	530 415	Electronics I	3
E. E.	530 431	Elec. Engg. Lab. I	2
Ap. M.	510 412	Dynamics	3
		Hum. or Soc. Sci. El.*	3
E. E.	530 115	Engineering Assembly	0
			18

Spring Semester

		Course	Sem. Hrs.
E. E.	530 405	Circuit Theory III	3
E. E.	530 416	Electronics II	3
E. E.	530 501	Energy Conversion I	3
E. E.	530 432	Elec. Engg. Lab. II	2
E. E.	530 498	Electromag. Theory II	3
		Hum. or Soc. Sci. El.*	3
E. E.	530 115	Engineering Assembly	0
			17

SENIOR

Fall Semester

		Course	Sem. Hrs.
M. E.	560 413	Thermodynamics I	3
E. E.	530 417	Electronics III	3
E. E.	530 502	Energy Conversion II	3
E. E.	530 433	Elec. Engg. Lab. III	2
Phys.	265 400	Atomic Physics or	
N. E.	580 410	Intro. to Nucl. Engg.	3
		Engg. Science Elec.*	3
E. E.	530 115	Engineering Assembly	0
			17

Spring Semester

		Course	Sem. Hrs.
E. E.	530 520	Control Systems	3
E. E.	530 530	E. E. Seminar	1
E. E.	530 434	Elec. Engg. Lab. IV	2
		Technical Elective*	6
		Hum. or Soc. Sci. El.*	3
E. E.	530 115	Engineering Assembly	0
			15

Number of hours required for graduation 132**

* Humanities and Social Science electives must be selected from the approved list and need not be taken in the order listed in the curriculum. Other electives must be chosen with the advice 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.

COLLEGE OF ENGINEERING

Curriculum in Mechanical Engineering

B. S. in Mechanical Engineering

FRESHMAN

Fall Semester

		Course	Sem. Hrs.
Engl.	229 100	English Composition I	3
Chem.	221 210	Chemistry I	5
Spch.	281 105	Oral Communication I	2
Math.	245 220	Anal. Geom. & Calc. I	4
G. E.	500 160	Engineering Concepts	2
Ph. Ed.	261 011	Basic Phys. Ed.	0
G. E.	500 110	Engineering Lectures	0
			16

Spring Semester

		Course	Sem. Hrs.
Engl.	229 120	English Composition II	3
Chem.	221 230	Chemistry II	3
M. E.	560 212	Graph. Comm. Anal. & Des. I	2
Math.	245 221	Anal. Geom. & Calc. II	4
		Hum. or Soc. Sci. El.*	3
Ph. Ed.	261 011	Basic Phys. Ed.	0
M. E.	560 115	Engineering Assembly	0
			15

SOPHOMORE

Fall Semester

		Course	Sem. Hrs.
Phys.	265 310	Engg. Physics I	5
Math.	245 222	Anal. Geom. & Calc. III	4
Econ.	225 110	Economics I	3
M. E.	560 217	Graph. Comm. Anal. & Des. II	3
I. E.	550 221	Indus. Production	2
M. E.	560 115	Engineering Assembly	0
			17

Spring Semester

		Course	Sem. Hrs.
Phys.	265 311	Engg. Physics II	5
Math.	245 240	Series & Diff. Equa.	4
Ap. M.	510 305	Statics	3
G. E.	500 350	Engg. Materials	2
		Hum. or Soc. Sci. El.*	3
M. E.	560 115	Engineering Assembly	0
			17

JUNIOR

Fall Semester

		Course	Sem. Hrs.
M. E.	560 413	Thermodynamics I	3
E. E.	530 419	Elec. Circuits & Math.	4
G. E.	500 351	Engg. Materials Lab.	1
Ap. M.	510 412	Dynamics	3
Ap. M.	510 415	Mech. of Materials	3
		Hum. or Soc. Sci. El.*	3
M. E.	560 115	Engineering Assembly	0
			17

Spring Semester

		Course	Sem. Hrs.
M. E.	560 513	Thermodynamics II	3
E. E.	530 423	Electronics & Control	3
E. E.	530 424	Elec. & Cont. Lab.	1
Ap. M.	510 471	Fluid Mechanics	3
Phys.	265 400	Atomic Physics or	
N. E.	580 410	Intro. to Nuclear Engg.	3
		Hum. or Soc. Sci. El.*	3
M. E.	560 115	Engineering Assembly	0
			16

SENIOR

Fall Semester

		Course	Sem. Hrs.
M. E.	560 452	Machine Design I	3
M. E.	560 521	Heat Transfer	3
M. E.	560 535	Mech. Engg. Lab. I	3
M. E.	560 560	Engg. Economics	3
		Technical Elective	6
M. E.	560 115	Engineering Assembly	0
			18

Spring Semester

		Course	Sem. Hrs.
M. E.	560 453	Mech. Engg. Des. Lab.	2
M. E.	560 551	Machine Design II	3
M. E.	560 583	Mech. Engg. Lab. II	2
M. E.	560 656	Mach. Vibration I or	
M. E.	560 622	Environmental Engg. I	3
		Hum. or Soc. Sci. El.*	3
		Technical Elective	3
M. E.	560 115	Engineering Assembly	0
			16

Number of hours required for graduation 132**

* Humanities and Social Science electives are to be selected from the approved list on page 171. Other electives must be chosen with the advice and approval of the 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.

COLLEGE OF ENGINEERING

Curriculum in Industrial Engineering

B. S. in Industrial Engineering

FRESHMAN

Fall Semester

		Course	Sem. Hrs.
Engl.	229 100	English Composition I	3
Math.	245 220	Anal. Geom. & Calc. I	4
Chem.	221 210	Chemistry I	5
Econ.	225 110	Economics I	3
Ph. Ed.	261 011	Basic Phys. Ed.	0
G. E.	500 110	Engineering Lectures	0
			15

Spring Semester

		Course	Sem. Hrs.
Engl.	229 120	English Composition II	3
Math.	245 221	Anal. Geom. & Calc. II	4
Chem.	221 230	Chemistry II	3
M. E.	560 212	Graph. Com. Anal. & Des. I	2
I. E.	550 372	Comput. & Data Proc.	2
G. E.	500 160	Engineering Concepts	2
Ph. Ed.	261 011	Basic Phys. Ed.	0
I. E.	550 115	Engineering Assembly	0
			16

SOPHOMORE

Fall Semester

		Course	Sem. Hrs.
Phys.	265 310	Engg. Physics I	5
Math.	245 222	Anal. Geom. & Calc. III	4
B. A.	305 275	Fund. of Accounting	4
I. E.	550 221	Indus. Production	2
I. E.	550 451	Work Measurement	3
I. E.	550 115	Engineering Assembly	0
			18

Spring Semester

		Course	Sem. Hrs.
Phys.	265 311	Engg. Physics II	5
Math.	245 240	Series & Diff. Equa.	4
I. E.	550 401	Indus. Management I	3
I. E.	550 441	Engg. Relia. & Qual. Assur. I	3
I. E.	550 115	Engineering Assembly	0
			15

JUNIOR

Fall Semester

		Course	Sem. Hrs.
Stat.	285 410	Intro. Prob. Stat. I	3
M. E.	560 413	Thermodynamics I	3
G. E.	500 350	Engg. Materials	2
G. E.	500 351	Engg. Materials Lab.	1
Ap. M.	510 305	Statics	3
		Soc. Sci. or Hum. El.*	3
		Technical Elective**	3
I. E.	550 115	Engineering Assembly	0
			18

Spring Semester

		Course	Sem. Hrs.
I. E.	550 571	Intro. Oper. Res. I	3
Ap. M.	510 415	Mechanics of Materials	3
E. E.	530 403	Elec. Circuits & Conts.	4
Stat.	285 411	Intro. Prob. Stat. II	3
I. E.	550 481	Indus. Plant Studies	0
		Soc. Sci. or Hum. El.*	3
I. E.	550 115	Engineering Assembly	0
			16

SENIOR

Fall Semester

		Course	Sem. Hrs.
I. E.	550 552	Job Eval. & Wage Incen.	2
I. E.	550 511	Prod. & Inv. Cont.	2
I. E.	550 502	Indus. Management II	2
I. E.	550 522	Tool Engineering	3
I. E.	550 575	Quan. Tech. in I. E.	3
		Soc. Sci. or Hum. El.*	6
I. E.	550 115	Engineering Assembly	0
			18

Spring Semester

		Course	Sem. Hrs.
Ap. M.	510 412	Dynamics	3
I. E.	550 625	The Man-Env. Systems	3
I. E.	550 581	Ind. Fac. Layout Des.	3
I. E.	550 572	Intro. to Oper. Res. II	3
		Soc. Sci. or Hum. El.*	3
I. E.	550 115	Engineering Assembly	0
			15

Number of hours required for graduation 131***

* Social Science and Humanities Electives must be selected from the approved list and need not be taken in the order listed in the curriculum.

** To 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.

COLLEGE OF ENGINEERING

Curriculum in Nuclear Engineering

B. S. in Nuclear Engineering

FRESHMAN

Fall Semester

		Course	Sem. Hrs.
N. E.	580 110	Nucl. Engg. Concepts	2
Engl.	229 110	English Composition I	3
Econ.	225 110	Economics I	3
Chem.	221 210	Chemistry I	5
Math.	245 220	Anal. Geom. & Calc. I	4
Ph. Ed.	261 011	Basic Phys. Ed.	0
G. E.	500 110	Engineering Lectures	0
			17

Spring Semester

		Course	Sem. Hrs.
Engl.	229 120	English Composition II	3
Chem.	221 230	Chemistry II	3
Chem.	221 250	Chemistry II Lab.	2
Math.	245 221	Anal. Geom. & Calc. II	4
Phys.	265 310	Engg. Physics I	5
Ph. Ed.	261 011	Basic Phys. Ed.	0
N. E.	580 115	Engineering Assembly	0
			17

SOPHOMORE

Fall Semester

		Course	Sem. Hrs.
Phys.	265 311	Engg. Physics II	5
Math.	245 222	Anal. Geom. & Calc. III	4
Ap. M.	510 305	Statics	3
		Soc. Sci. or Hum. El.*	3
N. E.	580 115	Engineering Assembly	0
			15

Spring Semester

		Course	Sem. Hrs.
Math.	245 240	Series & Diff. Equa.	4
N. E.	580 450	Elements Nucl. Engg.	3
Ap. M.	510 412	Dynamics	3
		Option	4, 4 or 3
		Soc. Sci. or Hum. El.*	3
N. E.	580 115	Engineering Assembly	0
			17, 17 or 16

JUNIOR

Fall Semester

		Course	Sem. Hrs.
N. E.	580 611	Radio. Appl. Engg.	3
		Soc. Sci. or Hum. El.*	3
		Option	11, 9 or 11
N. E.	580 115	Engineering Assembly	0
			17, 15 or 17

Spring Semester

		Course	Sem. Hrs.
N. E.	580 500	App. N. E. Anal.	3
		Soc. Sci. or Hum. El.*	3
		Option	11
N. E.	580 115	Engineering Assembly	0
			17

SENIOR

Fall Semester

		Course	Sem. Hrs.
N. E.	580 670	Nuc. Reactor Tech. I	3
N. E.	580 680	Neut. & Part. Inter.	3
		Option	9, 9 or 10
N. E.	580 115	Engineering Assembly	0
			15, 15 or 16

Spring Semester

		Course	Sem. Hrs.
N. E.	580 691	Nuc. Reac. Tech. II	3
N. E.	580 695	Nuc. Reac. Tech. Lab.	2
N. E.	580 606	Nuc. Engg. Materials	3
		Option	7, 9 or 7
N. E.	580 115	Engineering Assembly	0
			15, 17 or 15

Number of hours required for graduation 130**

NUCLEAR ENGINEERING

OPTION I

SOPHOMORE

Spring Semester

		Course	Sem. Hrs.
Ch. E.	520 215	Intro. to Proc. Anal.	4

JUNIOR

Fall Semester

		Course	Sem. Hrs.
E. E.	530 391	Circuit Theory I	3
Chem.	221 585	Phys. Chem. I Rec.	3
Ch. E.	520 415	Ch. E. Thermo.	5
			11

Spring Semester

		Course	Sem. Hrs.
Chem.	221 595	Phys. Chem. II Rec.	3
Ch. E.	520 430	Transport Phenomena	5
		Soc. Sci. or Hum. El.	3
			11

SENIOR

Fall Semester

		Course	Sem. Hrs.
N. E.	580 708	Fuel Proc. Lab.	1
Ch. E.	520 520	Process Anal. & Des.	5
E. E.	530 415	Electronics I	3
			9

Spring Semester

		Course	Sem. Hrs.
Ap. M.	510 415	Mech. of Materials	3
		Technical Elective	4
			7

OPTION II

SOPHOMORE

Spring Semester

		Course	Sem. Hrs.
Ch. E.	520 215	Intro. to Proc. Anal.	4

JUNIOR

Fall Semester

		Course	Sem. Hrs.
E. E.	530 391	Circuit Theory I	3
Chem.	221 585	Phys. Chem. I Rec.	3
M. E.	560 413	Thermodynamics I	3
			9

Spring Semester

		Course	Sem. Hrs.
Ap. M.	510 415	Mech. of Materials	3
M. E.	560 513	Thermodynamics II	3
Ap. M.	510 471	Fluid Mechanics	3
		Technical Elective	2
			11

SENIOR

Fall Semester

		Course	Sem. Hrs.
M. E.	560 521	Heat Transfer	3
E. E.	530 415	Electronics I	3
M. E.	560 535	Mech. Engg. Lab. I	3
			9

Spring Semester

		Course	Sem. Hrs.
M. E.	560 656	Machine Vibrations I or	
M. E.	560 715	Gas Dynamics I	3
		Soc. Sci. or Hum. El.	3
		Technical Elective	3
			9

OPTION III

SOPHOMORE

Spring Semester

		Course	Sem. Hrs.
E. E.	530 391	Circuit Theory I	3

JUNIOR

Fall Semester

		Course	Sem. Hrs.
Ch. E.	520 215	Intro. to Proc. Anal.	4
E. E.	530 204	Circuit Theory II	4
E. E.	530 415	Electronics I	3
			11

Spring Semester

		Course	Sem. Hrs.
Ch. E.	520 430	Transport Phenomena	5
M. E.	560 413	Thermodynamics I	3
		Soc. Sci. or Hum. El.	3
			11

SENIOR

Fall Semester

		Course	Sem. Hrs.
N. E.	580 761	Radiation Det. & Meas.	3
E. E.	530 416	Electronics II	3
		Technical Elective	4
			10

Spring Semester

		Course	Sem. Hrs.
N. E.	580 720	Nuclear Sys. Anal.	3
N. E.	580 762	Nuclear Inst.	4
			7

Electives must be chosen with the advice and approval of the head of the department and the dean.

* Humanities and Social Science electives are to be selected from the list on page 171. Other electives must be chosen with the advice 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.

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:

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.

		Course	*Sem. Hrs.*
B. A.	305 372	Introd. Accounting	5
B. A.	305 305	Managerial Accounting	3
Econ.	225 110	Economics I	3
Econ.	225 120	Economics II	3
B. A.	302 425	Business Law I	3
Com. Sci.	286 315	Fund. of Comp. Prog.	3
B. A.	305 400	Management Concepts	3
B. A.	305 405	Business Finance	3
B. A.	305 440	Marketing	3
B. A.	305 600	Business Policy	3
B. A.	305 602	Business and Society	3
		Field of Business Specialization	12
		Business electives	3

Total hours required 50

Some of the courses listed above may be used to satisfy elective requirements in the engineering curriculum. Since departmental policies on this matter vary, students should consult their faculty advisors.

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 71).

II. Complete the following courses in Geology.

Course		*Sem. Hrs.*
234 430	Historical Geology	4
234 460	Mineralogy I	4
234 461	Mineralogy II	4
234 420	Geomorphology	4
234 530	Structural Geology	4
234 603	Stratigraphic Geology	4
234 640	Field Geology	6
		30

Approved Humanities and Social Science Electives for Students Enrolled in the College of Engineering

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.

Department	Courses
Department of Art	Any course
Department of Economics	Any course above those required
Department of English	Any course above those required
Department of Geology and Geography	Any course in Geography
Department of History and Philosophy	Any course
Department of Modern Languages	Five hours
Department of Music	Any course
Department of Political Science	Any course, except Pol. Sci. 444
Department of Psychology	Any course
Department of Sociology and Anthropology	Any course
Department of Speech	Any course in "Theater and Interpretation"
College of Architecture and Design	Any course in history or appreciation of architecture
College of Commerce	Course No. 400—Administration Course No. 440—Marketing

Two areas should be chosen from those listed above. From each of these areas at least two courses should be taken; however, not more than three credit hours may be taken in applied music and/or applied art.

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 advisors and KSU to ensure a proper selection of courses. Questions should be referred to The Dean's Office, College of Engineering.

Basic Subjects Common to all Curricula

Subject	Credit Hours at KSU
Chemistry	8
Mathematics—(Anal. Geom. & Calc., Diff. Equa.)	16
Physics	10
Statics	3
English Composition	6
Economics	3
Social Science & Humanities Electives (courses in economics, psychology, history, literature, etc.)	15
	61

* These requirements are satisfied upon completion of the B. S. degree in Civil Engineering with judicious attention to the selection of Humanities and Social Science electives.

Other Pre-Engineering Subjects Which Vary with the Curriculum

	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	2		
Organic Chem.		8					
Geology	*		4				
Biology	5						
Accounting	*				3		

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:

Department	Subject
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

Agricultural Engineering

WILLIAM H. JOHNSON,* Head of Department

Professors Fairbanks, Hodges.* Larson,* and Johnson;* Associate Professors Clark,* Lipper,* and Stevenson;* Assistant Professors Baugher, Chung,* Manges,* and Spillman;* Instructors Anderson, McMillan, Murphy, and TenEyck; Emeritus: Professor Fenton.*

Agricultural Engineering is the profession that applies the art of 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.

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.

Courses in Agricultural Engineering

UNDERGRADUATE CREDIT

505 115. Engineering Assembly. (0) I, II. Presentation by students of abstracts and reviews of articles relative to their profession, and reports of engineering projects, industrial experiences, and original investigations conducted by the student branches of the professional engineering societies. Occasionally lectures by practicing engineers and by members of the engineering and university faculties are utilized. One hour of lecture a week, sophomore, junior, and senior years. Members of the engineering faculty.

505 311. Agricultural Engineering Fundamentals I. (3) II. Physical properties of biological materials. Functional requirements of agricultural machines. Two hours rec. and three hours lab. a week. Pr.: Math. 220; Phys. 310.

505 375. Agricultural Hydrology. (3) I. The hydrologic cycle, rainfall, runoff, soil and water relationships affecting crop production, drainage, irrigation, and erosion; watershed surveys. Two hours rec. and three hours lab. a week. Pr. or conc.: Phys. 310 or equiv.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

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.

505 440. Functional Requirements of Agricultural Structures. (3) I. Requirements for storage of agricultural products and for livestock production systems selection and use of materials; control of environment; layout of production systems. Two hours rec. and three hours lab. a week. Pr.: Phys. 311, M. E. 212 or equiv.

505 446. Tractors. (3) II. Theory, design, operation, and adjustment of the internal combustion engine and a comprehensive study of power and its relation to agriculture. Two hours rec. and three hours lab. a week. Pr.: Phys. 311, M. E. 413.

505 466. Analysis 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.

505 480. Soil and Water Conservation. (3) II. Principles and methods of land drainage, soil and water conservation, and irrigation. Two hours rec. and three hours lab. a week. Pr.: Ap. M. 471, Ag. E. 375, C. E. 422.

505 500. Rural Electrification. (3) II. Water supply, sewage disposal, lighting, heating, and ventila-

* Technical elective in the curriculum.

** Important prerequisite course in this curriculum.

tion of farm buildings; refrigeration; rural electrification. Two hours rec. and three hours lab. a week. Pr.: E. E. 403, Ap. M. 471, M. E. 412.

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 hour rec. a week. Pr.: Senior standing.

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.

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.: Aprpoval of department head.

Courses for Students in Agriculture

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.

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) I, II. 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) I, II. Agricultural surveying; layout and checking waterways, terraces and farm ponds; conservation planning from aerial photographs. 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.

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 controling erosion; drainage of agricultural lands. Two hours rec. and three hours lab. a week. Pr.: Agron. 270, Ag. 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. 200 and Ag. E. 651.

Applied Mechanics

PHILIP G. KIRMSER,* Head of Department

Professors Best, Haft,* Kirmser,* and McCormick;* Associate Professors Huang,* Kipp,* and Lindly;* Assistant Professors Crary, Hu and Knostman;* Emeritus: Dean Seaton, 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.

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.

Courses in Applied Mechanics

UNDERGRADUATE 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.

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.

510 421. Highway and Airport Materials and Design. (2) I, II. Pavement thickness design and the examination and testing of materials used in the construction of highways and airports. One hour rec. and three hours lab. a week. Pr. or conc.: Ap. M. 418, or G. E. 351 and C. E. 422.

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.

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.

510 603. Bituminous Materials and Mixes. (3) II. Manufacture of bituminous materials; significance of specifications and tests; selection of bituminous materials for various types of construction; aggregate for bituminous surfaces; design and control of bituminous mixes for highway and airport pavements. Two hours rec. and three hours lab. a week. Pr.: Ap. M. 421.

510 604. Cement and Concrete Technology. (3) I. The raw materials and manufacturing processes of portland cement; cementing components; physical and chemical aspects of the hydration reaction; properties of cement paste; concrete aggregates; principles of design, mixing, and placing concrete; properties of hardened concrete. Two hours rec. and three hours lab. a week. Pr.: Ap. M. 418, 421.

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. M. 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.

510 625. Plastics and Plastic Laminates. (3) II. Formation and structure of polymers; isomerism; relations between structure and engineering properties; modification of structure and properties by external causes; integral reinforcing and plastic concretions; applications. Three hours rec. a week. Pr.: Ap. M. 415; G. E. 351; M. E. 413.

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; two-dimensional 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.

510 721. 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.

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, strain-displacement 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.

Chemical Engineering

DR. L. T. FAN,* Head of Department

Professors Bates, Honstead,* and Kyle;* Associate Professors Akins* and Erickson;* Assistant Professors Hall,* Heymach, Matthews,* 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.

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 our graduate students.

Courses in Chemical Engineering

UNDERGRADUATE CREDIT

520 115. Engineering Assembly.

520 215. Introduction to Process Analysis. (4) I, II, S. An introduction to the basic concepts of chemical engineering. Three hours rec. and three hours lab. a week. Pr.: Chem. 230; Pr. or conc.: Math. 240 and Phys. 311.

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. 215.

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. 215.

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.

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.

520 635. 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.

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, thermal 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 and 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.

Civil Engineering

JACK B. BLACKBURN, Head of Department

Professors Blackburn, Smith,* and Snell;* Associate Professors Aguilar,* Cooper,* Rosebraugh,* and Williams;* Assistant Professors Funk,* Schmid,* and Swartz;* Emeritus: Professors Crawford, Frazier, and Morse.*

The civil engineer designs and builds: structures, including buildings, bridges, tunnels, towers, air frames and space vehicle; 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 above-named types of civil engineering works.

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.

Courses in Civil Engineering

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.

525 331. Analysis of Statically Determinate Structures. (3) I, II. Analysis of statically determinate beams, frames, and trusses; calculation of influence lines and deflections. Three hours rec. a week. Pr.: Ap. M. 415.

525 332. 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. Three hours rec. a week. Pr.: C. E. 331.

525 356. 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.

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 I. (3) I, II. Identification, classification, and engineering properties of soils; compaction, theories of consolidation, slope stability, and ground water flow. Two hours rec. and three hours lab. a week. Pr.: Ap. M. 415, G. E. 351.

525 426. Foundations. (3) I, II. Subsoil investigation, lateral earth pressure and bearing capacity, shallow foundations, piles and pile foundations, and retaining structures. Two hours rec. and three hours lab. a week. Pr.: C. E. 422.

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. 332.

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. 332.

525 452. Hydraulic Engineering. (3) I, II. Application of the principles of fluid mechanics to control and utilization of water; river and flood control, dams, power development, pipe networks; laboratory—fluid measuring devices, hydraulic models, and flow in open channels. Two hours rec. and three hours lab. a week. Pr.: C. E. 356.

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. 356, 452, 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; Pr. or conc.: C. E. 411.

525 485. Civil Engg. Project. (1-3) I, II. A laboratory design or research project on a 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.

UNDERGRADUATE AND GRADUATE CREDIT

525 612. Land Surveying. (3) I. The Law of Evidence applied to land surveying; systems of describing and of transferring real property, rectangular public land system, simultaneous and sequence conveyances, reversion and riparian rights, and deed descriptions. Two hours rec. and three hours lab. a week. Pr.: C. E. 212 and senior standing.

525 614. Advanced Surveying Engineering. (3) I. State coordinate system, control surveys, modern optical tachiometry, resection trigonometric leveling, and hydrographic surveys. Two hours lec. and three hours lab. a week. Pr.: C. E. 212 and senior standing.

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 soil; advanced study of theories of consolidation, lateral earth pressure, bearing capacity, stability of slopes, and ground water flow. Two hours rec. and three hours lab. a week. Pr.: C. E. 422.

525 626. Advanced Foundation Engineering. (3) II. Methods of subsoil investigations; design of sheeting and bracing systems, shallow foundations, piles and pile foundations, bridge abutments, and coffer dams; underpinning, external equilibrium of retaining walls, and control of ground water. Three hours rec. a week. Pr.: C. E. 622.

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. 332.

525 633. Experimental Structural Analysis. (3) II. Application of Muller-Breslau's Principle and Betti's Law to structural models; principles of similitude. One hour rec. and six hours lab. a week. Pr.: C. E. 332.

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.

525 711. Advanced Photogrammetry. (3) II. Photogrammetric optics and camera calibrations; distortions, basic analytic photogrammetry, and advanced instrumentation; analytical orientation techniques for vertical and convergent photography over flat and mountainous terrain; aerial triangulation. Two hours rec. and three hours lab. a week. Pr.: C. E. 411, 614.

525 712. Aerial Surveying, Planning and Estimating. (2) S. Techniques, specifications, ground control and photographic mission planning, restitution and map production, cost estimating and scheduling; cadastral applications. One hour rec. and three hours lab. a week. Pr.: C. E. 711.

525 715. Engineering Astronomy. (3) II. Astronomic systems of coordinates, location of celestial bodies, true and apparent motions. Time, astronomic triangle. Determination of azimuth, longitude, and latitude using geodetic instrumentation. Two hours rec. and three hours lab. a week. Pr.: C. E. 614 or equiv.

525 751. Hydraulics of Open Channels I. (3) I. Description and classification of open channel flow; properties of open channels, types of open channels, velocity distribution, and pressure distribution; energy and momentum principles; critical and uniform flow and gradually varying flow; design of channels for uniform flow. Three hours rec. a week. Pr.: C. E. 452.

525 762. Water Supply and Quality Control. (3) I. An in-depth 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. Origin-destination 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 I. (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.: 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.

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.

525 812. Analytical Photogrammetry. (3) I. Coordinate systems used in analytical photogrammetry, coordinate transformation and measuring instruments: comparators. Camera calibration. Single photograph space resection. Relative and absolute numerical orientation of stereophotographs. Scale transferring and analytical stereophotographic triangulation. Two hours rec. and three hours lab. a week. Pr.: C. E. 711 or equiv.

525 813. Geodetic Surveying. (3) II. Elements of geometrical geodesy and the universal rectangular coordinate system; geodetic triangulation and position computation, vertical datum and geodetic leveling, and elementary geodetic astronomy. Two hours rec. and three hours lab. a week. Pr.: C. E. 614.

525 817. Electronic Surveying. (2) S. Electronic surveying systems, data reduction, geodetic applications, planning and estimating. One hour rec. and three hours lab. a week. Pr. C. E. 614.

525 818. Adjustment of Surveys. (3) II. Accidental error theory, error forecasting, adjustment of independent direct observations, principle of least squares, adjustment of unobserved independent parameters, solution of normal equations, matrices in surveying data adjustment. Two hours rec. and three hours lab. a week. Pr. or conc.: C. E. 813 or consent of instructor.

525 824. Soil Mechanics Applied to Highway Engineering. (3) I. On demand. Application of soil mechanics to highway design subgrade sampling; stability of natural and cut slopes; stability and settlement of embankments and of embankment foundations. Two hours rec. and three hours lab. a week. Pr.: C. E. 622.

525 825. Advanced Soil Testing for Engineering Purposes. (3) II. On demand. Subsurface exploration; unconfined, triaxial, and direct shear tests; permeability, consolidation, and field load bearing tests. One hour rec. and six hours lab. a week. Pr.: C. E. 622.

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 non-symmetric 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. Rapidly varied flow; flow over spillways, hydraulic jump, flow in channels with non-linear alignment and of non-prismatic cross section; gradually and rapidly varying unsteady flow; flood routing. Three hours rec. a week. Pr.: C. E. 751.

525 854. Analysis of Ground Water Flow. (3) I. Hydraulics of steady state and transient flow into wells; well discharge and drawdown; artesian, free aquifer; pumping head; combinations of wells; method of images; parallel drains; seepage flow

through and under earth dams. 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. (1-3) 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.

525 872. Highway Planning and Economics. (3) II. Methods of determining highway travel patterns, highway classifications, and highway needs; estimating future highway needs; economic analysis of planned improvements; highway finance and administration. Two hours rec. and three hours lab. a week. Pr.: C. E. 775.

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.

Electrical Engineering

WELLINGTON W. KOEPSEL,* Head of Department

Professors Koepsel, Ward, Jr.,* and Lucas;* Associate Professors Lenhert,* Harris,* Stirland,* and Wirtz;* Assistant Professors Ahmed,* Bernotski,* Cottom,* Gallagher,* Johnson,* and Kaufman;* Instructors Dollar, Hearn, and Wakabayashi; 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 education 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.

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. Well equipped laboratory facilities are available for conducting original research in all of these areas.

Prerequisite to graduate study in the department 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.

Courses in Electrical Engineering

UNDERGRADUATE CREDIT

530 115. Engineering Assembly. (0) I, II. Lectures by practicing engineers and members of the engineering and university faculties. One hour of lecture a month, sophomore, junior and senior years.

530 391. 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.: Math. 222; Pr. or conc.: Phys. 311.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

530 403. Electric Circuits and Control. (4) I, II. Principles of direct-current circuits and machines, alternating-current 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. 391.

530 405. Circuit Theory III. (3) I, II, S. One and two port network theory. Three hours rec. a week. Pr.: E. E. 404.

530 406. Illumination A. (2) I, II. Systems, calculations, and specifications of interior wiring; principles of illumination. Two hours rec. a week. Pr.: Phys. 211 or 311.

530 415. Electronics I. (3) I, II, S. Fundamentals of electronic devices. Three hours rec. a week. Pr. or conc.: E. E. 404 or Pr.: E. E. 391, N. E. 500.

530 416. Electronics II. (3) I, II, S. Analysis and design of electronic circuits. Three hours rec. a week. Pr.: E. E. 415; Pr. or conc.: E. E. 405. N. E. majors: Pr.: N. E. 500, E. E. 404, 415.

530 417. Electronics III. (3) I, II. Cont. of Electronics II. Three hours rec. a week. Pr.: E. E. 416.

530 419. Electric Circuits and Machines. (4) I, II, S. Theory of magnetic circuits, direct-current circuits and machines, and alternating-current circuits and machines. Four hours rec. a week. Pr.: Phys. 311; Pr. or conc.: Math. 222 or 232.

530 420. Electric Circuits and Machines Laboratory. (1) I, II, S. Experiments on subject matter in E. E. 419. Three hours lab. a week. Pr. or conc.: E. E. 419.

530 423. Electronics and Control. (3) I, II. Theory and application of electronic rectifiers, amplifiers, oscillators, and control circuits. Three hours rec. a week. Pr.: E. E. 419.

530 424. Electronics and Control Laboratory. (1) I, II. Laboratory work to accompany E. E. 423. Three hour lab. on alternate weeks. Pr. or conc.: E. E. 423.

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. Electrical 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. 405, 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. 417, 498, 502.

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; Pr. or conc.: E. E. 520.

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. 391.

530 498. Electromagnetic Theory II. (3) I, II. Cont. of Electromagnetic Theory I. Three hours rec. a week. Pr.: E. E. 497; Pr. or conc.: E. E. 404.

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; Pr. or conc.: E. E. 498.

530 502. Energy Conversion II. (3) I, II, S. Cont. of Energy Conversion I. Three hours rec. a week. Pr.: E. E. 501.

530 520. Control Systems. (3) I, II. Modern control system theory; analysis and design of feedback control systems. Pr.: E. E. 501; Pr. or conc.: E. E. 417.

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.

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. 405, 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) II. Analysis and design of circuits using integrated and discrete circuit components. Three hours rec. a week. Pr.: E. E. 417.

530 640. Design of Switching Circuits. (3) I. Boolean algebra applied to design of switching networks, digital calculating circuits, codes, and translating circuits; sequential relay circuits. 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. 417.

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.

530 665. 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. 520 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.

530 751. Digital Techniques I. (3) II. Combinational and sequential circuits, counters, adders, accumulators, memory devices, digital differential analyzers, and programming of computers. Three hours rec. a week. Pr.: Comp. Sci. 615 or consent of instructor.

GRADUATE CREDIT

530 801. Digital Techniques II. (3) I. The organization and assembly of computer units into a general purpose computer. Three hours rec. a week. Pr.: E. E. 751.

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. Sampled-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 principle 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 information, reliable transmission via unreliable channels, error correcting codes. Three hours rec. a week. Pr.: E. E. 645.

530 821. Noise Theory. (3) I. A 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 Snythesis 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.

General Engineering

RALPH G. NEVINS, Dean

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.

500 115. 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. Members of the engineering faculty.

500 150. Introduction to Engineering. (1) I. History and scope of the engineering profession; educational requisites; fundamentals of engineering methodology; opportunities and challenges. One hour rec. a week.

500 160. Engineering 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.

500 350. Engineering Materials. (2) I, II. Engineering requirements of materials; arrangements of atoms in materials; metalic and ceramic phases and their properties; polymers; multiphase equilibrium and non-equilibrium 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.

500 351. Engineering Materials Laboratory. (1) I, II. Laboratory experiments supplementing G. E. 350. Pr. or conc.: G. E. 350.

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.

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.

Industrial Engineering

FRANK A. TILLMAN,* Head of Department

Professors Konz, Rey,* Smaltz,* and Tillman;* Associate Professors Clifton,* L. Grosh,* Hwang,* Ashour,* Woodard, and Lee;* Assistant Professors Byers, D. Grosh,* Hansen, and Roth; Instructor Nelson; Emeritus: Professors 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.

Graduate Study

The Department of Industrial Engineering offers advanced work leading to the degrees of 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.

Courses in Industrial Engineering

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.

550 221. 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.

550 371. 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.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

550 401. Industrial Management I. (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.

550 441. Engineering Reliability and Quality Assurance I. (3) I, II. Quantitative and qualitative con-

trols 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.

550 511. Production and Inventory Control. (2) 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.

550 522. Tool Engineering. (3) I. 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.

550 552. Job Evaluation 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.

550 571. 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 II. (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.

550 575. 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.

550 581. 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.

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.

550 660. 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, G. 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, G. 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.: G. 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.: G. 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 for 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.

550 742. Engineering Reliability and Quality Assurance II. (3) I, II. 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.

550 762. Advanced Metallurgy. Credit arranged. II. Studies in specialized phases and current concepts of metallurgy. Pr.: G. E. 351.

550 766. Powder Metallurgy. (3) II. Production of powers 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.

550 771. Advanced Industrial Economy Studies. (3) I. The problems of model construction for industrial forecasting. The methods utilized are least squares, regression, exponential smoothing and adaptive fitting. Three hours rec. a week. Pr.: Consent of instructor.

550 781. Problems in Industrial Engineering. Credit arranged. I, II, S. Pr.: Senior or graduate standing in industrial engineering.

GRADUATE CREDIT

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.

550 873. 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-linerization 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.

Mechanical Engineering

PRESTON E. McNALL,* Head of Department

Professors Appl, Bowyer,* Crank,* Duncan,* Flinner,* Hobson, McNall,* Nevins,* Rohles,* Tripp,* and Wood; Associate Professors Azer,* Besch,* Gorton,* Gowdy,* Lindholm,* Messenheimer, Miller,* Sprague,* Turnquist,* and Walker;* Assistant Professors Annis,* Pauli, and Swearingen;* Instructors Ball, Bell, Nash, and Ward; Emeritus: Dean Durland; Professors Brainard, Helander, 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.

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 Uni-

versity. 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.

Courses in Mechanical Engineering

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.

560 218. Graphical Communications II. (2) I, II, S. Continuation of the study of projective geometry; detail and assembly layouts, principally by free-hand sketching; functional dimensioning; charts and graphs. Four hours lab. a week. Pr.: M. E. 212 or equiv.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

560 406. Air Conditioning A. (3) I, II. Principles of heating, cooling, and ventilating: heat transmission; equipment used for heating, cooling and ventilating. Three hours rec. a week. Primarily for students who have not had engineering thermodynamics. Pr.: Phys. 211 or 310.

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 analyses of machine elements—cams, 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 industrial-type 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. 424.

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.

UNDERGRADUATE AND GRADUATE CREDIT

560 608. Advanced Experimental Methods. (3) II. Principles of instrumentation and measurement methods of experimental procedure, data checking and analysis of experimental results. Two hours rec. a week. Pr.: Math. 240, M. E. 535, or consent of instructor.

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. 419; 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 one-dimensional 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. or conc.: 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 non-linear 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.

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 non-linear 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 II. (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.

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.

560 816. 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. Cont. of Advanced Thermodynamics I. Three hours rec. a week. Pr.: M. E. 711.

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, Math. 621 or equiv.

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. Adavnced 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 non-linear 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.

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, and Shultis;* Instructors Iotti and 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. The student may elect an option with special emphasis on the mechanical, chemical or instrumentation aspects of the nuclear field.

As a profession, nuclear engineering requires understanding and competence in many and diverse disciplines. Hence, the 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, the 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.

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 auto- and cross-correlation noise analysis system, a graphite subcritical reactor, a low-level liquid scintillation counting system, NaI(Tl), Ge(Li), Si(Li) gamma-ray spectrometer system, a neutron spectrometer system, a multiparameter pulse-height analysis system and four multi-channel analyzers with pulse-height, 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.

Courses in Nuclear Engineering

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.

580 115. Nuclear Engineering Assembly. (0) I, II. Familiarization with technical publications in nuclear science and engineering, examination of technical writing styles, and review of current events of significance in the nuclear field.

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 war-

fare considerations. Two hours rec. a week. Pr.: Sophomore standing.

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.

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. 670.

580 670. Nuclear Reactor Technology I. (3) I. Mathematical methods in reactor physics, including computer applications, diffusion and slowing down of neutrons; theory of subcritical reactors, criticality conditions and reactor heat transfer. Three hours rec. a week. Pr.: N. E. 450, N. E. 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.

580 691. Nuclear Reactor Technology II. (3) II. Basic theory and problems associated with design, construction, and operation of research and power reactors. Three hours rec. a week. Pr.: N. E. 670.

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 and/or fuel fabrication, and heat transfer. Six hours lab. a week. Pr. or conc.: N. E. 691.

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. 670, 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. 691.

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. 670.

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. 670.

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. 670, 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.

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. 691.

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 B/l, reactor power calibration, auto and cross-correlation 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.

ENGINEERING EXPERIMENT STATION

RALPH G. NEVINS, Dean
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 a biennial report. A copy of the most recent report will be sent free of charge on request.

INSTITUTE FOR ENVIRONMENTAL RESEARCH

RALPH G. NEVINS, Dean and Director
PRESTON E. McNALL, JR., Associate Director
FREDERICK H. ROHLES, JR., Associate Director

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 to thermal 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.

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 can carry out projects and research using the facilities of the Institute and with the assistance of the Institute staff. The Institute is attached, administratively, to the Department of Mechanical Engineering, College of 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 sciences, and education are participating members of the Institute staff. The Institute is organized so that faculty members or students from any department can carry out research in the Institute within its stated objectives.

INSTITUTE FOR SYSTEMS DESIGN AND OPTIMIZATION

RALPH G. NEVINS, Dean
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 June 26, 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.

INSTITUTE FOR COMPUTATIONAL RESEARCH IN ENGINEERING

RALPH G. NEVINS, Dean
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.

ENGINEERING COMPUTING CENTER

RALPH G. NEVINS, Dean
J. J. SMALTZ, Director

The College of Engineering provides an Engineering Computing Center under the direction of the Department of Industrial Engineering. The digital computer used is an I.B.M. 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, COGO, and ECAP are on disk for immediate use. Other processors and many scientific subroutines are available in the Engineering Computing Center 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 I.B.M. 360/50 with much greater capacity and higher operating speeds than are available at the Engineering Computing Center.

NUCLEAR ENGINEERING SHIELDING FACILITY

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 full-scale 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.

NUCLEAR REACTOR CENTER

CURTIS G. CHEZEM, Head, Nuclear Engineering
ROBERT W. CLACK, Director, Nuclear Reactor Facility
N. DEAN ECKHOFF, Director, Neutron Activation Analysis Laboratory

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. It can be used as a controllable source of ionizing radiation and 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.

O.C.D. PROFESSIONAL ADVISORY SERVICE CENTER

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 advisor and a part time assistant. The highly qualified fallout shelter instructors and analysts are faculty members of the University. Advisors 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.

The Kansas Industrial Extension Service

Kansas State University serves as the headquarters for the Kansas Industrial Extension Commission of the Kansas Board of Regents.

The Kansas Industrial Extension Service furnishes technical assistance and is developing a program of continuing education and information service for business, industry, and commerce in Kansas.

The Kansas Industrial Extension Service supervises the Industrial Liaison Representative Program in which representatives of Kansas companies are invited to inform the Industrial Extension Service of their company's interests and desires for technical information and continuing education. Faculty members are appointed to maintain a personal relationship with these manufacturing representatives for the purpose of keeping up to date on mutual interests and programs.

A program of continuing education for engineers and manufacturing employees is administered. Short courses, seminars, work-

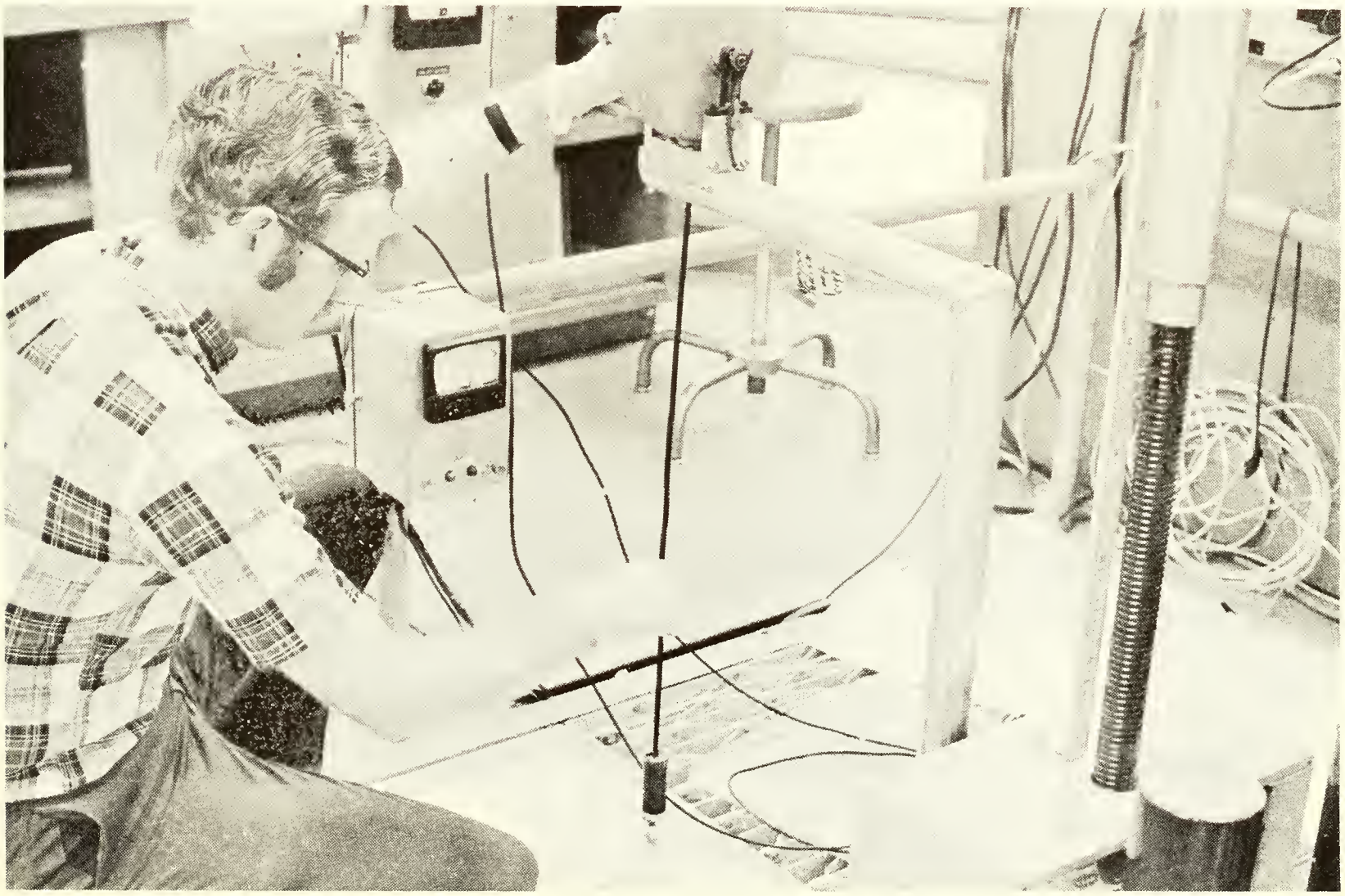
shops, conferences, and a wide variety of educational opportunities are being made available. Facilities of the University are used wherever possible, qualified consultants from outside the State are brought in wherever appropriate, and video tapes are used to aid in instruction.

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, 125 Seaton Hall, Kansas State University, Manhattan, Kansas 66502.

Kansas State University TRIGA Mark II Reactor

The reactor's mosaic, depicting supplicant hands of mankind receiving the blessing of controlled nuclear energy, has attracted nationwide publicity. The modern nuclear reactor is used extensively by undergraduates at KSU and neighboring institutions for research and experimentation in engineering, agriculture, medicine and earth sciences.



The College of Home Economics

DORETTA HOFFMAN,* Dean
RUTH HOEFLIN,* Associate Dean
JEAN REEHLING, Assistant Dean
JEAN SEGO, Assistant to the Dean

Home economics subject matter opens the door to creative approaches in the understanding and solution of the many challenges that face families today. With its primary goal of serving families, the whole world is the realm of activity for home economics. Home economists learn to recognize the many and varied ways in which people react to each other and to their physical and social environment whether in this country or abroad. They learn to understand and to work with the poor and underprivileged, the old and the very young as well as the average and in between age groups. A degree in home economics, based on the application of principles, provides a broad, liberal education along with a specialty that prepares young adults to be professionals in careers for today's immediate use and for the unknown world of tomorrow.

Honors Program and Master's Degree Project

Students with a potential for unusual scholastic attainment are invited to participate in the Home Economics Honors Program. Eligible students have excellent high school records and rank in the upper five percent 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 for the honors program. Honor students have special advisors who 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 semester, 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 that may include unusual educational experiences and preparation for graduate study.

A Degree in Home Economics

Programs of study leading to the Bachelor of Science degree can be planned within the four curriculums offered in the College of Home Economics. These curriculums are designed to meet the needs of students with varying interests. They are listed and described on the following pages.

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 careers as teacher, home economics agent, interior designer, home economist in business or in 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 much the same, so the student has time to study possibilities in all areas in home economics before choosing the best suited to her 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. Courses are offered which lead to the Master of Science and Doctor of Philosophy degrees.

Transfer Students

Careful planning enables a student to transfer to the College of Home Economics at Kansas State University without loss of credit. Potential transfer students should write for a list of required courses in the selected major. Any student who plans to transfer for the junior year should write for suggestions or preferably come for a conference before the start of the sophomore year.

The courses listed below can be transferred to the College of Home Economics. A degree may be earned in two years from Kansas State University by capable students with good academic records who have planned their programs of study previously.

TWO-YEAR PROGRAM WITHOUT HOME ECONOMICS COURSES

Courses	Semester credit hours*
English Composition	6
Speech	2
General Psychology	3
General and Elem. Organic Chemistry**	10
American Govt. or Political Science	3-6
Sociology	3-6
Civilization or World History	3-6
General Zoology or Biology (lab.)	4-5
Economics	3
Modern Language	4-6
Literature	6
Elementary Design (with lab.)	2
Educational Psychology or Child and Adolescent Psychology (if in education)	3
Art Appreciation	3
Electives to bring total to 62 hours	

TWO-YEAR PROGRAM WITH HOME ECONOMICS COURSES

Courses	Semester credit hours*
English Composition	6
Speech	2
General and Elem. Organic Chemistry**	10
General Psychology	3
American Govt. or Political Science	3-6
Elementary Design (with lab.)	2
Foods or Nutrition	3
Human or Family Relations	2
General Zoology or Biology (Lab.)	4-5
Modern Language	4-6
Literature	6
Economics	3
Sociology	3-6
Clothing Construction (if education or clothing and textiles major)	3
Educational Psychology or Child and Adolescent Psychology (if in education)	3
Art Appreciation	3
Electives to bring total to 62 hours	

Curriculum in Home Economics with Options

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

* The credit hours given above apply to courses at 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.

** Textile Research and Foods and Nutrition Science require Chemistry I and II (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 Interior Design and Family and Child Development.

combinations suited to individual needs. Electives may be used to build strong combinations with other fields of interest.

Liberal-General Education Courses, 34 Hours

Communications, 8 Hours

Engl.	229 100	English Composition I	3
Engl.	229 120	English Composition II	3
Spch.	281 105	Oral Communication I	2

Social Science, 6 Hours

Econ.	225 110	Economics I	3
Psych.	273 110	General Psychology	3

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 include 8-12 credit hours, with two courses in sequence plus one additional course.)

Home Economics Core, 12 Hours

I. Des.	611 101	Design for Cont. Living	3
F. C. Dev.	620 250	Human Relations	2
F. Ec.	630 300	Family Economics	3
F. & N.	640 133	Food for Man	2
Gn. H. E.	650 110	Intro. to Home Economics	1
Gn. H. E.	650 300	Home Economics Seminar	1

Professional and Supporting Courses, 58 to 66 Hours

(See specific option)

Unrestricted Electives, 12 to 20 Hours

(See specific option)
For men who take Air or Military Science, the credits will be accepted in lieu of unrestricted electives.

Other

Physical Education (2 semesters) 0

Total for Graduation, 124 Hours

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.

PROFESSIONAL AND SUPPORTING COURSES

R. T. V.	290 152	Radio-TV Speech Procedures	3
R. T. V.	290 160	Survey of Broadcasting	2
R. T. V.	290 225	Radio-TV Continuity	3
R. T. V.	290 326	Intro. to Television	2
R. T. V.	290 661	TV Production	3
R. T. V.	290 745	Broadcasting of Women's Programs	3
		OR	
R. T. V.	290 685	Radio-TV Writing I	

Home Economics Courses, 24*

Area of Concentration ..... (14)
Courses selected from two areas other than concentration ..... (10)

Basic Disciplines, 10*

Courses selected to support home economics areas

Speech and/or Social Sciences, 12**

Option Requirements 62
Unrestricted Electives 16
Curriculum Requirements 46
124

Option in Home Economics Education—Vocational 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 page 154 for admission requirements to teacher education.

PROFESSIONAL AND SUPPORTING COURSES

Biol.	215 198	Prin. Biology	5
		OR	
Biol.	215 205	Gen. Zoology (4)	
Biol.	215 200	Public Health Bact.	3
Chem.	221 110	General Chemistry	5
Chem.	221 190	El. Org. Chemistry WITH	3
Chem.	221 191	El. Org. Chem. Lab.	2
		OR	
Biochem.	020 120	Intro. Org. & Biochem. (5)	
A. & F.	405 202	Educ. Psy. I	3
A. & F.	405 302	Educ. Psy. II	3
A. & O.	410 550	Meth. of Tchg. H. E.	2
A. & O.	410 750	Curriculum in H. E.	3
C. & I.	415 450	Prin. of Sec. Educ.	3
C. & I.	415 477	Tchg. Part in Sec. Sch.	8
C. & T.	610 131	Socio-Econ. of Clothing	2
C. & T.	610 210	Pattern Study and Garment Construction	3
C. & T.	610 260	Textiles	3
I. Des.	611 215	Intro. Interior Design	2
F. C. Dev.	620 325	The Preschool Child	3
F. C. Dev.	620 475	The Adolescent	3
F. Ec.	630 320	The House	3
F. Ec.	630 360	Home Management	2
F. Ec.	630 365	Home Management Lab.	2
F. & N.	640 601	Food Science	3
F. & N.	640 602	Principles of Nutrition	3

Option Requirements 66
Unrestricted Electives 10
Curriculum Requirements*** 46
124

Option in Clothing and Retailing (C. & T.)

Courses prepare students for careers in fashion merchandising in department stores and specialty shops.

PROFESSIONAL AND SUPPORTING COURSES

Art	209 100	Design I	2
Engl.	229 200	English Composition III	3
		OR	
Engl.	229 451	Mod. Engl. Grammar	
Math.	245 100	College Algebra OR	3
B. A.	305 273	Prin. of Acctg.	
B. A.	305 400	Administration	3
B. A.	305 440	Marketing	3
B. A.	305 540	Retailing	3
Chem.	221 110	Gen. Chemistry and	5
Chem.	221 190	El. Org. Chemistry	3
		OR	
Phys.	265 101	Man's Phys. Wld. I (3)	
Phys.	265 102	Man's Phys. Wld. II (3)	
Phys.	265 103	Man's Phys. Wld. I Lab. (1)	
Phys.	265 104	Man's Phys. Wld. II Lab. (1)	
C. & T.	610 131	Socio-Econ. of Cloth.	2
C. & T.	610 210	Pattern Study and Garment Construction	3
C. & T.	610 230	Fashion Merchandising I	3
C. & T.	610 260	Textiles	3
C. & T.	610 395	Window Display	3
C. & T.	610 525	Fashion Store Ser. Lab.	5
C. & T.	610 630	Clothing Economics	3
C. & T.	610 635	Fashion Merchandising II	3
C. & T.	610 650	Intermediate Textiles	3
C. & T.	610 730	History of Costume	3
I. Des.	611 215	Intro. Interior Design	2
		OR	
C. & T.	610 220	Costume Design I	

Option Requirements 58
Unrestricted Electives 20
Curriculum Requirements**** 46
124

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.

* Selected in consultation with home economics faculty adviser.

** Selected in consultation with Radio-TV faculty adviser.

*** Under Liberal-General Education Additional Requirements, take P. Sci. 220 (freshmen and sophomores) or P. Sci. 444 (juniors and seniors) Soc. 211 and 3 hours additional social science at 400 level or above; six hours of literature or language; and Art 100.

**** Under Liberal-General Education Additional Requirements, take Hist. 101 and Psych. 510.

PROFESSIONAL AND SUPPORTING COURSES

Art	209 100	Design I	2
Chem.	221 210	Chemistry I	5
Chem.	221 230	Chemistry II	3
Chem.	221 250	Chemistry II Lab.	2
Chem.	221 350	Gen. Org. Chemistry	3
Chem.	221 351	Gen. Org. Chem. Lab.	2
Chem.	221 444	Quant. Anal. OR	4
Biochem.	020 421	Gen. Biochemistry (3)	
Math.	245 100	College Algebra	3
Mod. L.	253	Modern Language	6
Phys.	265 112	Descriptive Physics	4
Stat.	285 320	Elements of Statistics	3
C. & T.	610 131	Socio-Econ. of Clothing	2
C. & T.	610 210	Pattern Study and Garment Construction	3
C. & T.	610 220	Costume Design I OR	
I. Des.	611 215	Intro. Interior Design	2
C. & T.	610 260	Textiles	3
C. & T.	610 630	Clothing Economics	3
C. & T.	610 650	Intermediate Textiles	3
C. & T.	610 655	Advanced Textiles	3
F. Ec.	630 320	The House OR	3
F. Ec.	630 605	Consumers and the Mkt.	
F. & N.	640 601	Food Science	3
Option Requirements			61-62
Unrestricted Electives			16-17
Curriculum Requirements			46
			124

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.

PROFESSIONAL AND SUPPORTING COURSES

Art	209 100	Design I	2
Art	209 190	Drawing I	2
Art	209 195	Survey of Art Hist. I	3
Art	209 196	Survey of Art Hist. II	3
Art	209 200	Design II	2
Art	209 210	Drawing II	2
Art	209 222	Water Color I	2
Art	209 224	Figure Drawing I	2
Mod. L.	253 131	French I	4
C. & T.	610 131	Socio-Econ. of Clothing	2
C. & T.	610 210	Pattern Study and Garment Construction	3
C. & T.	610 220	Costume Design I	2
C. & T.	610 260	Textiles	3
C. & T.	610 310	Tailoring	3
C. & T.	610 315	Costume Illustration	2
C. & T.	610 320	Costume Design II	3
C. & T.	610 325	Fashion Life Sketch	2
C. & T.	610 395	Window Display	3
C. & T.	610 610	Pattern Dev. Theory I	3
C. & T.	610 615	Design by Draping	3
C. & T.	610 620	Costume Design III	3
C. & T.	610 730	History of Costume	3
I. Des.	611 740	Hist. of Fabric Design	3
Option Requirements			60
Unrestricted Electives			18
Curriculum Requirements*			46
			124

Option in Interior Design (I. Des.)

This option is designed for students who wish preparation for careers as interior designers.

PROFESSIONAL AND SUPPORTING COURSES

Arch.	105 207	Arch. Graphics I	2
Arch.	105 208	Arch. Graphics II	2
Arch.	105 231	Design Analysis	4
Art	209 100	Design I	2
Art	209 190	Drawing I	2
Art	209 195	Survey of Art History I	3
Art	209 196	Survey of Art Hist. II	3
Art	209 200	Design II	2
Art	209 210	Drawing II OR	
Art	209 222	Water Color I	2
Art	209 230	Sculpture I	2
Art	209 260	Design in the Crafts	2
Art	209 265	Ceramics I	2
Art	209 290	Lettering OR	
Art	209 205	Commercial Art Tech.	2
C. & T.	610 260	Textiles	3
C. & T.	610 365	Weaving I	2
I. Des.	611 240	Interior Design I	3
I. Des.	611 245	Contemporary Homes	3
I. Des.	611 340	Interior Design II	3
I. Des.	611 345	Interior Des. Practicum	2
I. Des.	611 640	Interior Design III	3
I. Des.	611 645	Historic Furn. Design	3
I. Des.	611 740	Historic Fabric Design	3
Option Requirements			55
Unrestricted Electives			23
Curriculum Requirements**			46
			124

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.

PROFESSIONAL AND SUPPORTING COURSES

P. Sci.	269 229	American Government***	3
Soc.	277 211	Intro. to Sociology	3
Spch.	281 632	Spch. and Lang. Dev.	3
		Social Science electives at 400 level or above****	9
		Communications elective*****	3
C. & T.	610 131	Socio-Econ. of Cloth. OR	
C. & T.	610 440	Socio-Psych. Aspects of Cloth. (3)	
F. C. Dev.	620 325	The Preschool Child	3
F. C. Dev.	620 350	Family Relationships	2
F. C. Dev.	620 360	Middle Childhood	3
F. C. Dev.	620 375	Family Health	2
F. C. Dev.	620 470	Creative Experiences for Presch. Child	3
F. C. Dev.	620 625	Comm. Res. for Children	3
F. C. Dev.	620 650	Advanced Study of Child.	3
F. C. Dev.	620 660	The Family	3
F. C. Dev.	620 670	Dir. Exper. Early Childhood Education	6
F. C. Dev.	620 675	Parent Education	3
F. C. Dev.	620 780	Problem in Fam. and Child Development	1
F. & N.	640 132	Basic Nutrition	3
F. & N.	640 603	Child Nutrition	3
Option Requirements			61-62
Unrestricted Electives			16-17
Curriculum Requirements***			46
			124

* 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.

** Under Liberal-General Education Additional Requirements, take four hours of physical science and Mod. L. 131.

*** Or P. Sci. 444 (juniors and seniors).

**** Selected in consultation with faculty advisor.

***** Under Liberal-General Education, specified requirements: Biol. 198 and 425; six hours of literature or language.

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.

PROFESSIONAL AND SUPPORTING COURSES

P. Sci.	269 220	American Government*	3
Soc.	277 211	Intro. to Sociology	3
		Social Science electives at 400 level or above**	9
		Communications elective**	3
C. & T.	610 131	Socio-Econ. of Cloth.	2
		OR	
C. & T.	610 440	Socio-Psych. Aspects of Cloth (3)	
F. C. Dev.	620 325	The Preschool Child	3
F. C. Dev.	620 350	Family Relationships	2
F. C. Dev.	620 360	Middle Childhood	3
F. C. Dev.	620 375	Family Health	2
F. C. Dev.	620 475	The Adolescent	3
F. C. Dev.	620 660	The Family	3
F. C. Dev.	620 675	Parent Education	3
F. & N.	640 132	Basic Nutrition	3

(CHOOSE ONE AREA)

Social Welfare

Soc.	277 260	Intro. to Social Work	3
		Additional hours in management; nutrition; community organization, problems and resources; language**	15

Youth Work

Soc.	277 260	Intro. to Social Work	3
		Additional hours in recreation, literature, crafts, special education, music, community programs**	15

Family Life Education

Soc.	277 260	Intro. to Social Work	3
		Additional hours in communications, adult education, family problems and resources, and related areas of home economics	15

Option Requirements	60-61
Unrestricted Electives	17-18
Curriculum Requirements***	46
	124

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.

PROFESSIONAL AND SUPPORTING COURSES

P. Sci.	269 220	American Government*	3
Soc.	277 211	Intro. to Sociology	3
		Social Science electives at 400 level or above**	9
		Communications elective**	3
C. & T.	610 131	Socio-Econ. of Cloth.	2
		OR	
C. & T.	610 440	Socio-Psych. Aspects of Cloth. (3)	
F. C. Dev.	620 325	The Preschool Child	3
F. C. Dev.	620 350	Family Relationships	2
F. C. Dev.	620 360	Middle Childhood	3
F. C. Dev.	620 375	Family Health	2
F. C. Dev.	620 475	The Adolescent	3
F. C. Dev.	620 660	The Family	3
F. C. Dev.	620 675	Parent Education	3
F. & N.	640 132	Basic Nutrition	3
A. & O.	410 605	Extension Organ. & Policies	3
A. & O.	410 752	Methods of Adult Tchg.	3
		Consumer Education Electives**	6
		Mass Communications Skills Electives**	6

Option Requirements	60-61
Unrestricted Electives	17-18
Curriculum Requirements****	46
	124

Consumer Interest Option (F. Ec.)

This option allows 34-35 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.

PROFESSIONAL AND SUPPORTING COURSES

Econ.	225 120	Economics II	3
P. Sci.*	269 220	American Government	3
Soc.	277 211	Intro. to Sociology	3
		Soc. Sci. Electives	9
C. & T.	610 131	Socio-Econ. of Cloth.	2
		OR	
C. & T.	610 260	Textiles (3)	
F. C. Dev.	620 325	Preschool Child	3
		OR	
F. C. Dev.	620 660	The Family	3
F. Ec.	630 200	Family Finance	2
F. Ec.	630 320	The House	3
F. Ec.	630 340	Household Equipment	2
F. Ec.	630 360	Home Management	2
F. Ec.	630 365	Home Management Lab.	2
F. Ec.	630 600	Fam. in Amer. Econ.	3
F. Ec.	630 605	Consumers and the Mkt.	3
F. & N.	640 132	Basic Nutrition	3
		Prof. Electives**	18-19

Option Requirements	61-63
Unrestricted Electives (if F. C. Dev. 620 660 is elected, take F. C. Dev. 620 350	15-17
Curriculum Requirements*****	46
	124

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 commercial companies or press, radio, and TV. This option also provides basic training for those who wish to prepare for research.

PROFESSIONAL AND SUPPORTING COURSES

Chem.	221 110	General Chemistry	5
Chem.	221 190	El. Org. Chemistry WITH	3
Chem.	221 191	El. Org. Chem. Lab.	2
		OR	
Biochem.	020 120	Intro. Org. & Biochem (5)	
Math.	245 100	College Algebra	3
Phys.	265 112	Descriptive Physics	4
		OR	
Phys.	265 211	Physics I and (4)	
Phys	265 212	Physics II (4)	
Math.	245 150	Plane Trig.	3
		OR	
Stat.	285 320	Elem. of Stat.	
C. & T.	610 260	Textiles	3
F. C. Dev.	620 660	The Family OR	3
Soc.	277 646	Sociology of the Family	
F. Ec.	630 200	Family Finance	2
F. Ec.	630 320	The House	3
F. Ec.	630 340	Household Equipment	2
F. Ec.	630 360	Home Management	2
F. Ec.	630 605	Consumers and the Mkt.	3
F. Ec.	630 620	Housing Requirements of Families	2
F. Ec.	630 640	Adv. Household Equip.	3
F. & N.	640 245	Food Science	3
		Prof. Electives**	9-17

Option Requirements	68
Unrestricted Electives (if F. C. Dev. 620 660 is elected, take F. C. Dev. 620 350)	10
Curriculum Requirements******	46
	124

* Or P. Sci. 444 (juniors and seniors).

** Selected in consultation with faculty advisor.

*** Under Liberal-General Education, specified requirements: Biol. 198 and 425; six hours of literature or language.

**** Under Liberal-General Education, specified requirements: Biol. 198 and 425.

***** Under Liberal-General Education Additional Requirements take Math. 100 and Stat. 320.

****** Under Liberal-General Education Additional Requirements, take Biol. 198 and Biol. 450; Soc. 211.

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.

CHOOSE ONE OF THE PROFESSIONAL AREAS I, II, III

Area I—Business Organization

ASI	005 280	Meat Sel. Utiliz., HE	2
Journ.	289 306	Reporting I	3
Journ.	289 610	Family Page	3
FE	630 340	Household Equip.	2
FE	630 605	Consumer & Market	3
FE	630 640	Adv. Household Equip.	3
FN	640 300	Meal Management	3
FN	640 410	Prin. of Food Demon.	2
FN	640 601	Food Science	3
FN	640 602	Principles of Nutrition	3
FN	640 605	Food Research Tech.	3
FN	640 680	Seminar Foods & Nutr.	2
IM	660 600	Quantity Foods	3

Area II—Extension Service

ASI	005 280	Meal Sel. Utiliz., HE	2
Journ.	289 306	Reporting I	3
		OR	
Journ.	289 350	Agri. Journ.	
A. & O.	410 605	Extension Org. & Policy	3
A. & O.	410 752	Methods of Adult Tchg.	3
FE	630 305	Family Finance	2
FE	630 340	Household Equip.	2
FE	630 605	Consumer & Market	3
FN	640 300	Meal Management	3
FN	640 410	Prin. of Food Demon.	2
FN	640 601	Food Science	3
FN	640 602	Principles of Nutrition	3
FN	640 680	Seminar Foods & Nutr.	2
IM	660 600	Quantity Foods	3

Area III—Communication Services

ASI	005 280	Meat. Sel. Utiliz., HE	2
Journ.	289 306	Reporting L & Lab.	3
Journ.	289 316	Reporting II*	3
Journ.	289 320	Prin. of Advertising	3
		OR	
Journ.	289 635	Public Relation	
Journ.	289 330	Editing I	3
Journ.	289 610	Family Page	3
F. Ec.	630 340	Household Equipment	2
F. & N.	640 300	Meal Management	3
F. & N.	640 410	Prin. of Food Demon.	2
F. & N.	640 601	Food Science	3
F. & N.	640 602	Principles of Nutrition	3
F. & N.	640 605	Food Research Tech.	3
F. & N.	640 680	Seminar Foods & Nutr.	2
I. M.	660 600	Quantity Foods	3

SUPPORTING COURSES

Biol.	215 198	Prin. of Biol.	5
Biol.	215 200	Publ. Hlth. Bact.	3
		OR	
Biol.	215 450	General Microbiology (4)	
Chem.	221 110	General Chemistry	5
Chem.	221 190	El. Org. Chem. Lab.	2
		with	
Chem.	221 191	El. Org. Chemistry	3
		OR	
Biochem.	020 120	Intro. Org. & Biochem. (5)	
Phys.	265 112	Descriptive Physics	4
Option Requirements			56-61
Unrestricted Electives			17-22
Curriculum Requirements**			46
			124

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.

PROFESSIONAL AND SUPPORTING COURSES

Biochem.	020 200	Elem. Biochemistry	5
		OR	
Biochem.	020 421	Gen. Biochemistry (3)	
Biol.	215 198	Prin. of Biology	5
Biol.	215 450	Microbiology	4
Biol.	215 425	Human Physiology	4
Chem.	221 210	Chemistry I	5
Chem.	221 230	Chemistry II	3
Chem.	221 250	Chemistry II Lab.	2
Chem.	221 350	Gen. Org. Chemistry	3
Chem.	221 351	Gen. Org. Chem. Lab.	2
Physics	265 112	Descriptive Physics	4
F. & N.	640 300	Meal Management	3
F. & N.	640 601	Food Science	3
F. & N.	640 602	Prin. of Nutrition	3
F. & N.	640 605	Food Research Tech.	3
F. & N.	640 680	Seminar in Foods and Nutrition	2
F. & N.	640 710	Nutr. Throughout Life Cycle	3
		Foods and Nutr. Elective	3
		Home Ec. Elective	3
Option Requirements			58-60
Unrestricted Electives			15-17
Curriculum Requirements***			49
			124

Option in Dietetics and Institutional Management (Ins. M.)

Opportunities are increasing for dietitians or directors of food services in hospitals, college residence halls, school lunch rooms, and cafeterias. Graduates may accept appointments to internships that are accredited by the American Dietetic Association and which lead to membership in that professional organization.

PROFESSIONAL AND SUPPORTING COURSES

A. S.I.	005 280	Meat. Sel. and Util., H. E.	2
Biol.	215 198	Principles of Biology	5
Biol.	215 200	Pub. Health Bacteriology	3
		OR	
Biol.	215 450	Microbiology (4)	
Biol.	215 425	Human Physiology	4
Chem.	221 110	General Chemistry	5
Chem.	221 190	El. Org. Chemistry	3
Chem.	221 191	El. Org. Chem. Lab.	2
B. A.	305 431	Personnel Administration	3
F. & N.	640 300	Meal Management	3
F. & N.	640 601	Food Science	3
F. & N.	640 602	Principles of Nutrition	3
F. & N.	640 605	Food Research Tech.	3
Ins. M.	660 600	Quantity Foods	3
Ins. M.	660 605	Food Production Mngt.	4
Ins. M.	660 625	Quan. Food Pur. & Control	2
Ins. M.	660 635	Food Serv. Equip. & Layout	2
Ins. M.	660 640	Org. & Mngt. of Food Services	3

CHOOSE ONE AREA

Hospital Dietetics

Biochem.	020 200	Elem. Biochemistry	5
A. & O.	410 551	Meth. of Tchg. for Diet. Stu.	3
F. & N.	640 710	Nutr. Life Cycle	3
F. & N.	640 712	Diet. Therapy	3

School and University Food Service

Psych.	273 510	Psych. Business & Ind.	3
B. A.	305 273	Prin. of Accounting	3
B. A.	305 305	Managerial Accounting	3
B. A.	305 400	Administration	3
Option Requirements			61-64
Unrestricted Electives			14-17
Curriculum Requirements****			46
			124

Curriculum in Home Economics with Liberal Arts

B. S. in Home Economics

This curriculum is for the student who wishes to combine a broad liberal arts edu-

* May be waived by consent of instructor.

** Under Liberal-General Education Additional Requirements, take Spch. 225; and an additional six hours social science including Soc. 211; five hours communication electives; six hours humanities.

*** Under Liberal-General Education Additional Requirements, take five hours elective, nine hours humanities, Math. 100 or 220, and an additional six hours social science.

**** See page 196.

cation 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.

Liberal-General Education Courses, 65-68 Hours

Communications				8
Engl.	229 100	English Composition I	3	
Engl.	229 120	English Composition II	3	
Spch.	281 105	Oral Communication I	2	
Social Science				12
Econ.	225 110	Economics I	3	
Psych.	273 110	General Psychology	3	
Electives in Econ., Socl., Anthro., Govt.			6	
Humanities				17-18
Philosophy, Mathematics, Logic			3	
Literature or History			6	
Electives in Humanities			8-9	
Physical Science				8-10
Biological Science				8
Concentration in one subject matter area*				12

Home Economics, 33 Hours

I. Des.	611 101	Design for Contemp. Living	3
F. C. Dev.	620 250	Human Relations	2
F. Ec.	630 300	Family Economics	3
F. & N.	640 133	Food for Man	2
Gn. H. E.	650 110	Intro. to Home Economics	1
Gn. H. E.	650 300	Home Economics Seminar	1

Courses in Home Economics in one of the following areas of concentration 21

a. Clothing, Textiles, and Interior Design. C. & T. 131 (2), C. & T. 260 (3), courses in fashion and interior design, construction and related areas in home economics (16).

b. Family and Child Development: F. C. Dev. 325 (3), F. C. Dev. 350 (2), F. C. Dev. 660 (3), courses in Family and Child Development and related areas in home economics (13).

c. Family Economics: F. Ec. 305 (2), F. Ec. 360 (2), F. Ec. 605 (3), courses in Family Economics and related areas in home economics (14).

d. General Home Economics. F. & N. 132 (3), F. Ec. 350 (2), F. C. Dev. 325 (3) and selected home economics courses (13).

Unrestricted Electives, 24-27 Hours

Other

Physical Education (two semesters) 0

Total for Graduation 124

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 home pages on newspapers, or writing promotional material for businesses and other organizations. The curriculum includes technical journalism courses and a concentration in one field of home economics.

Liberal-General Education Courses, 34 Hours

Communications				8
Engl.	229 100	English Composition I	3	
Engl.	229 120	English Composition II	3	
Spch.	281 105	Oral Communication	2	
Social Science				6
Econ.	225 110	Economics I	3	
Psych.	273 110	General Psychology	3	
Additional Requirements**				20

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 include 8-12 credit hours, with two courses in sequence plus one additional course.)

Home Economics Core, 12 Hours

I. Des.	611 101	Design for Cont. Living	3
F. C. Dev.	620 250	Human Relations	2
F. Ec.	630 300	Family Economics	3
F. & N.	640 133	Food for Man	2
Gn. H. E.	650 110	Intro. to Home Ec.	1
Gn. H. E.	650 300	Home Economics Seminar	1

Professional and Supporting Courses, 62 Hours

Journ.	289 235	Survey of Mass Media	3
		OR	
Journ.	289 660	Journalist in a Free Society	
Journ.	289 306	Reporting I	3
Journ.	289 316	Reporting II	3
Journ.	289 320	Prin. of Advertising	3
Journ.	289 330	Editing I	3
Journ.	289 610	Family Page	3

Home Economics Courses,* 24**

Area of Concentration (14)

Courses selected from two areas other than concentration (10)

Basic Disciplines,* 9**

Courses selected to support home economics areas

12 to 15 Hours Selected from the Following Courses:

Journ.	289 615	Magazine Article Writing	3
		OR	
Journ.	289 620	Interpretation of Cont. Affairs	
Journ.	289 335	Photojournalism I	3
Journ.	289 635	Public Relations	3
		OR	
Journ.	289 630	Public Information Methods	
Journ.	289 455	Ad. Copy and Layout	3
		OR	
Journ.	289 617	Magazine Production	
		OR	
Journ.	289 331	Editing II	
Journ.	289 626	Formation of Public Opinion	3
		OR	
Journ.	289 640	Law of the Press	
		OR	
Journ.	289 606	History of Journalism	
R. TV	290 152	Radio-TV Speech and Procedures	3
		OR	
R. TV	290 225	Radio-TV Continuity	
Journ.	289 358	Publications Management	1
		OR	
Journ.	289 799	Problem in Journalism	
		OR	
Journ.	289 645	Readings in Journalism	

Unrestricted Electives, 16 Hours

Other

Physical Education (two semesters) 0

Total for Graduation 124

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.

Liberal-General Education Courses, 47 Hours

Communications				11
Engl.	229 100	English Composition I	3	
Engl.	229 120	English Composition II	3	
Spch.	281 105	Oral Communication I	2	
		Communications Elective	3	
Humanities Electives				Minimum 3
Social Science				12
Econ.	225 110	Economics I	3	
Econ.	225 120	Economics II	3	
Psych.	265 110	General Psychology	3	
Soc.	277 211	Intro. to Sociology	3	
Biological Science				5
Biol.	215 198	Principles of Biology	5	
Physical Science				10
Chem.	221 110	General Chemistry	5	
Bio-chem.	020 120	Intro. Org. & Bio. Chem.	5	
		OR		
Chem.	221 190	El. Org. Chem. (3)		
Chem.	221 191	El. Org. Chem. Lab. (2)		

* Selected in consultation with faculty adviser.

** Under Liberal-General Education Additional Requirements, take Soc. 211 and P. Sci. 220(freshmen and sophomores) or P. Sci. 444 (juniors and seniors).

*** Selected in consultation with Home Economics faculty adviser.

Professional and Supporting Courses, 56-57 Hours

A.S.I.	005 280	Meat. Sel. and Util., H. E. ..	2
Biol.	215 200	Public Health Bacteriology	3
B. A.	305 273	Prin. of Accounting	3
B. A.	305 305	Managerial Accounting	3
B. A.	305 400	Administration	3
B. A.	305 425	Business Law I	3
B. A.	305 431	Personnel Admin.	3
B. A.	305 440	Marketing	3
I. Des.	611 101	Design for Contem. Living	3
F. & N.	640 132	Basic Nutrition OR	3
F. & N.	640 133	Food for Man (2)	
F. & N.	640 601	Food Science	3
Ins. M.	660 600	Quantity Foods	3
Ins. M.	660 605	Food Production Mngt.	4
Ins. M.	660 625	Quan. Food Pur. and Control	2
Ins. M.	660 635	Food Serv. Equip. and Layout	2
Ins. M.	660 640	Org. and Mngt. of Food Serv.	3
Ins. M.	660 780	Prob. in Inst. Mngt.	3

Choose Three Courses:

Psych.	273 510	Psych. Business & Ind.	3
Journ.	289 635	Public Relations	3
B. A.	305 350	Small Business Operation ..	3
B. A.	305 405	Business Finance	3
B. A.	305 540	Retailing	3
B. A.	305 631	Org. Behavior and Admin. ..	3

Unrestricted Electives, 20-21 Hours

Other

Physical Education (two semesters) 0
Total for Graduation ..... 124 Hours

Clothing, Textiles, and Interior Design

JESSIE A. WARDEN,* Head of Department

Professors Brockman and Warden;* Associate Professor Cormany;* Assistant Professors Craigie,* and Friend; Instructors Bereuter, Braun, Munson, Newby, O'Shea, Peterson and Witt; 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.

Courses in Clothing and Textiles

UNDERGRADUATE CREDIT

610 131. Socio-Economics of Clothing. (2) 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 224, 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.

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. A. 540.

UNDERGRADUATE AND GRADUATE CREDIT

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 fabrics. 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 I. (3) I. The processes involved in planning and controlling the operation of fashion departments. Pr.: C. & T. 230 and B. A. 540 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.

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.

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.

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. (2) I. Refinishing, restyling, upholstering and/or slipcovering furniture; also designing and making draperies and lamp shades. Pr.: I. Des. 240.

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.

611 720. Readings 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.

Family and Child Development

MARJORIE STITH,* Head of Department

Professors Kennedy, McCord* and Stith;* Associate Professor Bollman;* Assistant Professor Smock; Instructors Bailey, Bergen, and Coates; 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 work-

ing 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 Three-Year 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 over-all grade-point average of 2.2 on all work taken at Kansas State University; (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.

Department 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 setting. 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.

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 culturally disadvantaged families and children provides new professional opportunities to the home economist with a graduate degree in child development and family relationships.

Courses in Family and Child Development

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.

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.

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.

620 670. 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 information 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.

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 careers. 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.

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 counseling. 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.

Family Economics

RICHARD L. D. MORSE,* Head of Department

Professor Morse; Assistant Professors Annis* and Rasmussen; Instructors Fasse and Kiemann; 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 family management, its resources in relation to its goals. Undergraduate options are: (1) Consumer Interest, (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, 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 available 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.

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. (2) 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. (2) 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. Four hours rec. and 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, and consent of department head.

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. Field trip out of town. 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. (2) 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. Six hours rec. and lab. a week. Field trips. Pr.: F. Ec. 320, 340; senior or graduate standing.

630 630. Household Equipment Theory. (3) I, S. Analytical study of appliance design, performance and evaluation concepts for application in consumer decision-making. Not open 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. 752 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 affairs. Pr.: C. & I. 550 or A. & O. 752 and F. Ec. 300 or consent of instructor.

630 715. Advances in Consumer Economics. (3 or 2) 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.

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. Ec. 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.

Foods and Nutrition

LUCILLE WAKEFIELD,* Head of Department

Distinguished Professor Caul; Professors Finkelstein,* Harrison,* Tinklin,* and Wakefield;* Associate Professors Browning* and Fryer;* Assistant Professors Bowers* and Newell; Instructor Funchess; Emeritus: Associate Professor 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 foods 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. 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.

Courses in Foods and Nutrition

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. (2) 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 Food 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.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

640 402. Food Product Development and Control. (3) I, or II. Food product concept, feasibility and evaluation. Pr.: 3 cr. foods or consent of instructor.

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.

UNDERGRADUATE AND GRADUATE CREDIT

640 601. Food Science. (3) I, II, S. Preparation of foods as related to their chemical, physical, and organoleptic properties. One hour rec. and six 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 personnel involved in action programs for nutrition; methods for determining and implementing nutrition education programs. Pr.: F. & N. 132, or 602; or consent of instructor.

604 610. 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 socio-economic and cultural groups during life cycle. Pr.: Three hours sociology, nutrition course, 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.

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 socio-psychological 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.

General Home Economics

DORETTA HOFFMAN,* Head of Department

Professors Hoeflin and Hoffman;* Assistant Professor Reehling; Instructors Moxley and Sego; Emeritus: Professor Kramer;* Assistant Professor Barnes.**

Courses in General Home Economics

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.

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.

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.: Consent of instructor.

The Merrill-Palmer Program

Selected graduate and undergraduate students may attend Merrill-Palmer Institute in Detroit for one fall semester, earning up to 16 hours of credit. All plans must be approved in advance by the Dean of the College of Home Economics.

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.

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: thesis, report, or 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 159, 160. Graduate faculty members in Home Economics Education serve as major advisers for those students who select this area as their major.

Institutional Management

GRACE M. SHUGART,* Head of Department

Professor Shugart; Associate Professors Riggs and Zeigler;* Assistant Professor 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 Restaurant Management and a Bachelor of Science in Home Economics for students majoring in Dietetics and Institutional Management.

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 stu-

dents majoring in institutional management at this University.

A well-designed laboratory furnished with hotel-and restaurant-sized 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.

Courses in Institutional Management

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 Management 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.

UNDERGRADUATE AND GRADUATE CREDIT

660 600. Quantity Foods. (3) II. Menu planning in food services; principles and methods of preparing food in quantity, emphasizing importance of standardized recipes and use of institutional equipment as related to physical layout. One hour rec. and six hours lab. a week. Pr.: F. & N. 601.

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.

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.

The College of Veterinary Medicine

CHARLES E. CORNELIUS,* Dean
DONALD M. TROTTER,* Associate Dean
LEE T. RAILSBACK, Assistant to the Dean

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 pre-veterinary 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 with the process of selection. In general, no requests for admission 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, (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.

Pre-Veterinary Medical Requirements

The pre-veterinary medical work may be pursued at Kansas State University in the College of Arts and Sciences (Page 71) or the College of Agriculture (Page 28) or in any approved junior college or university.

Course	Sem. Hrs.
English Composition I	3
English Composition II	3
Social Science Electives	6
Chemistry I	5
Chemistry II	3
Chemical Analysis	4
General Organic Chemistry	5
Prin. Animal Science	3
Animal Science & Industry	1
Oral Communications	2
Humanities Electives	6
Physics I and II	8
Trigonometry	3
General Zoology	4
Genetics	3
Dairy Science	1
Poultry Science	1
Electives*	2-4
Total Semester Hours	64

A Kansas State University student who completed the pre-veterinary curriculum in the College of Arts and Sciences or the College of Agriculture is 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.)

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 University Library on campus.

FEES FOR VETERINARY MEDICAL STUDENTS

Assessments

Per semester (16 weeks or more if enrolled in more than six hours)

	Kansas Residents or Staff Members	*Non-residents*
1. Incidental	$227.00	$535.00
2. Student Health	20.00	20.00
3. Student Union (Building fund)	4.00	4.00
4. Student Union Annex I	3.50	3.50
5. Student Union Annex II	5.00	5.00
6. Student Activities (incl. Union operations)	14.25	14.25
7. Stadium Bonds	4.25	4.25
Total for Veterinary Medical Students	$278.00	$593.00

Curriculum in Veterinary Medicine

Doctor of Veterinary Medicine

The Curriculum in Veterinary Medicine at Kansas State University was established to give the young men 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 which 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 M. S. and Ph. D. degrees.

Curriculum in Veterinary Medicine

For admission to this curriculum, consult the previously listed "Pre-veterinary Medical Requirements."

The carefully planned two or two and one-half 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.

FIRST PROFESSIONAL YEAR

Fall Semester

		Course	Sem. Hrs.
Physi.	740 630	Physio. Chem.	2
Biochem.	020 421	Biochemistry	3
Physi.	740 600	Gross Anatomy I	7
Physi.	740 610	Micro Anatomy I	5
Physi.	740 140	Vet. Orientation	1
			18

Spring Semester

		Course	Sem. Hrs.
I. D.	720 610	Vet. Microbiol. I	5
Physi.	740 605	Gross Anatomy II	5
Physi.	740 615	Micro. Anatomy II	3
Physi.	740 635	Physiology I	5
			18

SECOND PROFESSIONAL YEAR

Fall Semester

		Course	Sem. Hrs.
A. S. I.	005 240	Livestock Feeding	3
I. D.	720 620	Vet. Microbiol. II	5
Physi.	740 645	Physiology II	5
Path.	730 603	Gen. Pathology	5
			18

Spring Semester

		Course	Sem. Hrs.
Physi.	740 670	Pharmacology	6
Path.	730 610	System. Pathology	5
I. D.	720 675	Clinic. Pathology	3
I. D.	720 695	Parasitology I	3
Surg.	750 610	Propaedeutic Med.	2
			19

THIRD PROFESSIONAL YEAR

Fall Semester

		Course	Sem. Hrs.
Surg.	750 695	Toxicology	4
I. D.	720 697	Parasitology II	3
Surg.	750 605	Surgery I	3
Surg.	750 630	Medicine I	5
Surg.	750 640	Radiology I	2
Surg.	750 700	Clinic I	2
			19

Spring Semester

		Course	Sem. Hrs.
Physi.	740 620	Anatomy III	2
Surg.	750 615	Surgery II	8
Surg.	750 650	Medicine II	7
Surg.	750 710	Clinic II	2
			19

FOURTH PROFESSIONAL YEAR

Fall Semester

		Course	Sem. Hrs.
B. A.	305 101	Fund. Bus. Professional People	2
I. D.	720 751	Public Health I	4
Path.	730 757	Avian Medicine	3
Surg.	750 670	Medicine III	6
Surg.	750 725	Clinical Med. I	4
			19

* Number depending on selection of other courses.

Spring Semester

		Course	Sem. Hrs.
Surg.	750 720	Therapeutic Nutri.	3
I. D.	720 753	Public Health II	3
Surg.	750 665	Lab. Animal Med.	3
Surg.	750 690	Medicine IV	6
Surg.	750 735	Clinical Med. II	4
			19

Infectious Diseases

E. H. COLES,* Head of Department

Professors Coles, Kelley,* Leland,* and Lindquist;* Associate Professors Burroughs,* Minocha,* and Osbaldiston;* Assistant Professors Moore* and Ridley.*

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.

Courses in Infectious Diseases

UNDERGRADUATE AND GRADUATE CREDIT

720 610. Veterinary Microbiology I. (5) II. Morphology, biology, classification and culture of bacteria; 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. Study of the pathogenic bacteria, viruses and fungi as 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, S. in even years. 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.: Second-year 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 anthropod and protozoan parasites 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 College of Veterinary Medicine or consent of instructor.

720 697. Veterinary Parasitology I. (3) I. Study of the helminth parasites—nematodes, cestodes, trematodes and acanthocephalans—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. On sufficient demand. 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 Hygiene. (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 Techniques 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.

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, S. in odd years. 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.: Path. 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.

Pathology

S. M. DENNIS,* Head of Department

Professors Dennis and Cook;* Associate Professors Anthony,* McGavin,* Smith,* and Strafuss;* Assistant Professor Gray; Instructors Miles, Munger, and Rapp.*

Basic courses in pathology are offered for students enrolled in the veterinary medicine curriculum. Instruction is by lecture, recita-

Number of hours required for graduation: Pre-veterinary, 64; professional, 149; total, 213.

tion, 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 and systemic pathology.

Courses in Pathology

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. (5) 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.

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.

Physiological Sciences

EMERSON L. BESCH,* Head of Department

Professors Cornelius, 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 degree Doctor of Philosophy in the field of Physiology and to the degree Master of Science in anatomy and in physiology.

A combined Anatomy-Physiology course is offered for undergraduate and graduate students outside the field of veterinary medicine.

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.

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.

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, chicken, 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.

740 665. 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.

740 670. 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 Biocheme. 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.

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 even-numbered years and each S. Pr.: Consent of staff.

740 850. Anatomical Techniques. (1 to 2) I of odd-numbered 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.

Surgery and Medicine

J. E. MOSIER,* Head of Department

Professors Mosier, Butler,* and Noordsy;* Associate Professors Anderson,* Frey,* Guffy,* Oehme,* and Wallace;* Assistant Professors Berry, Brandt, Carnahan, Gelatt,* Harris, Jernigan, Johnson,* Milleret, and Taussig; Instructors Blauch, Henry, Kruckenberg, Schoneweis, 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 the 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 Univeristy.

Good library facilities, adequate physical equipment, and an abundance of cases offer excellent resources for research in surgery and medicine.

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.

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 in odd numbered years. The study of transplantation of tissues and associated problems. Pr.: D. V. M. degree or consent of staff.

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 or consent of instructor.

Courses in Medicine

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.

UNDERGRADUATE AND GRADUATE CREDIT IN MINOR FIELD

750 400. Diseases of Wildlife. (3) II. Infectious and non-infectious diseases of birds, fur-bearing animals, zoological animals, and fish, with reference to methods of prevention and control. Pr.: Biol. 205, Biol. 220.

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.: 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. Twenty-two 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 I. (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.

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.

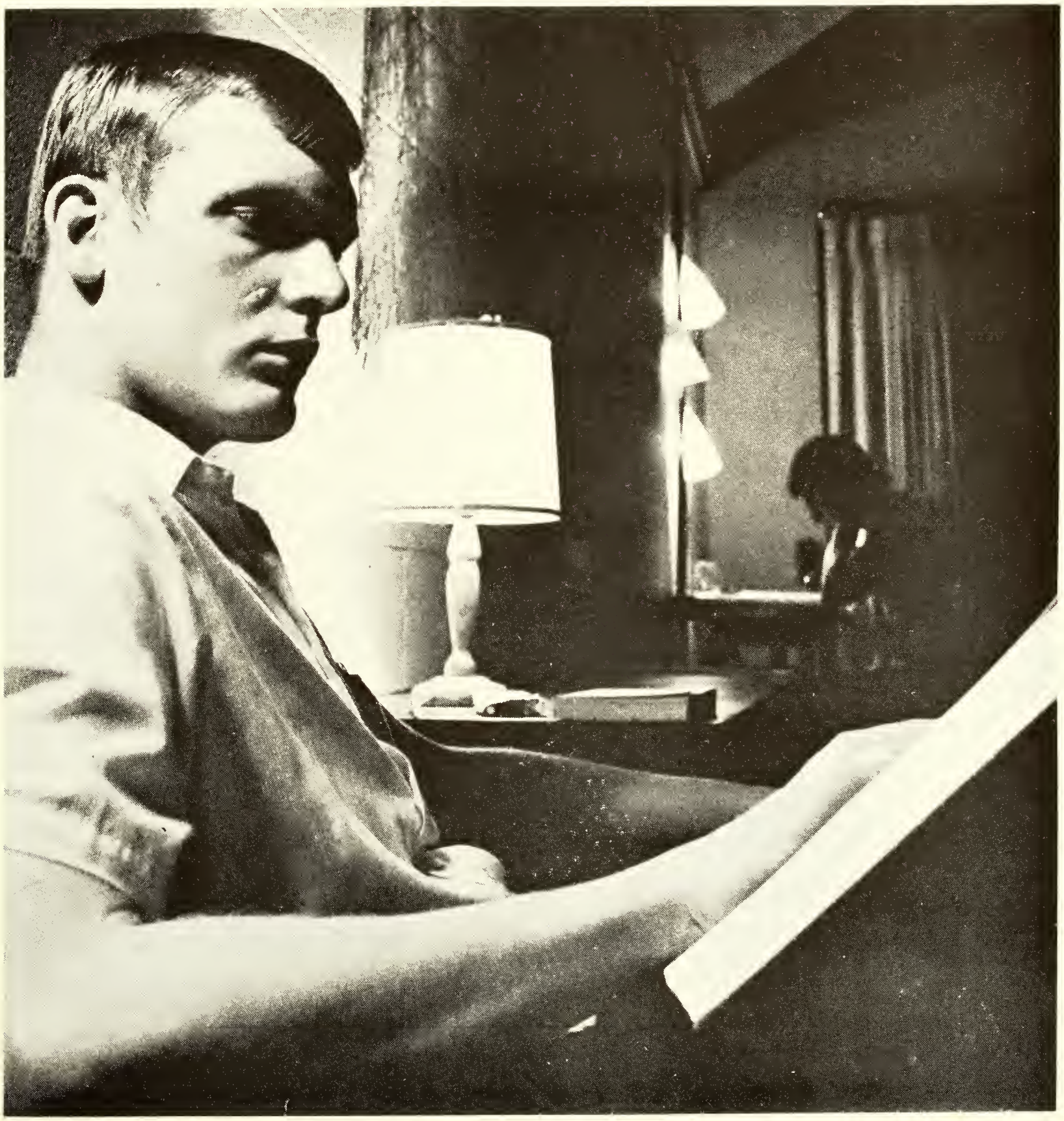
750 835. Interpretation of Radiologic Studies of Body Systems. (4) II in odd numbered years. The rationale of radiologic procedures are studied and the interpretation of radiographs of body systems emphasized. Pr.: D. V. M. degree or consent of instructor prior to registration.

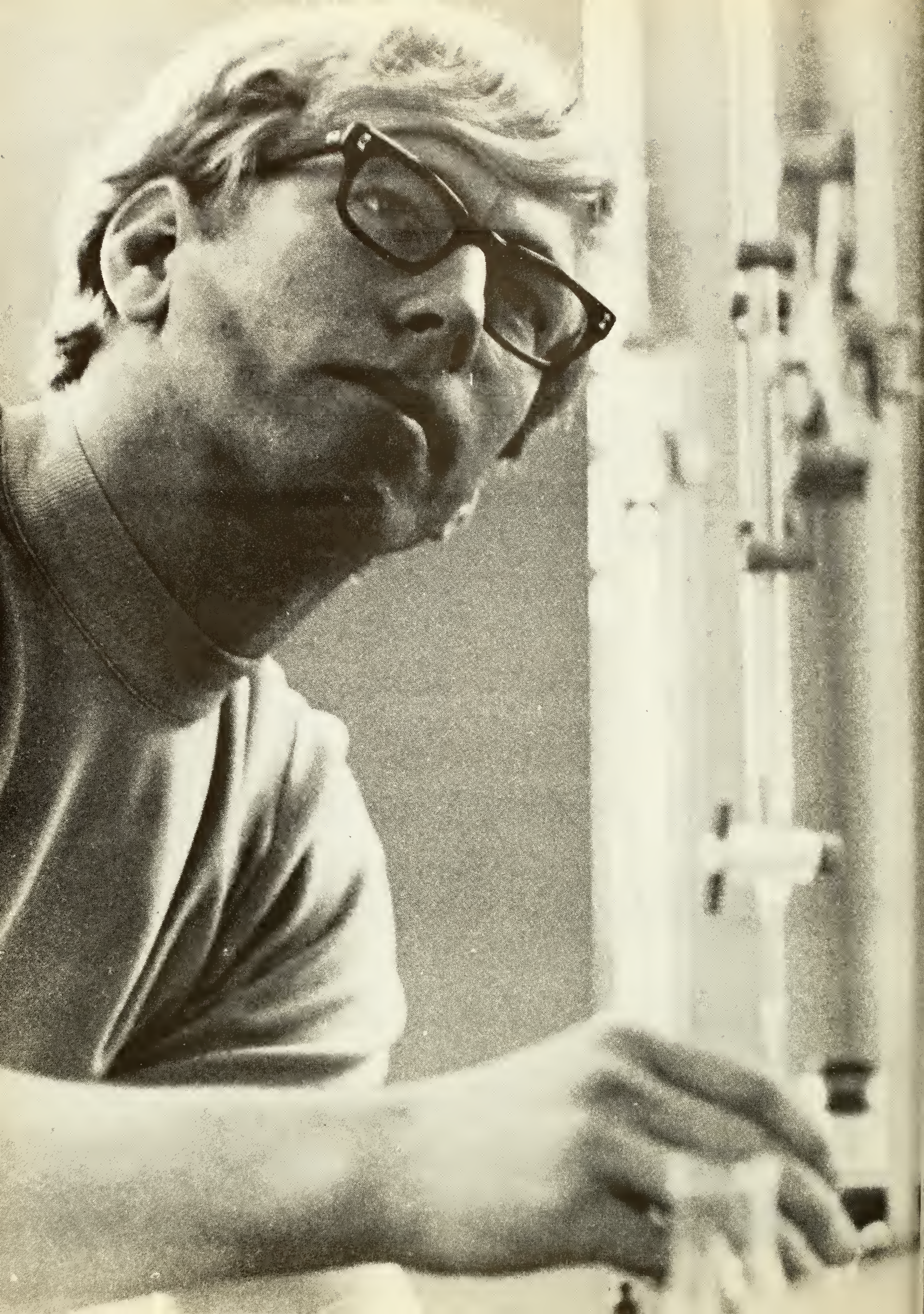
750 840. Comparative Gastroenterology. (3) II in even numbered years. A comparative medical study of the etiopathogenesis, diagnostic criteria and treatment of gastroenteric disorders in the canine, equine, porcine, and bovine species. Comparable disorders in man are discussed. Pr.: D. V. M. degree.

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.

750 890. 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.





The Graduate School

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.

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 stu-

dents' 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, and the Bureau of General Research specifically serves the Colleges of Arts and Sciences, Commerce, and Education.

General Information

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 at 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 assur-

ing 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.

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 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 page 13.

Graduate Study by Seniors. A senior at KSU who is within two semesters of receiving his bachelor's degree may enroll for one or more courses for graduate credit. 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.

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 1 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 9 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.

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 nine years prior to receiving a Ph. D., require validation either by repeating the course or by passing an advanced course in the subject area, or by successfully completing a validation examination. The method of validation is

determined by the department concerned, and validation is to be completed at least two weeks before the student's final oral examination.

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 60 hours of graduate work, but substantial experience or training may be substituted for 15 hours of this requirement if approved by the faculty in Regional and Community Planning and the Dean of the Graduate School.

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 of 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 in the program of study and on submission of a dissertation to the Dean of the Graduate School the candidate is given a final examination as the 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 $20.00.

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.

Student Organizations
See page 22.

Graduate Student Housing
See page 19.

Graduate Loans
See page 20.

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 half-time 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.

Offerings of the Graduate School

Major Fields for Master of Science

Major work leading to the degree Master of Science is offered in the following fields:

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
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
Mathematics
Mechanical Engineering
Microbiology
Music
Nuclear Engineering
Parasitology
Pathology
Physical Education
Physical Science Teaching
Physics
Physiology
Plant Pathology
Poultry Science
Psychology
Statistics
Surgery and Medicine
Technical Journalism

Major Fields for Master of Arts

Major work leading to the degree Master of Arts is offered in the following fields:

Art
Economics
English
Geography
History
Mathematics
Modern Languages
Music
Philosophy
Political Science
Radio and Television
Sociology
Speech

Major Fields for Master of Architecture

Major work leading to the degree Master of Architecture is offered in the following fields:

Architectural Design
Architectural Structures
Interior Architectural Design

Master of Landscape Architecture

Major work leading to the degree Master of Landscape Architecture is offered in the College of Architecture and Design.

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 College of Architecture and Design.

Major Fields for Doctor of Philosophy

Major work leading to the degree Doctor of Philosophy is offered in the following fields:

Agronomy
Animal Breeding
Animal Nutrition
Applied Mechanics
Biochemistry
Biology
Chemical Engineering
Chemistry
Economics (Agricultural)
Economics (Arts and Sciences)
Education
Electrical Engineering
English
Entomology
Food Science
Foods and Nutrition
Genetics
Geochemistry
Grain Science
History
Horticulture
Industrial Engineering
Mathematics
Mechanical Engineering
Microbiology
Nuclear Engineering
Parasitology
Pathology
Physics
Physiology
Plant Pathology
Psychology
Statistics

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.

Animal Breeding

R. R. SCHALLES, Chairman

Professors Craig, Farmer, Gier, Huston, and Wheat; Associate Professors Kiracofe and Smith; Assistant Professors Ames, 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:

Reproductive Physiology

Anatomy
Embryology
Cytology
Histology
Endocrinology
General Physiology

Reproductive Physiology
Biochemistry
Statistics
Research Techniques
Genetics

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.

Animal Nutrition

PAUL E. SANFORD,* Chairman

Professors Bartley, Koch,* Parrish,* Richardson, Sanford,* Smith, Underbjerg, and Ward; Associate Professors Adams, Brent, Drake, Harbers, and Morrill; Assistant Professors Ames, Beecher, and Hines; Instructor Frey.**

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 upon graduate study in Animal 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.

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 cr. 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 10 cr. hrs. equivalent; (4) Statistical Methods 520, 521 or equivalent; (5) Special Anatomy 625 (min. 2 hrs.); (6) histology, Biology 415; (7) seminar; (8) tool courses (min. 3 hrs.) 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.

Biochemistry

R. E. CLEGG,† Chairman

Professors Burkhard,† Clegg,† Lark, H. L. Mitchell, Nordin, Parrish, and Ruliffson; Associate Professors Clarenburg and Hedgcoth;† Assistant Professors Beecher, B. Cunningham, Klopfenstein, and Mueller.

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 or 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.

* Members of the Animal Nutrition Coordinating Committee.
† Members of the Biochemistry Executive Committee.

Food Science

HAROLD J. TUMA,* Chairman

Professors Caul, Claydon, Clegg, Deyoe, Fan, Farrell, Finkelstein, Greig, Harrison, Hoover,* J. Johnson, Kyle, H. L. Mitchell, Parrish, Pfost,* Shugart, Tinklin, Tsen, Wakefield, and Ward; Associate Professors Bassette, F. Cunningham,* L. Erickson, B. Fryer, Kropf, Lineback, and Tuma;* Assistant Professors Allen, Beecher,* Bowers, Brent,* Iandolo,* Mickelsen,* Middleton, Miller, and R. J. Robinson.*

Graduate work leading to the degrees Master of Science 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.

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

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

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

Genetics

THAD PITTENGER,† Chairman

Professors Craig,† Eisenstark,† Hall,† Heyne, Huston,† and Pittenger;† Associate Professors Barnett, Casady, Fisher, McCracken,† Smith, Wassom, Wheat,† and Wolstenholme; Assistant Professors Liang, Nassar,† Reiter, and 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 made up of faculty from participating departments which not only sets the academic requirements for degrees but

* Members of the Food Science Coordinating Committee.
† Members of the Genetics Coordinating Committee.

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.

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.

Parasitology

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.

Pathology

A. L. BURROUGHS, Chairman

Professors Coles, Dennis, Kelley, Leland, and Lindquist; Associate Professors Anthony, Burroughs, McGavin, Minocha, Osbaldiston, J. Smith and Strafuss; Assistant Professor W. Moore.

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, sys-

temic 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.

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 strengthen 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 32 hours of graduate level courses. The nature of the final examination will be governed by the program chosen.

Physiological Sciences

M. R. FEDDE,* Chairman

Professors Bartley, Cornelius, Farmer, Gier, Koch, Underbjerg, Ward, and Wakefield; Associate Professors Besch, Clarenburg, Fredde,* Hopkins, Kropf, J. Mitchell, Morrill,* Oehme, Osbaldiston and Upson; Assistant Professors Ames, Cardinet,* Gronwall, Kiracofe,* Westfall, 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, 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 (Biochem. 655, 656, 665, and 666 or the equivalent); physical chemistry; gross and microscopic anatomy (Anat. 700 and Biology 415 or the equivalent); systemic physiology (Physi. 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 below). The student is also encouraged to obtain experience in the teaching laboratory in one or more of the areas of physiology.

No foreign language is required for this degree.

Following is a selected list of elective courses:

Animal Science and Industry

Research Techniques in Reproduction
Analytical Techniques in Animal Science and Industry

Biochemistry

Biochemistry of Toxic Materials
Lipids
Vitamins
Intermediary Metabolism
Nucleic Acids
Hormones
Proteins
Chemistry of Carbohydrates
Enzyme Chemistry
Enzyme Laboratory

Biology

Advanced Cell Biology I and II
Comparative Anatomy of Vertebrates
Embryology
Human Physiology
Zoological Microtechniques
Principles of Zoophysiology
Comparative Embryology
Cytology
Physiology of the Sense Organs
Endocrinology
Experimental Endocrinology
Comparative Physiology of Animals
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

* Members of the Steering Committee.

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

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.

Regional and Community Planning

VERNON P. DEINES,* Chairman

Professors Blackburn, Douglas, Ealy,* Emerson, Friedmann,* Hill, Kelley,* Miles,* Montgomery, Morse,* O'Fallon, Pine, Secher,* Smith and Wright; Associate Professors Deines,* Edmonds, Erickson, McGraw, Rosebraugh, and Siddall;* Assistant Professors Barnes, Bollman, Day, 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 Graduate Curriculum in Regional and Community Planning which is staffed by faculty from 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 the traditional one-year Master of Arts, Master of Science, or Ph. D. degree in their undergraduate discipline or profession with a minor in planning.

Operational sub-committees for curriculum development, professional relations, public service, and research include other faculty and student members from the University.

Typical courses in the program include the following:

Agricultural Economics
Land Resource Conservation
Seminar in Land Economics

Architecture
Advanced Environmental Seminar
Theory of Design

Civil Engineering
Economics of Design and Construction
Planning Engineering
Urban Transportation Analysis I and II
Air Photo Interpretation
Traffic Engineering I and II

Commerce
Administration
Business and Society

Computer Science
Computer Organization and Planning
Programming Systems
Programming Languages

Economics
Intermediate Economic Analysis
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

Geography
Urban Geography
Geography of Transportation
Resource Utilization and Economic Development

Geology
Applied Geology

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

Landscape Architecture
Site Planning and Analysis
Seminar in Ecology
Community Planning

Mathematics
Set Theory and Logic
Determinants and Matrices

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

* Members of the Interdepartmental Committee.

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
Rural Politics
Administrative Policy Making
The Politics of Developing Nations
Administration in Developing Nations
Seminar in Public Policy and Decision Making

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 Societal and Institutional Dynamics
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

Technical Journalism
Formation of Public Opinion
Public Relations

The Division of Cooperative Extension

FLOYD W. SMITH, Acting 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 who are not enrolled as resident students of the University. The principal purpose of these programs is that of disseminating up-to-date, practical information developed through research and experimentation to this and other institutions and to encourage the adoption and use of such information.

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 that many of the 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 people participating in the Cooperative Extension program is also expanding and now includes urban and suburban people as well as farm families with whom the original program in agriculture, home economics, and 4-H Club work was developed.

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 members of the faculty are not commonly re-

ferred 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 to and from Kansas State University.

Extension Teaches in Many Ways

The methods of instruction used by Extension workers are quite informal when compared to classroom methods. 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.

Extension Stimulates Community Action

Extension workers may assist people to work together as a group for a common goal that is not attainable to the individual such as: organizing county-wide campaigns to control diseases, pests and weeds; to conserve soil and moisture in an entire watershed; to 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.

Extension Takes People to the University

Extension agents acquaint many people with the work of the University by organizing and conducting groups to visit the University and its branch experiment stations and fields. Many of the 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-H Round-up.

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 and serve as the local source of information regarding the programs of all other governmental agencies affecting agriculture such as the Soil Conservation Service, Rural Electrification Administration, Farm Credit Administration, Agricultural Stabilization and Conministration.

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 personnel, organized under several departments.

Extension Specialists

Highly trained specialists are stationed at the University and in area offices in different parts of the State. These specialists assist the county Extension agents in helping to solve problems for individuals that arise in the specialists' particular field. They also train the county Extension agents in the 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.

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.

Office of Extension Information

E. D. WARNER, Extension Editor and Associate State Leader

Professor Warner; Associate Professors Dexter, Graham, Parris, and Unruh; Assistant Professors Cozart, Medlin, Peck and Tennant; Instructors Dierking, Koons, and Peterson; Extension Assistant Sullins.

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 mediums of communication. 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 homemaking for an improved agricultural industry. All means of communication are utilized in the dissemination of information for the benefit of both rural and town people.

Scientific information, as written in popular version by the departmental staff, is channeled through all practical means of communication, including newspapers, printed publications, circulars and posters, printed annual reports, exhibits, motion pictures, 2 x 2 slides, radio and television.

Each week some 400 weekly newspapers of the state, the farm press, and daily newspaper outlets are provided with news stories on research work of the Kansas Agricultural Experiment Station.

County 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 that will acquaint people of Kansas with the projects being carried.

Each year over three million copies of timely, popular Extension Service, experiment station, USDA publications and other printed materials are printed and distributed.

A limited library of motion pictures and 2 x 2 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.

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, Ketch, Kuehn and Nagel; Assistant Instructor Frank; Extension Assistant Marrs.

Radio is divided into two phases: broadcasting programs over KSAC, an institution-owned, non-commercial, educational station; and broadcasting script and recorded services and live programs over more than 80 cooperating commercial radio stations in Kansas and on our borders.

Station KSAC, the University radio station, is used exclusively for the dissemination of informative and cultural programs produced by this institution and other educational agencies. 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 all-University programs, while 50 percent 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 broadcast 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 off-campus groups with educational objectives are produced on a fee basis.

Agricultural Production, Management, and National Resource Development

The departments listed below include those members of the Extension staff who conduct and supervise programs in agricultural production and management education throughout the state. The programs are developed in cooperation with the county Extension agents and the residents of the counties through their designated leaders.

Agricultural Economics

Farm Management

PAUL L. KELLEY, Head of Department

NORMAN V. WHITEHAIR, Assistant Head of Department

Professors Kelley and Whitehair; Associate Professor Thomas; Assistant Professors Figurski, Langemeier, McReynolds, Overley, Schlender, Treat, and Whipps; Instructors Appleby, Collins, DeLano, Dickson, Faidley, Frederick, Germann, Greene, Guy, Hackler, Herod, Kepley, Mullen, Olson, Parker, Pretzer, Reimer, Smerchek, Stielow, Trayer, and Urban.

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 intensive 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 so 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 and encourages the adoption of same.

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. Workshops are conducted, in-depth, in cooperation with the production specialists and county agents.

Special educational efforts include the educational needs of the agri-related businesses, i.e., bankers, PCA managers, machinery dealers, feed and supply firms, etc.

Extension Agronomy

RAYMOND V. OLSON, Head of Department
FRANK G. BIEBERLY, Section Leader

Professors Bieberly, Jones, Olson; Associate Professors Harper, Hyde, Nilson, Peterson, Whitney, and Wilkins; Assistant Professors Edelblute, McMaster, and Tobin; Emeritus: Professors 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 intepret 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 over-all 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.

Extension Animal Science and Industry

DON L. GOOD, Head of Department
WENDELL A. MOYER, Section Leader

Professors Good and Moyer; Associate Professors Francis, McAdams, Phar, and Zoellner; Assistant Professors Ahlschwede, and Westmeyer; Emeritus: Professor Elling.

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.

Extension Dairy and Poultry Science

CHARLES L. NORTON, Head of Department

Professor Norton; Associate Professors Adams, Bonewitz, and Jackson; Assistant Professor Dunham.

Dairy Science

The Extension specialists in dairy science provide educational dairy information to enable Kansas families to effectively participate in community, state, national and interna-

tional 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.

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 the people in the poultry industry.

Extension Entomology

HERBERT C. KNUTSON, Head of Department

Professor Knutson; Associate Professor Gates; 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-H entomology project is designed to teach the interrelation of insects and the environment as well as the identification of insects.

Extension Horticulture and Forestry

RONALD W. CAMPBELL, Head of Department
HAROLD G. GALLAHER, Assistant Head of Department

Extension Horticulture

FRANK D. MORRISON, Section Leader

Professor Campbell, Associate Professor Morrison; Assistant Professor Nighswonger; Instructors Jones, Leuthold.

Programs in Extension horticulture serve a broad segment of people who are interested in horticulture plants. Some may be interested in fruit, nut or vegetable products for commercial sales or food for personal use. There is wide interest in the use of plant materials to create a more desirable environment with turfgrass, flowers, shrubs, and trees. Some people use horticultural plants for therapeutic purposes as they pursue a hobby or exercise and relax in caring for plants.

The subject matter areas in Extension horticulture include fruits, nuts, vegetables, turfgrass, flowers, shrubs, ornamental and shade trees and landscape architecture. Assistance is available to homeowners and commercial producers, such as nurseries, florists, greenhouse operators, vegetable, fruit and nut growers. Programs are also developed for public and private concerns such as park departments, schools, cemeteries, municipalities, highway departments, industrial parks and golf clubs.

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.

State and Extension Forestry

HAROLD G. GALLAHER, State and Extension Forester

Professor Gallaher; Associate Professor Strickler; Assistant Professors Biswell, Deutsch, Gaylor, Grey, 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 forestry-related areas. Landowners receive assistance in management and marketing of their timber. Assistance is also 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, 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 Hiawatha, Parsons, Hutchinson, and Hays.

Extension Plant Pathology

JOHN F. SCHAFER, Head of Department

Professors King and Shafer; Associate Professor Willis.

The purpose of the work by Extension specialists in plant pathology is to keep the people of Kansas informed about diseases and 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 the rural and urban people by news articles in local papers, radio, television, meetings, field and home visits, and office and phone calls.

Extension Veterinary Medicine

CHARLES E. CORNELIUS, Dean
HOMER K. CALEY, Section Leader

Professor Cornelius; Associate Professor Caley.

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.

Extension Wildlife Management

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 non-game 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, boat handling and water safety schools.

Special emphasis is placed on the ecological act 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 K-State radio network; KARD, KAKE, and KTVH television stations and their satellite networks.

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.

Extension Engineering

LEO T. WENDLING, State Leader and Acting Head of Department

Professors Herpich and Wendling; Associate Professors Holmes, Schindler, and Selby; Assistant Professors Jepsen and Shuyler.

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 county 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 assists with the development and planning of 4-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.

Marketing and Utilization of Agricultural Products

Agricultural Economics

PAUL L. KELLEY, Head of Department
NORMAN V. WHITEHAIR, Assistant Head

Professors Coppersmith, Kelley, Trieb, and Whitehair; Associate Professors Jackson, Richards, and Walker.

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, etc. 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.

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.

Extension Home Economics

SHIRLEY A. WHITE, Head of Department

Professor White; Associate Professors Dickinson, Ellithorpe, Johnson and Wiggins; Assistant Professors Anderson, Atkinson, Brill, Carlson, Guthrie, Howe, Wells, Miller, Pass, Redeker, Spoon, and Starkey; Instructors Slinkman and Schaaf; Emeritus: Professors Allen, Koenig, Myers, and Smurthwaite; Associate Professor Self, Assistant Professor Briggs.

Extension educational work in home economics is carried on in counties through organized study groups, public meetings, press, radio, television, and self-teaching materials. Definite programs are pursued throughout the year by the Extension homemaker units and other organized women's groups, 4-H Clubs, and special interest groups. Educational materials prepared by the specialists and by county Extension home economists are used by local leaders in their respective communities.

The programs of work for the various groups in the counties are based on local situations in the communities. They evolve through community and committee meetings and include the development of activities pertaining not only to the home and to the community but also to international problems. All Kansas counties have appropriations for Extension home economics work with 117 home economist positions.

4-H and Other Youth Programs

GLENN M. BUSSET, Head of Department

Professors Busset and Apel; Associate Professors Daugherty, Eyestone, Hanna, and Honstead; Assistant Professors Area, Bates, and Borst; Instructors Crandall and Coen.

4-H work is an 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-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, discussions. Adult leaders counsel with the 4-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-H member. The leaders and members work in cooperation with the county Extension agents.

In addition to approximately 35,000 boys and girls enrolled in 1,050 4-H Clubs, another 5,000 boys and girls have had one or more 4-H educational learning experiences as special 4-H members. The 4-H program nationally has more than 27 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; hence, the 4-H program was broadened to include not only projects of a farm and home nature, but many activities such as health, music, conservation of wildlife and natural resources, recreation, parliamentary practices and art. The present 4-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-H work around the world, is the 4-H International Farm Youth Exchange. Kansas 4-H members have lived for periods of up to six months 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.

Community and Resource Development

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, Frazier, Olsen, Smythe, and Vacin; Instructor Kirgsley.

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. A major objective 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 nonfarm employment and strengthen community services.

Educational programs in public affairs and policies are conducted.

County Extension Operations

Professors Norby and Ross; Associate Professors Cox, Hoss, King, and Mann; Assistant Professors Appleby, Blankenhagen, Crist, Neufeld, and Schroeder.

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 office include county Extension director, county Extension agricultural agent, county Extension home economist, county Extension 4-H agent, and county Extension horticultural agent. The professional people 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 people 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.

Division of Continuing Education

HAROLD J. ALFORD, Director

Professor Alford; Assistant Professors Harold, Miller, Mordy, and Williamson; Instructors Deyoe, Dieckhoff, Reichow, Richardson, Swegle, Triplett, and Hummel; Itinerant Teachers Larsen and Savage; Emeritus: Professors Billings and Pattison.

The Division of Continuing Education was established to help meet the increased demands of a changing society for greater educational opportunities beyond the campus, in response to rapidly developing patterns for a coordinated state-wide extension program in Kansas, and to recent federal legislation.

The purposes of the Division of Continuing Education are to provide:

1. University work for adults whose regular academic program has been interrupted.
2. Technical, professional and postgraduate continuing education.
3. Citizenship training for civic literacy and public responsibility.
4. Continuing opportunities for cultural, intellectual, physical and emotional development.
5. Family life and consumer education.
6. Urban and community development, including research on a wide range of urban problems.
7. Labor education.
8. International education.
9. Assistance to, and cooperation with, a wide range of adult education agencies—public and private; local, national and international; compulsory and voluntary.

To carry out these purposes, the work of the Division is divided into the following areas:

Office of Community Services
Office of Conferences and Short Courses
Office of Extension Classes
Office of Research and Development

Office of Community Services

It is the function of this office to help Kansas communities improve the conditions of community life by offering programs of adult continuing education which help prepare citizens for civic responsibilities.

Instructional programs presented through the Office of Community Services are conducted by resident faculty members from the appropriate academic departments, or by instructors approved by those departments. The office has no instructional staff of its own.

The Office of Community Services is currently concerned with advising and assisting communities to prepare for the future through community and regional planning. The specific activities are included in the following description.

Education in Community Problem Solving—This involves administration of the University's projects under Title I of the Higher Education Act of 1965 which include:

1. Short course training in community planning nad development.
2. Conferences on how to organize for community problem solving.
3. Providing for the application of research findings to the problems of Kansas communities.
4. Cooperation in the community service programs of local colleges.

The Office of Community Services cooperates with local governments and organizations to plan for the University's participation in the adult educational programs they desire.

Office of Conferences and Short Courses

A successful conference involves an effective interchange between participants and resource people as the result of timeliness and relevancy of content, knowledge of subject and skill in presentation by resource people, appropriate recruitment of participants and smooth coordination of physical and fiscal detail through the cooperation of everyone involved.

The Office of Conferences and Short Courses, Division of Continuing Education, Kansas State University, is dedicated to the design and delivery of successful conferences to meet the Continuing Education needs of the University and the community.

Conference Proposals. Proposals for a conference will normally originate when a University faculty member or department identifies a need in his particular discipline or constituency, when an individual or group seeks help from the University for a specific problem or when the Division of Continuing Education, itself, identifies a University or community need that it feels can best be met by utilizing the educational tool of a conference or short course.

A faculty member wishing to originate a proposal for a conference should confer with his colleagues and his department head to see what kind of interest they have in the idea. If the department is interested in sponsoring the conference, either the individual faculty

member or the department head (depending on that department's policies) should contact the Conference Office as early as possible in the preliminary discussions so that an experienced conference coordinator can assist in each step of planning.

When a request comes to the University from a community group or individual, a conference coordinator will discuss the idea with an appropriate academic department or administrative unit head. If the department sees merit in the suggestion and wishes to consider sponsoring the event, the conference coordinator will arrange preliminary meetings with the originating community group or individual.

When the Division of Continuing Education, itself, is the originator of a conference proposal, a staff member will consult first with appropriate academic department or other administrative unit heads to see whether any of them wish to join in sponsoring the conference.

Organization. Whatever the source of the conference proposal, the essential planning ingredient is a planning committee. When a single department is the sponsor, this committee is selected by the conference coordinator and the sponsoring academic department head or his designated representative. In other cases, the committee is selected by the conference coordinator in consultation with appropriate University and community representatives. The committee should designate a chairman to work closely with the conference coordinator throughout subsequent planning, presentation and follow-up phases.

Conference planning then becomes the joint responsibility of the chairman and the coordinator. The chairman usually assumes major responsibility for program content and instruction, but he should also have concern for publicity and for the financial stability of the conference. The coordinator assumes primary responsibility for the administrative details of the conference, including such items as finances, physical facilities, teaching equipment and devices and registration procedures. He also must be concerned with development: design, content and instruction.

Office of Extension Classes

The Office of Extension Classes is responsible for the following activities:

Extension Classes. Extension classes are college-level courses offered on a credit or non-credit basis to fulfill educational needs in communities throughout the state. These classes are usually offered as a result of the expressed need for an educational program in a community. Instruction can be provided in several ways.

Instructors may be persons in the community who are approved by the K. S. U. academic department as qualified to instruct the subject matter.

On-campus instructors may travel to off-campus locations to conduct classes.

Instruction can be extended from the campus via a system of two-way amplified voice contact and two-way writing capability. Using this system, specialized instruction may be offered to groups throughout the state, using on-campus resource people. Regular on-campus classes may also be extended off-campus using the system.

Extension Course Offerings. In addition to many courses listed by the academic departments of the University, the Division of Continuing Education may offer the following courses on an extension class basis:

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) Cont. 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) Cont. 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 who 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) Cont. of CAR 11.

CAR 13. Sculpture I. (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 I. (2) Cont. of CAR 13.

Kansas Rural-Urban Art Program. KRUAP, conducted in cooperation with the College of Architecture and Design, is a program of personal and cultural improvements centered around appreciation for and involvement in art. The program is centered around both credit and non-credit classes, regional art shows and critiques, the publication of an art newsletter and a state-wide amateur art exhibition.

Home Study. By action of the Board of Regents, correspondence instruction in Kansas at the state institutions of higher education was consolidated into the Extramural Independent Study Center, University of Kansas, Lawrence, Kansas 66044. Full and complete information about correspondence study opportunities in Kansas is available from the Division of Continuing Education, Room 317, Umberger Hall.

University Speakers. The office receives and processes requests for speakers, from individuals or groups in the state.

Civil Defense Training Program. The following courses and seminars are offered as part of the program of Civil Defense Training and are sponsored by the Department of Defense:

Radiological Monitoring for Instructors
Radiological Defense Officer I
Shelter Management for Instructors
Civil Defense Management
Plans and Operations I
Emergency Operations Simulation Training
Seminar in Emergency Preparedness for Public Officials
Seminar in Emergency Preparedness for Business and Industry

In general, this program is responsible for the technical Civil Defense training throughout Kansas.

Rural Electric Job Training and Safety Program. This program is a joint training venture of the Kansas Electric Cooperatives, Inc., the Kansas State Board for Vocational Education and Kansas State University. The program provides training in the fields of power generation, transmission and distribution. A majority of this training is conducted in the field. However, each year several week-long training sessions are conducted on the KSU campus.

Office of Research and Development

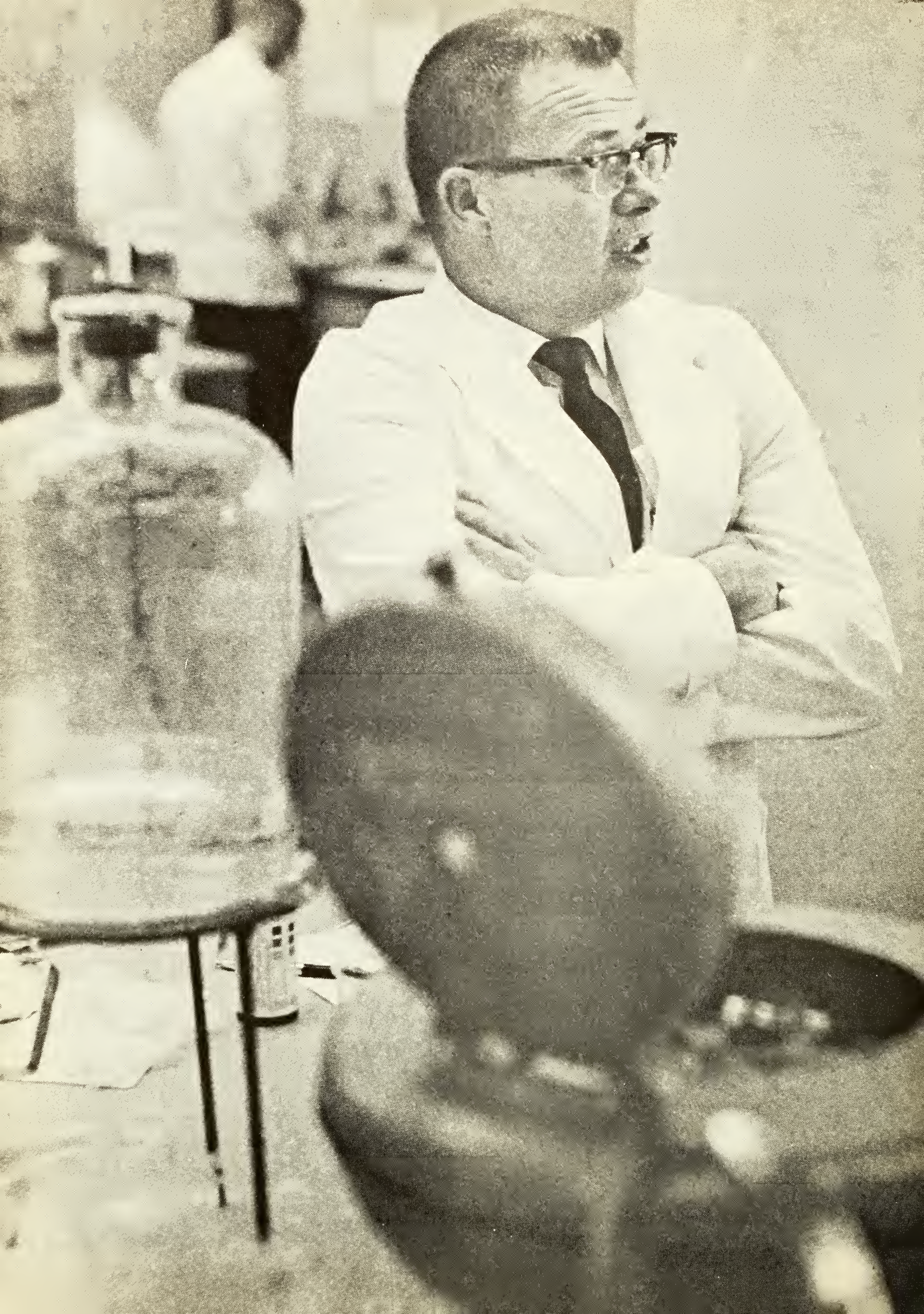
This office is the facilitating link between the people of Kansas and the University. Its purpose is to be sensitive to the educational needs of Kansans; then to call upon the academic resources of the University to fulfill these needs through extension classes, conferences, community services, media teaching, or innovative new approaches as the situation requires.

Research and Development fulfills the following areas of responsibility within the Division of Continuing Education:

1. Research and data gathering necessary to determine the continuing education requirements of Kansas and the Midwest.
2. Development and initiation of educational and informational programs to fill the continuing education needs of Kansas and the Midwest.
3. Coordination with federal and state agencies and private foundations to secure support for new research projects and continuing education programs, and maintain contact as the projects develop.
4. Coordination of new continuing education programs and research developments with other educational institutions such as junior colleges, colleges and universities.
5. Coordination of newly developing continuing education programs with appropriate University administrators and faculty.
6. Acquisition and interpretation of administrative research and data needed by the Office of the Director of Continuing Education.

Research and Development carries on an active research and development in the area of communication-aided instruction as it applies to continuing education. A communication-aided instructional system is presently being developed between Kansas State University and various junior colleges throughout Kansas. These systems are intended to strengthen the Continuing Education capability of Kansas State University as well as the junior colleges. Systems such as these overcome the travel distance and time problem and, therefore, make the resources of Kansas State University available to a bigger segment of Kansas.

The communication-aided instruction systems presently being utilized are centered around "tele-lecture" and tele-writer" equipment and concepts. Other areas of research and development of present concern include computer-aided instruction, dial access tape retrieval and electronic video recording.



Officers of Administration, Instruction, and Research

Officers of Administration

Includes only those with rank of instructor or above.

AKIN, JAMES N., Associate Director of Career Planning and Placement (1966). B. S., 1960, M. S., 1964, Kansas State University.

AMEEL, HENRIETTA R., Assistant Professor, University Library (1960). A. B., 1930, Coe College; A. B. in L. S., 1935, University of Michigan.

BAEHR, WILLIAM FREDERICK, Professor Emeritus, University Library (1943, 1969). B. S. in L. S., 1927, M. A., 1930, University of Illinois.

BARTON, JEAN L., Instructor, University Library (1968). B. A., 1965, Washington University; M. L. S., 1969, Drexel Institute of Technology.

BAXTER, MABEL GERTRUDE, Instructor Emeritus, University Library (1916-47, 1957).

BEATTY, DANIEL D., Business Manager, Professor of Business Administration (1956, 1959). A. B., 1947, Hope College; M. B. A., 1949, University of Michigan.

***BECK, GLENN H.**, Vice President for Agriculture (1936, 1965). B. S., 1936, University of Idaho; M. S., 1938, Kansas State University; Ph. D., 1950, Cornell University.

BERGEN, GERALD R., Director, Aids, Awards and Veterans Service (1965, 1969). B. S., 1958, M. S., 1967, Kansas State University.

BIEBER, IDA R., Instructor, University Library (1968). B. A., 1946, University of Kansas; M. S., 1963, University of Wisconsin.

BLACKBURN, RICHARD D., Director, Kansas State Union (1963). B. S., 1950, Kansas Wesleyan University; M. P. S., 1956, University of Colorado.

BONEBRAKE, CASE A., Administrator of Physical Plant (1947, 1967). B. S., 1947, B. S., 1955, Kansas State University.

BOOKER, JERELYN S., Acting Assistant Dean of Students, Instructor (1969). B. A., 1966, M. A., 1969, Howard University.

BRETTELL, J. ALLAN, Assistant Dean, Foreign Student Adviser, Assistant Professor (1966). B. S., 1949, M. S., 1951, Westminster College.

BURTON, RUTH ANN, Instructor, University Library (1969). B. A., 1964, Allegheny College; M. S., 1969, Kansas State Teachers College.

BUTLER, NORVILLE L., Associate Professor, Student Health Center (1964). B. A., 1931, Nebraska Wesleyan University; M. D., 1940, College of Medicine, University of Nebraska.

CAMP, MILDRED, Associate Professor Emeritus, University Library (1927, 1955). A. B., 1912, Eureka College; B. L. S., 1924, University of Illinois.

***CHALMERS, JOHN**, Vice President for Academic Affairs, Professor of Economics, (1963, 1969). A. B., 1938, Middlebury College; Ph. D., 1943, Cornell University.

CLARK, ELIZABETH D., Instructor, Counseling Center (1968). B. S., 1963, M. S., 1966, Kansas State University.

COOL, VINCENT J., Assistant Professor of Architecture; Assistant Vice President for Planning (1957, 1967). B. S., 1951, Kansas State University; Registered Architect, 1952.

COON, CAROLYN A., Residence Hall Director, Instructor (1967). B. B. A., 1964, University of Iowa.

COPPERSMITH, DORIS H., Instructor, Counseling Center (1969). B. S., 1948, Western Kentucky University; M. S., 1969. Kansas State University.

DALLAM, JERALD, Assistant Director of Records, Instructor (1968). B. S., 1959, Northwest Missouri State College; M. S., 1965, Oklahoma State University.

***DANSKIN, DAVID G.**, Director, Counseling Center, Professor Psychology & Education (1959, 1966, 1968). A. B., 1950, University of Redlands; M. A., 1951, Ph. D., 1954, Ohio State University.

DAVIS, ELIZABETH HAMILTON, Associate Professor Emeritus, University Library (1920, 1958). A. B., 1909, McMurry College for Women; B. L. S., 1911, University of Illinois.

DE ORDIO, JOSEPH P., Instructor, Counseling Center (1968). B. A., 1964, M. Ed., 1968, University of Rochester.

DODGE, THEODORE O., Director, Budget Office, Assistant Professor (1946, 1957). B. S., 1940, Kansas State University; C. P. A., 1954, Kansas.

DOMITZ, GARY, Instructor, University Library (1967). B. A., 1966, M. S. L. S., 1967, Kansas State Teachers College.

***EDELMAN, SHELDON K.**, Associate Professor and Assistant Director, Student Counseling Center (1967). B. A., 1952, University of Illinois; M. A., 1956, Roosevelt University; Ph. D., 1960, Purdue University.

EDWARDS, A. THORNTON, Director of Housing and Food Service, Associate Professor of Psychology (1945, 1949). B. S., 1941, M. S., 1946, Kansas State University.

ELKINS, RICHARD NELSON, Associate Director of Admissions, Instructor (1966, 1968). B. S., 1956, M. S., 1963, Kansas State University.

FARLEY, RICHARD A., Director of Library, Professor (1966). B. A., 1940, Northland College, B. L. S., 1941, University of Wisconsin; M. S., 1952, Ph. D., 1967, University of Illinois.

***FARRELL, FRANCIS DAVID**, President Emeritus (1918, 1943). B. S., 1907, Utah State Agricultural College; Agr. D., 1925, University of Nebraska; LL. D., 1943, Washburn Municipal University.

FERGUSON, JANNA M., Instructor, University Library (1969). B. A., 1964, Tulane University, M. L. S., 1966, University of Michigan.

FLOWERS, HENRY M., Instructor, Student Health (1966). B. A., 1948, Greenville College; M. A., 1957, Wichita University.

FORD, KENNEY LEE, Alumni Secretary Emeritus (1928). B. S., 1924, M. S., 1932, Kansas State University.

FOSTER, DONALD E., Director of Records (1965, 1968). B. S., 1960, M. S., 1961, Kansas State University.

FRITH, THOMAS J., Assistant Dean of Students, Residence Hall Program Director; Assistant Professor (1965). A. B., 1960, M. A., 1963, Ed. S., 1965, University of Iowa.

GEISSLER, VERNON V., Assistant Director of Career Planning and Placement (1966). B. S., 1942, M. S., 1966, Kansas State University.

GERRITZ, ELLSWORTH M., Dean of Admissions and Records, Professor (1954, 1962). B. E., 1938, St. Cloud State Teachers College; M. S., 1948, Ph. D., 1951, University of Minnesota.

GILDSETH, BRUCE L., Assistant Dean of Students, Assistant Professor (1968). B. A., 1962, Augsburg College; M. A., 1966, Ph. D., 1968, University of Minnesota.

GREGORY, MARGARET T., Instructor, University Library (1969). B. S., 1968, University of Kansas; M. S., 1969, Kansas State Teachers College.

HAINES, RICHARD D., Assistant Professor, University Information (1967). B. S., 1958, Kansas State University.

***HAJDA, JOSEPH**, Director of International Activities, Associate Professor of Political Scence (1957, 1965, 1960). B. Pol. Sci., 1948, Charles University, Prague (Czechoslovakia); A. B., 1951, M. A., 1952, Miami University; Ph. D., 1955, Indiana University.

HATHAWAY, JAMES C., Assistant Professor, Unversity Library (1967). B. S. Ed., 1962, Kansas State College at Pittsburg; M. S., 1964, Kansas State Teachers College.

HESS, H. DEAN, Executive Alumni Secretary (1961). B. S., 1950, Kansas State University.

HEYWOOD, KENNETH M., Director, Endowment and Development (1956). B. S., 1938, Kansas State University; M. A., 1949, University of Wyoming.

***HOYT, DONALD P.**, Director, Office of Educational Research, Professor (1968). B. S., 1948, University of Illinois; M. A., 1950, Ph. D., 1954, University of Minnesota.

HUBBLE, JAYNE N., Instructor, Counseling Center (1967). A. S., 1964, Vincennes University; B. S., 1966, Purdue University; M. S., 1967, Indiana State University.

JUBELT, HILBERT P., Director, Student Health Center, Physician (1961). B. S., 1941, University of Illinois; M. D., 1943, University of Illinois, College of Medicine; 1950, American Board of Pediatrics.

KASPER, EUGENE C., Dean of Students, Associate Professor of Education (1968). B. S., 1956, M. S., 1956, Kansas State Teachers College; Ed. D., 1963, University of North Dakota.

KAUPP, BEVERLY JANE, Instructor, Counseling Center (1967). B. S., 1964, Fort Hays State College; M. S., 1967, Kansas State University.

***KENNEDY, CARROLL EARL**, Assistant Director of Counseling Center, Associate Professor of Family and Child Development (1954, 1966). A. B., 1949, Wheaton College; M. S., 1953, Kansas State University; Ed. D., 1963, University of Maryland.

KEPPLE, MELVIN T., Instructor, Director, Data Processing Center (1967). B. S., 1950, Washburn University of Topeka.

KERR, WENDELL ROBERT, Assistant to Director of Housing; Assistant Professor of Education (1947, 1957). B. S., 1947, M. S., 1957, Kansas State University.

***KRUH, ROBERT F.**, Dean of the Graduate School, Professor of Chemistry (1967). A. B., 1948, Ph. D., 1951, Washington University (St. Louis).

LACY, JR., BURRITT S., Consulting Psychiatrist, Student Health Center (1964). B. A., 1941, Harvard University; M. D., 1944, Cornell University; 1951, American Board of Psychiatry and Neurology.

LAFENE, BENJAMIN WILLIAM, Professor, Physician, Student Health Center (1946, 1948, 1962). B. S., 1923, Michigan State University; M. D., 1931, Western Reserve University.

LAMBERT, JOHN P., Instructor, Radiation Safety Officer (1964). B. S., 1959, Lebanon Valley College; M. P. H., 1963, University of Michigan.

LAUGHLIN, J. BRUCE, Director of Career Planning and Placement, Assistant Professor (1962, 1966). B. S., 1950, University of Kansas; M. S., 1961, Kansas State University; J. D., 1967, Washburn University.

LEWIS, JAMES J., Director of Admissions (1963). B. S., 1953, M. S., 1954, Kansas State University; Ed. D., 1961, University of Kansas.

LILLY, JERRY A., Administrative Assistant, Vice President for Student Affairs, Instructor (1967). B. S. Ed., 1964, Concord College.

LITCHFIELD, MEREDITH, Assistant Professor, University Library (1967). B. S., 1950, M. S., 1967, Kansas State Teachers College.

LU, JAMES Y., Instructor, University Library (1969). B. A., 1960, Tamkang College; M. S., 1965, Kansas State Teachers College.

MacMILLAN, WILLIAM, Instructor, Counseling Center (1964). A. B., 1951, University of Michigan.

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McCAIN, JAMES ALLEN, President (1950). A. B., 1926, LL. D., 1951, Wofford College; M. A., 1929, Duke University; Ed. D., 194B, Stanford University; LL. D., 1965, Montana State University; LL. D., 1965, Colorado State University; D. Sc., 1967, Andhra Pradesh State University (India).

MILBOURN, MAX W., Assistant to the President, Associate Professor of Journalism (1949, 1957). A. B., 1938, University of Wichita.

MITCHELL, SHARLENE K., Residence Hall Director, Instructor (1969). B. S., 1968, Kansas State University.

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NORDIN, MARGARET N., Associate Dean of Students and Dean of Women; Associate Professor (1957). B. S., 1941, M. A., 1953, Ph. D., 1962, University of Minnesota.

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RAZAK, C. KENNETH, Director of Kansas Industrial Extension Service, Professor (1966). B. S., 1939, M. S., 1942, University of Kansas. Professional Engineer, 1951.

REPPERT, JOE R., University Editor, Instructor (1969). B. A., 1966, Kansas State University.

RICHARDS, ARNE H., Assistant Professor, University Library (1965). B. A., 1954, Yankton College; M. S. in L. S., 1960, University of Illinois.

RIDGEWAY, EDITH MARY, Assistant Professor, University Library (1943, 1956). A. B., 1927, Kansas State Teachers College; B. S. in L. S., 1940, University of Illinois; M. S., 1956, Kansas State University.

RIGGS, JEAN M., Associate Director of Housing and Food Service, Associate Professor of Institutional Management (1960). B. S., 1939, M. S., 1956, Iowa State University.

ROBERTS, MARY EILLEEN, Assistant Professor, University Library (193B, 1943). B. S., 1930, Kansas State University; B. S. in L. S., 193B, University of Illinois; A. M., 1949, University of Michigan.

ROCHAT, CARL ROBERT, Director, Office of University News, Associate Professor of Journalism (1953, 1954). B. S., 1940, Kansas State University; M. S., 194B, University of Illinois.

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ROSE, DONALD L., Director, Department of Intramurals & Recreation (196B). B. S., 1953, Kansas State University.

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SEGO, WILBURN, Residence Hall Director, Instructor (1967). A. B., 1951, West Kentucky University.

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SMITH, WALTER D., Associate Director, Kansas State Union (1957, 1966). B. A., 1960, Kansas Wesleyan University.

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WILDER, RUSSELL, Professor, Counseling Center (1967). B. S., 1933, Princeton University; M. D., 1938, Harvard University Medical School; Ph. D., 1949, University of Minnesota.

WILLIAMS, EVAN W., Instructor, University Library (1964). A. B., 1955, Washington University; M. L. S., 1956, University of Illinois.

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***ZIEGLER, MERNA MILLER**, Director of Food Service, Kansas State Union, Associate Professor of Institutional Management (1940, 1957). B. S., 1932, M. S., 1941, Kansas State University.

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ANDERSON, KLING L., Professor of Agronomy Emeritus (1936, 1967). B. S., 1936, University of California; M. S., 1938, Kansas State University; Ph. D., 1951, University of Nebraska.

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ATKINSON, C. HARRY, Associate Professor of Agronomy; Soil Scientist, Soil Conservation Service, U. S. D. A., Agr. Exp. Sta. (1949). B. S., 1931, M. S., 1933, Pennsylvania State University.

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***BASSETTE, RICHARD**, Associate Professor of Dairy and Poultry Science; Associate Dairy Scientist, Agr. Exp. Sta. (1958, 1964). B. S., 1952, M. S., 1955, Ph. D., 1958, University of Maryland.

BAXTER, WILLIAM M., Assistant Professor and Assistant to the Superintendent, Fort Hays Agr. Exp. Sta. (1949, 1967). B. S., 1949, Kansas State University.

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***BIDWELL, ORVILLE W.**, Professor of Agronomy; Agronomist, Agr. Exp. Sta. (1950, 1960). A. B., 1940, Oberlin College; B. S., 1942, Ph. D., 1949, Ohio State University.

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***BLOCKER, H. DERRICK**, Assistant Professor of Entomology; Assistant Entomologist, Agr. Exp. Sta. (1965). B. S., 1954, M. S., 1958, Clemson University; Ph. D., 1965, North Carolina State University.

BOLING, JOHNNY C., Assistant Professor of Entomology; Assistant Entomologist, Agr. Exp. Sta. (1970). B. S., 1965, Texas A and M; M. S., 1968, Ph. D., 1970, Mississippi State University.

BONNE, DONALD J., Instructor of Agronomy; Assistant Agronomist, Irrigation Experiment Field (1969). B. S., 1967, M. S., 1969, University of Nebraska.

BOREN, FRED W., Professor and Superintendent in charge, Southeast Kansas Branch Agr. Exp. Sta. (1957, 1968). B. S., 1946, A and M College of Texas; M. S., 1950, Kansas State University; Ph. D., 1965, Utah State University.

***BRANDNER, LOWELL**, Professor; Agricultural Editor (1947, 1961). A. B., 1937, B. S., 1937, Emporia State Teachers College; M. S., 1951, Kansas State University; Ph. D., 1960, University of Wisconsin.

***BRENT, BENNY E.**, Associate Professor of Animal Science and Industry; Associate Animal Scientist, Agr. Exp. Sta. (1966, 1969). B. S., 1959, M. S., 1960, Kansas State University; Ph. D., 1966, Michigan State University.

BRETHOUR, JOHN R., Associate Professor; Associate Animal Scientist, Fort Hays Branch Agr. Exp. Sta. (1957, 1968). B. S., 1955, Kansas State University; M. S., 1956, Oklahoma State University.

BRINKMAN, GEORGE L., Assistant Professor of Agricultural Economics; Assistant Economist, Agr. Exp. Sta. (1969). B. S., 1964, M. S., 1965, Washington State University; Ph. D., 1969, Michigan State University.

***BROWDER, LEWIS E.**, Assistant Professor of Plant Pathology; Research Plant Pathologist, U. S. D. A., Agricultural Research Service (1958). A. S., 1952, Cameron State Agricultural College; B. S., 1954, M. S., 1956, Oklahoma State University; Ph. D., 1965, Kansas State University.

***BULLER, ORLAN H.**, Associate Professor of Agricultural Economics; Associate Economist, Agr. Exp. Sta. (1963, 1969). B. S., 1958, Kansas State University; M. S., 1959, Ph. D., 1965, Michigan State University.

BURCHETT, LOWELL A., Instructor in Agronomy; Assistant Agronomist, North Central Kansas Experiment Field (1965). B. S., 1956, Oklahoma State University.

***BURKHARD, RAYMOND KENNETH**, Professor of Biochemistry; Biochemist, Agr. Exp. Sta. (1950, 1957). A. B., 1947, Arizona State College; Ph. D., 1950, Northwestern University.

***BURLEIGH, JAMES R.**, Assistant Professor of Plant Pathology; Research Plant Pathologist, U. S. D. A., Agricultural Research Service (1964). B. S., 1958, Fresno State College; M. S., 1962, Ph. D., 1964, Washington State University.

CALL, EDWARD P., Associate Professor of Dairy and Poultry Science; Associate Dairy Scientist, Agr. Exp. Sta. (1963, 1968). B. S., 1951, Ohio State University; Ph. D., 1967, Kansas State University.

***CAMPBELL, RONALD W.**, Professor; Head, Department of Horticulture and Forestry; Horticulturist in charge, Agr. Exp. Sta. (1946, 1966). B. S., 1943, M. S., 1946, Kansas State University; Ph. D., 1955, Michigan State University.

CARPENTER, FRANK R., Assistant Dean, College of Agriculture; Associate Professor (1961, 1969). B. S., 1948, M. S., 1951, Kansas State University; Ph. D., 1967, University of Missouri.

***CASADY, ALFRED J.**, Associate Professor of Agronomy; Research Agronomist, U. S. D. A., Agricultural Research Service (1949, 1955). B. S., 1948, M. S., 1950, Ph. D., 1962, Kansas State University.

CLAPP, ALFRED L., Professor of Agronomy Emeritus (1915, 1961). B. S., 1914, M. S., 1934, Kansas State University.

***CLAYDON, THOMAS J.**, Professor of Dairy and Poultry Science; Dairy Scientist, Agr. Exp. Sta. (1946, 1965). B. S. A., 1934, University of Saskatchewan (Canada); M. S., 1936, Ph. D., 1939, Iowa State University.

***CLEGG, ROBERT E.**, Professor of Biochemistry; Biochemist, Agr. Exp. Sta. (1948, 1954). B. S., 1936, Rhode Island State College; M. S., 1939, North Carolina State College; Ph. D., 1948, Iowa State University.

CONDRAY, JERRY L., Assistant Professor; Assistant Agronomist, Garden City Branch Agr. Exp. Sta. (1968). B. S., 1966, M. S., 1968, Kansas State University.

***COX, RUFUS F.**, Professor of Animal Science and Industry; Animal Scientist, Agr. Exp. Sta., Head of Department Emeritus (1930, 1966). B. S., 1923, Oklahoma State University; M. S., 1925, Iowa State University; Ph. D., 1941, Cornell University.

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***CUNNINGHAM, BRYCE A.**, Assistant Professor of Biochemistry; Assistant Biochemist, Agr. Exp. Sta. (1963). B. A., 1955, B. S., 1958, Ph. D., 1963, University of Minnesota.

***CUNNINGHAM, FRANKLIN E.**, Associate Professor of Dairy and Poultry Science; Associate Poultry Scientist, Agr. Exp. Sta. (1969). B. S., 1957, Kansas State University; M. S., 1959, Ph. D., 1963, University of Missouri.

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***ELLIS, JR., ROSCOE**, Professor of Agronomy; Agronomist, Agr. Exp. Sta. (1948, 1960). B. S., 1948, M. S., 1950, Kansas State University; Ph. D., 1952, University of Wisconsin.

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***HANSING, EARL DAHL**, Professor of Plant Pathology; Plant Pathologist, Agr. Exp. Sta. (1935, 1947). B. S., 1933, University of Minnesota; M. S., 1937, Kansas State University; Ph. D., 1941, Cornell University.

***HARBERS, LENIEL H.**, Associate Professor of Animal Science and Industry; Associate Animal Scientist, Agr. Exp. Sta. (1964). B. S., 1957, M. S., 195B, Texas A and M College; Ph. D., 1961, Oklahoma State University.

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WILLIS, WILLIAM WAYNE, Assistant Professor of Horticulture and Forestry Emeritus (1944, 1961). A. B., 1912, College of Emporia.

WINZER, JACK W., Assistant Professor of Horticulture and Forestry; Southeast Kansas Experiment Field (1963, 1966). B. S., 1957, M. S., 1959, Texas A and M College.

***WITHEE, LAURESTON VAN**, Associate Professor of Agronomy; Associate Agronomist, Agr. Exp. Sta. (1953, 1965). B. S., 1947, Kansas State University; M. S., 1952, University of Nebraska; Ph. D., 1963, Kansas State University.

WITT, MERLE D., Assistant Professor; Assistant Agronomist, Garden City Branch Agr. Exp. Sta. (1969). B. S., 1967, Fort Hays State College; M. S., 1969, Kansas State University.

WOODRUFF, NEIL PARKER, Associate Professor of Agronomy; Research Investigations Leader, U. S. D. A., Agricultural Research Service (1949, 1963). B. S., 1949, M. S., 1953, Kansas State University.

ZAHNLEY, JAMES WALTER, Professor of Agronomy Emeritus (1915, 1954). B. S., 1909, B. S. in Agric., 1918, M. S., 1926, Kansas State University.

Faculty of the College of Architecture and Design

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***BARNES, ALTON A.**, Assistant Professor in Landscape Architecture (1967, 1969). B. L. A., 1965, University of Georgia; M. L. A., 1969, University of Illinois.

***BISSEY, CHARLES R.**, Assistant Professor of Construction Science (1969). B. S. 1957. Colorado State University; M. Arch., 1961, Kansas State University. Registered Architect, Registered Engineer.

BLACKMAN, MERRILL EMMETT, Assistant Professor of Architecture (1965). B. S., 1949, Kansas State University. Registered Architect, 1955. Professional Engineer, 1949.

BORNER, WILLIAM L., Instructor in Architecture (1969). B. Arch., 1967, Case-Western Reserve University; M. Arch., 196B, University of Michigan.

BUTKE, WALTER J., Assistant Professor of Architecture (1966, 1970). B. Arch., 1963, Columbia University; M. Arch., Kansas State University, 1970.

***CHADWICK, THEODORE AVERY**, Professor of Architecture (1927, 1947). B. S., 1927, North Dakota Agricultural College; M. Arch., 1954, Massachusetts Institute of Technology. Registered Architect in New York, 1936; in Kansas, 1953.

***CHANG, AMOS I. T.**, Associate Professor of Architecture (1966). B. S., Civil Engg., 1939, National Chung King University; M. F. A. in Arch., 1949, Ph. D. in Arch., 1951, Princeton University. Registered Architect.

***CHRISTENSEN, KEITH H.**, Associate Professor of Architecture (1966). B. Arch., 1950, University of Nebraska; M. Arch., 1957, University of Michigan. Registered Architect, 1960.

***DAY, DENNIS J.**, Assistant Professor of Landscape Architecture (1966). B. S., 1964, Michigan State University; M. L. A., 1966, University of Michigan.

***DEINES, VERNON PHILIP**, Professor of Planning (1957, 1966, 1970); Head, Department of Regional and Community Planning (1969); Director of the Center for Community Planning Services. B. S., 1952, M. R. P., 1961, Kansas State University. Registered Professional Engineer, 1952.

***DURGAN, JACK CLYDE**, Professor of Interior Architecture (1954, 1962, 1967); Head, Department of Interior Architecture (1969). B. Arch., 1951, Oklahoma State University; M. S., 1958, Kansas State University. Registered Architect in Texas, 1951; in Kansas, 1954.

***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). B. S., 1940, Oklahoma State University; M. S., 1946, Kansas State University; Ph. D., 1955, Louisiana State University.

***EDMONDS, LELAND R.**, Assistant Professor of Planning (1967). B. A., 1949, University of Kansas; M. A., 1952, University of Kansas.

ERNST, F. GENE, Assistant Professor of Architecture; Assistant Dean of the College of Architecture and Design (1967). B. Arch., 1953, Kansas State University. Registered Architect in Kansas, 1953; in Louisiana, 1957.

***FISCHER, EMIL C.**, Professor; Dean, College of Architecture and Design; Architect (1955, 1963). A. B., 1930, Columbia College; B. S., 1932, M. S., 1933, Columbia University. Registered Architect in New Jersey, 1935; in Ohio, 1946; in Kansas, 1955.

***HALL, CHARLES L.**, Associate Professor of Architecture (1964, 1968). B. Arch., 1953, Pennsylvania State University; M. Arch., 1967, Kansas University. Registered Architect in Kansas, 1953; in Minnesota, 1961; in North Dakota, 1962; in South Dakota, 1962. NCARB, 1961.

***HEINTZELMAN, JOHN CRANSTON**, Professor of Architecture (1947, 1954). B. Arch., 1938, Massachusetts Institute of Technology; M. Arch., 1941, Columbia University. Registered Architect, 1953.

* Graduate faculty.

*HELM, JR., JOHN FREDERICK, Professor of Architecture (1924, 1938). B. D., 1924, Syracuse University; D. F. A., 1951, Bethany College.

JAHNKE, WILLIAM R., Associate Professor of Architecture (1968). B. S., 194B, Duke University. Registered Professional Engineer in Missouri, 1951; in Pennsylvania, 1952.

*KRIDER, ALDEN, Professor of Architecture (1949, 1962). B. S., 1933, M. S., 1955, Kansas State University. Registered Architect in Missouri, 1945; in Kansas, 1949.

LIPPENBERGER, RAY E., Assistant Professor of Architecture (1964). B. S., 1936, Kansas State University. Registered Architect in Kansas, 1949; in Nebraska, 1955.

*McGRAW, EUGENE THOMAS, Associate Professor of Planning (1958, 1964, 1968). B. Arch., 1957, Oklahoma State University; M. R. P., 1963, Kansas State University.

*MILES, FREDERICK D., Professor of Architecture (1967); Head, Department of Architecture (1969). B. S., 1936, University of Illinois. Registered Architect in Illinois, 1952; in Arizona, 1965.

*MILLER, HAROLD JAMES, Associate Professor of Architecture (1959, 1965). B. S., 1952, B. Arch., 1952, Kansas State University; M. Arch, 1960, University of Illinois. Registered Architect, 1952. Professional Engineer, 1952.

MURPHY, STEPHEN M., Instructor in Interior Architecture (1968). B. S., 1968, Kansas State University.

*PARKS, CHARLES ELWOOD, Professor of Landscape Architecture (1949, 1965). Extension Specialist in Landscape Architecture (1949, 1950). B. S., 1949, University of Illinois; M. S., 1957, Kansas State University.

*QUINLAN, LEON REED, Professor of Landscape Architecture Emeritus; Ornamental Horticulturist and Landscape Architect, Agr. Exp. Sta. (1927, 1931, 1964). B. S., 1921, Colorado State University; M. L. A., 1925, Harvard University.

*REID, RONALD L., Assistant Professor in Architecture (1969). B. Arch., 1962, Kansas State University; M. Arch., 1968, University of California. Registered Architect, 1965.

*SANNER, ALBERT E., Associate Professor of Architecture (1963). B. S., Arch., 1947, B. S., Arch. Engg., 1948, University of Illinois; M. Arch., 1966, University of Nebraska. Registered Architect in Illinois, 1950; in Indiana, 1959.

SELFRIDGE, O. JOHN, Assistant Professor in Architecture (1969). B. Arch., 1959, Kansas University; M. C. P., 1964, Yale University.

SHEPARD, JIM B., Assistant Professor (1967). B. A., 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 Structures (1948, 1966). Head, Department of Construction Science (1969). B. S., 1940, University of Washington. Professional Engineer in Washington, 1947; in Kansas.

*WEIGEL, PAUL, Professor of Architecture Emeritus (1921, 1924, 1959). B. Arch., 1912, Cornell University. Registered Architect in New York, 1917; in Kansas, 1950.

WEISENBURGER, RAY B., Associate Professor of Planning (1964, 1970). B. Arch., 1959, University of Illinois; M. C. P., 1970, Cornell University. Registered Architect, 1962.

WENDT, EUGENE G., Assistant Professor of Architecture (1962, 1969). B. Arch., 1959, Kansas State University.

*WRIGHT, HENRY, Regents' Distinguished Professor of Environmental Technology (1965).

Faculty of the College of Arts and Sciences

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*ABERLE, NELLIE, Professor of English Emerita (1921, 1959). B. S., 1912, M. S., 1914, Kansas State University.

ABRAHAM, ERIC J., Instructor in Art (1969). B. F. A., 1963, Kansas City Art Institute; M. F. A., 1969, University of Nebraska.

*ADAMS, MARJORIE, Assistant Dean; Associate Professor of English (1954, 1961). B. A., 1941, Louisiana Polytechnic; M. A., 1948, Ph. D., 1951, University of Texas.

AHUJA, YOGA DHYAN, Associate Professor of Modern Languages (196B). M. A., 194B, Ph. D., 1951, Panjab University; Diploma, 1957, Tehran University; Diploma, 1964, Delhi University.

ALEXANDER, LOREN R., Instructor in Modern Languages (1965). B. M., 1951, Southwestern College; M. A., 1954, Colorado State College of Education; M. A., 1965, Michigan State University.

*ALSOP, INEZ, Associate Professor of History Emerita (1923, 1960). B. S., 1916, Kansas State Teachers College (Emporia); M. S., 1920, University of Kansas.

ALTHOFF, PHILLIP STANLEY, Assistant Professor of Political Science (1970). B. A., 1963, Illinois State University; M. A., 1966, The University of Iowa; Ph. D., 1970 (in preparation).

*AMEEL, DONALD JULES, Professor of Biology (1937, 1945). A. B., 192B, Wayne University; M. A., 1930, D. Sc., 1933, University of Michigan.

AMOS, EDGAR McCALL, Associate Professor of Technical Journalism Emeritus (1921, 1950). B. S., 1902, Kansas State University.

ANDERSON, JR., CHARLES C., Professor and Head of Department of Aerospace Studies (196B). A. B., 1951, M. A., 1953, Sacramento State College; 1954, Air Command and Staff School.

*ANDERSON, LORAN C., Associate Professor of Biology; Plant Anatomist, Agr. Exp. Sta. (1963, 1970). B. S., 195B, M. S., 1959, Utah State University; Ph. D., 1962, Claremont Graduate School.

*ANDREWS, ARTHUR CLINTON, Professor of Chemistry (1926, 1952). B. S., 1924, University of Wisconsin; M. S., 1929, Kansas State University; Ph. D., 1938, University of Wisconsin.

*ANSDELL, ORA JOYE, Associate Professor of English (1946, 1957). B. S., 1932, Kansas State University; M. A., 1939, University of Michigan; B. L. S., 1946, University of Chicago; Ph. D., 1956, University of Colorado.

APPLEGATE ROBERTA G., Assistant Professor of Technical Journalism (1964). A. B., 1940, Michigan State University; M. S., 1942, Northwestern University.

ARNOLD, LINDBERG, Instructor in Military Science (1969). B. A., 1956, Tougaloo College.

ASENETA, LYDIA, Instructor in Speech (1967). B. S., 1949, M. A., 1958, The National Teachers' College of the Philippines; M. A., 196B, Kansas State University.

AVERY, MADALYN, Associate Professor of Physics Emerita (1924, 1946). B. S., 1924, M. S., 1932, Kansas State University.

*BABCOCK, RODNEY WHITTEMORE, Professor of Mathematics Emeritus; Dean Emeritus (1930, 1960). A. B., 1912, University of Missouri; M. A., 1915, Ph. D., 1924, University of Wisconsin.

*BAGLEY, EDGAR SIDNEY, Professor; Assistant Head of Economics, Teaching and Graduate Studies; Economist, Agr. Exp. Sta. (1940, 1950). B. A., 1935, M. A., 1936, University of California at Los Angeles; Ph. D., 1950, State University of Iowa.

BAILES, KENDALL E., Assistant Professor of History (1970). A. B., 1963, Dartmouth College; M. A., 1966, Columbia University.

*BARFOOT, DOROTHY, Professor of Art Emerita (1930, 1962). B. A., State University of Iowa; M. A., 1928, Columbia University.

*BARK, LAURENCE DEAN, Professor of Climatology; Associate Meteorologist, Agri. Exp. Sta. (1956, 1967). B. S., 1948, M. S., 1950, University of Chicago; Ph. D., 1954, Rutgers University.

*BARKLEY, THEODORE M., Associate Professor and Associate Director, Division of Biology; Curator of the Herbarium; Taxonomist, Agr. Exp. Sta. (1961, 1967). B. S., 1955, Kansas State University; M. S., 1957, Oregon State University; Ph. D., 1960, Columbia University.

BARNES, VERNON L., Assistant Professor of Speech (1969). B. A., 1957, Ottawa University; M. A., 1964, Kansas State University.

BARRETT, ERNIE D., Athletic Director (1969). B. S., 1951, M. S., 1956, Kansas State University.

BARTON, BEVERLY S., Assistant Professor of Music (1969). B. M., 1966, Indiana University; Master of Music in Piano, 196B.

BASS, LOUIS R., Assistant Professor of Military Science (1969). B. S., 1961, Kansas State University; 1969, Infantry Officers Career Course.

BAYSDEN, MARTHA ROSS, Instructor in Modern Langauges (196B). B. S., 1964, M. A., 1966, Appalachian State University.

*BECK, HENRY VOORHEES, Professor of Geology (1946, 1961). B. S., 1946, M. S., 1949, Kansas State University; Ph. D., 1951, University of Kansas.

*BEESON, MARGARET E., Associate Professor of Modern Languages (1960, 196B). A. B., 194B, Wesleyan College; M. A., 1949, Emory University; Ph. D., 1954, University of Texas.

BELL, ALAN L., Instructor in Art (1968). A. A. S., 1962, New York State University of Agriculture and Technology; B. S., 1966, State University College at New Paltz; M. A., 1968, Kansas University.

BENNETT, JAMES ALDEN, Assistant Professor of Modern Languages (1967). A. S., 1950, St. Joseph Junior College and Kansas University; B. S., 1952, Northwest Missouri State College; M. A., 1960, Kansas University.

*BHALLA, CHANDER P., Associate Professor of Physics (1966). B. S., 1952, B. Sc., 1954, M. S., 1955, Punjab University; Ph. D., 1960, University of Tennessee.

BOLAN, JOHN ELDON, Instructor in Physical Education (1967). B. A., 1952, Ottawa University.

BOURSAW, JON E., Assistant Professor of Aerospace Studies (1968). B. B. A., 1961, Washburn University.

BRADLEY, DOROTHY GOUGH, Instructor in Economics (1947). B. S., 1932, Northwestern University; M. S., 1950, Kansas State University.

BRADY, DAVID WILLIAM, Assistant Professor of Political Science (1969). B. S. E., 1963, Western Illinois University; M. A., 1967, University of Iowa.

BRANCH, JESSE O., Assistant Football Coach (1967). B. S. E., 1963, University of Arkansas.

BRANN, SYLVIA J., Assistant Professor of Modern Languages (1968). B. S., 1959, Kansas State Teachers College at Pittsburg; M. A., 1963, Ph. D., 1969, University of Illinois.

*BRONDELL, WILLIAM JOHN, Assistant Professor of English (1964). A. B., 1959, M. A., 1964, Ph. D., 1964, University of Missouri.

*BROOKINS, DOUGLAS G., Associate Professor of Geology (1962, 1966). A. A., 1956, Santa Rosa Junior College; A. B., 1958, University of California; Ph. D., 1963, Massachusetts Institute of Technology.

BROWN, MERLE, Assistant Professor of Physics (1964) (State Climatologist). B. S., 1942, Kansas State College at Pittsburg.

*BROWN, SAM C., Professor of Psychology (1963, 1967). B. B. A., 1957, City College of New York; M. A., 1961, Ph. D., 1963, University of Virginia.

BUCK, CLAYTON A., Associate Professor of Biology (1970). B. S., 1959, Kansas State University; Ph. D., 1964, Montana State University.

*BUNTON, NORMA D., Professor; Head, Department of Speech (1954, 1960). B. S., 1939, Southwest Texas State College; M. Ed., 1947, University of Texas; Ph. D., 1954, State University of Iowa.

*BURKE, WILLIAM L., Assistant Professor of Speech (1964). B. S., 1959, M. A., 1960, Ph. D., 1965, Northwestern University.

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BUSSING, CHARLES EARL, Assistant Professor of Geography (1954, 1966). A. B., 1959, Colorado State College; M. A., 1961, University of Colorado; Ph. D., 1968, University of Nebraska.

CAMMACK, LARRY ALAN, Instructor in Mathematics (1963, 1965). A. B., 1963, Phillips University; M. S., 1965, Kansas State University.

***CARDWELL, ALVIN BOYD,** Professor of Physics (1936, 1955). Physicist in charge, Agr. Exp. Sta.; Physicist in charge, Eng. Exp. Sta. B. S., 1925, D. Sc., 1961, University of Chattanooga; M. S., 1927, Ph. D., 1930, University of Wisconsin.

***CAREY, JAMES CHARLES,** Professor of History (1948, 1954). B. A., 1937, Nebraska State Teachers College (Wayne); M. A., 1940, Ph. D., 1948, University of Colorado.

CARLSON, NANCY B., Assistant Professor of Speech (1968). B. A., 1953, M. S., 1950, West Michigan University.

CHAMBERLIN, DAVID NATHANIEL, Assistant Professor of Political Science (1966). B. A., 1963, Northwestern University.

***CHAPIN, ERNEST KNIGHT,** Associate Professor of Physics Emeritus (1923, 1968). A. B., 1918, M. S., 1923, University of Michigan.

***CHAUDHURI, SAMBHUDAS,** Assistant Professor of Geology (1966). B. S., 1956, Calcutta University, India; M. S., 1958, Jadavpur University, India; M. S., 1961, University of Indiana; Ph. D., 1966, Ohio State University.

***CHELIKOWSKY, JOSEPH RUDOLPH,** Professor of Geology (1937, 1955). B. A., 1931, M. A., 1932, Ph. D., 1935, Cornell University.

***CHRIST, RICHARD E.,** Assistant Professor of Psychology (1965). B. S., 1955, M. S., 1961, University of Toledo; Ph. D., 1962, University of Massachusetts.

CLARK, WILLIAM KLINE, Instructor in Geology (1949, 1956). B. S., 1947, University of Notre Dame; M. S., 1950, Kansas State University.

CLEARY, ELIZABETH, Assistant Professor of Speech (1961, 1968). B. S., 1934, Boston University; M. S., 1961, Kansas State University.

***CLIMENHAGA, JOEL,** Associate Professor of Speech (1968). B. A., 1953, M. A., 1958, University of California at Los Angeles.

***COATES, WILLIAM A.,** Associate Professor of Modern Languages (1966). B. A., 1937, Harvard College; M. A., 1939, Ph. D., 1950, Harvard University.

***COCKE, CHARLES L.,** Assistant Professor of Physics (1969). A. B., 1962, Haveford College; Ph. D., 1967, California Institute of Technology.

COHEN, PETER Z., Instructor in English (1961). B. S., 1953, M. A., 1961, University of Wyoming.

CONOVER, DARLINE, Instructor in English (1963). B. S., 1927, Kansas State University.

***CONOVER, WILLIAM JAY,** Associate Professor of Statistics; Statistical Consultant, Agr. Exp. Sta. (1964, 1967). B. S., 1958, Iowa State University; M. A., 1962, Ph. D., 1964, the Catholic University of America.

***CONROW, KENNETH,** Associate Professor of Chemistry (1961, 1964). B. A., 1954, Swarthmore College; M. A., 1955, Ph. D., 1962, University of Illinois.

CONROW, MARGARET E., Assistant Professor of English (1964, 1969). B. A., Swarthmore College; M. A., 1955, Ph. D., 1962, University of Illinois.

***CONSIGLI, RICHARD ALBERT,** Professor of Biology (1963, 1969). B. S., 1954, Brooklyn College; M. A., 1956, Ph. D., 1960, University of Kansas.

***COOKS, R. GRAHAM,** Assistant Professor of Chemistry (196B). B. Sc., Ph. D., University of Natal, Pietermaritsburg; Ph. D., Cambridge University.

***COPELAND, JAMES L.,** Associate Professor of Chemistry (1962, 1968). B. S., 1952, University of Illinois; Ph. D., 1962, Indiana University.

***CRAIGIE, BARBARA,** Assistant Professor of Art (1954, 1963). B. A., 1932, University of Minnesota; M. A., 1942, University of Missouri.

***CRAWFORD, FRANCIS W.,** Associate Professor of Physics (1960). A. B., 1924, Phillips University; M. S., 1929, Ph. D., 1934, University of Oklahoma.

***CRAWFORD, GOLDA MILDRED,** Associate Professor of History (1946, 1964). B. S., 192B, M. S., 1940, Kansas State University; Ph. D., 1963, Syracuse University.

***CURNUTTE, JR., BASIL,** Professor of Physics; Associate Physicist, Agr. Exp. Sta. (1954, 1964). B. S., 1945, U. S. Naval Academy; Ph. D., 1953, Ohio State University.

***DAANE, ADRIAN H.,** Professor and Head of Chemistry Department (1963). B. S., 1941, University of Florida; Ph. D., 1950, Iowa State University.

DACE, LETITIA, Instructor in Speech (1967). A. B., 1963, Sweet Briar College; M. A., 1967, Kansas State University.

***DACE, WALLACE,** Professor of Speech (1963, 1968). A. B., 1943, Illinois Wesleyan University; M. F. A., 1948, Yale University; Ph. D., 1952, Denver University.

***DALE, E. BROCK,** Professor of Physics (1957, 1967). B. S., 1940, M. S., 1944, University of Oklahoma; Ph. D., 1953, Ohio State University.

***DANEN, WAYNE C.,** Assistant Professor of Chemistry (1967). B. A., 1964, St. Norbert College; Ph. D., 1967, Iowa State University.

***DAVIS, EARLE ROSCO,** Professor of English (1949, 1950). A. B., 1927, B. M., 1929, Monmouth College; M. A., 1928, University of Illinois; Ph. D., 1935, Princeton University.

***DAYTON, ARTHUR D.,** Assistant Professor of Statistics; Consultant, Agr. Exp. Sta. (1966). B. S., 1960, Berea College; M. S., 1964, Ph. D., 1967, Michigan State University.

***DeCOU, DONALD FRANK,** Associate Professor of Economics (1947). B. S., 1929, Kansas State Teachers College of Pittsburg; M. B. A., 1934, Northwestern University; 1966, University of Wisconsin.

***DEIBLER, GERALD WILLIAM,** Assistant Professor of Drawing and Painting (1956, 1963). B. A. 1951, University of Nebraska; M. F. A., 1955, University of Colorado.

DELEHANTY, JOHN A., Associate Professor of Economics (1966). B. B. A., 1952, M. A., 1956, University of Miami; Ph. D., 1960, Indiana University.

DENNIS, JR., EVERETTE E., Assistant Professor of Technical Journalism (196B). B. S., 1964, University of Oregon; M. A., 1966, Syracuse University.

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***DIXON, LYLE J.,** Associate Professor of Mathematics (1963). B. S., 194B, M. S., 1950, Oklahoma State University; Ph. D., 1963, University of Kansas.

DODDS, DARRELL DeLOSS, Assistant Professor of Athletics (1963). B. S., 1959, M. S., 1960, Kansas State University.

DOEZEMA, C. PHILIP, Assistant Professor of Biology (1970). B. S., 1961, Michigan State University; Ph. D., 1967, Stanford University.

***DONOVAN, ROBERT KENT,** Assistant Professor of History (1964). B. A., 1954, Harvard University; B. A., 1958, M. A., 1963, Cambridge University; Ph. D., 1965, Harvard University.

***DOUGLAS, LOUIS HARTWELL,** Professor of Political Science (1949). A. B., 1931, Hastings College; M. A., 1937, Ph. D., 1949, University of Nebraska.

***DRAGSDORF, R. DEAN,** Professor of Physics (194B, 1956). S. B., 1944, Ph. D., 1948, Massachusetts Institute of Technology.

DRISS, ANN, Instructor in Modern Languages (1927). A. B., 1952, Washburn University; M. S., 1966, Kansas State Teachers College.

DUSHKIN, LELAH, Assistant Professor of Sociology (1968). A. B., 1953, Smith College; M. S., 1956, University of Pennsylvania.

EATON, GEORGE R., Assistant Professor of Technical Journalism (1955). B. S., 1947, South Dakota State College.

EBBERTS, GEORGE ORVAL, Assistant Dean; Assistant Professor (1946, 1956). B. S., 1949, M. S., 1951, Kansas State University.

***ECK, JOHN S.,** Assistant Professor of Physics (1969). B. S., 1962; Ph. D., 1967, The Johns Hopkins University.

EDWARDS, AHMED T., Assistant Professor of Military Science (1967). B. S., 1950, University of Utah; 1959, Artillery Career Officers Course; 1963, Command and General Staff College.

EDWARDS, DONALD, Instructor in Military Science (1969).

***EISENSTARK, ABRAHAM,** Professor of Biology; Virologist, Agr. Exp. Sta. (1951, 1959). A. B. 1940, M. A., 1942, Ph. D., 1948, University of Illinois.

***EITNER, WALTER HUGO,** Associate Professor of English (1954, 1959). A. B., 194B, University of Denver; A. M., 1949, University of Michigan; Ph. D., 1959, University of Denver.

ELLIOTT, GERALD F., Assistant Football Coach (1967). Ind. Mgt., 1957, Auburn University.

***ELLIS, BYRON ELBRIDGE,** Professor of Technical Journalism Emeritus (1949, 1950). A. B., 1927, Pacific Union College; A. M. in Ed, 1933, University of Southern California.

ELLIS, SANDRA D., Assistant Professor of Music (1969). B. M., 1963, M.S., 1965, Kansas State College.

***ELLSWORTH, LOUIS DANIEL,** Professor of Physics (1946, 1954). B. S., 1937, Case Institute of Technology; M. S., 193B, Ph. D., 1941, Ohio State University.

***EMERSON, M. JARVIN,** Professor of Economics (1962, 1969). B. A., 1957, Luther College; M. A., 1960, Ph. D., 1963, State University of Iowa.

***ENGLER, LEO F.,** Associate Professor of Speech (1962). B. A., 1952, University of Iowa; M. A., 1953, Ph. D., 1962, University of Texas.

***EVANS, JOHN C.,** Assistant Professor of Physics (1966). B. S., 1960, University of Oklahoma; M. S., 1962, Rensselaer Polytechnic Institute; M. S., 1964, Ph. D., 1966, University of Michigan.

***EVANS, THOMAS MARION,** Professor; Head, Department of Physical Education (1942, 1950). B. S., 1930, Kansas State University; M. S., 1942, University of Michigan; P. E. Dir., 1958, Indiana University.

EVANS, WILLIAM E., Assistant Professor of English (1969). B. A., 1963, Wayne State University; M. A., 1965, University of Michigan.

***FAULKNER, JACOB OLIN,** Professor of English Emeritus (1922, 1955). B. A., 1907, Washington and Lee University; M. A., 1920, Pennsylvania State University.

***FERGUSON, CLYDE RANDOLPH,** Assistant Professor of History (1960, 1963). B. A., 1955, University of Oklahoma; M. A., 1957, Ph. D., 1960, Duke University.

***FERGUSON, GARY W.,** Assistant Professor of Biology (1969). B. S., 1963, Tulane University; M. S., 1965, Texas Technological College; Ph. D., 196B, University of Michigan.

FERGUSON, STEPHEN M., Research Associate, Department of Physics (1969). B. S., 1962, Montana State University; M. S., 1964, Ph. D. 1969, University of Washington.

***FEYERHERM, ARLIN M.,** Professor of Statistics; Statistical Consultant, Agr. Exp. Sta. (1953, 1964). B. S., 1946, University of Minnesota; M. S., 1948, University of Iowa; Ph. D., 1952, Iowa State University.

***FINA, LOUIS R.,** Associate Professor of Biology; Microbiologist, Agr. Exp. Sta. (1954, 1962). A. B., 1942, M. S., 1948, Ph. D., 1950, University of Illinois.

***FISHER, KENNETH W.,** Associate Professor of Biology (1966). B. Sc., 1953; M. Sc., 1954, Ph. D., 1957, University of London.

FISHER, PAUL S., Assistant Professor of Computer; Consultant, Agr. Exp. Sta. (1967). B. A., 1963, M. A., 1964, University of Utah; Ph. D., 1969, Arizona State University.

FITZSIMMONS, LOWELL G., Head Basketball Coach (1967, 1968). B. S., 1957, M. E., 195B, Midwestern University.

***FLANAGAN, BRUCE,** Associate Professor of Speech (1966). B. S., 1953, Western Michigan University; M. S., 195B, Southern Illinois University; Ph. D., 1966, University of Florida.

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*FLORA, CORNELIA BUTLER, Assistant Professor of Sociology (1970). B. A., 1965, University of California; M. S., 1966, Ph. D., 1970, Cornell University.

*FLORA, JAN L., Assistant Professor of Sociology (1970). B. A., University of Kansas; M. S., 1967, Ph. D., 1970, Cornell University.

*FOLLAND, NATHAN O., Assistant Professor of Physics (1966). B. A. 1959, Concordia College; Ph. D., 1965, Iowa State University.

FONTENLA, DORACY, Lecturer in Physics (1968). B. S., Universidad Distrito Federal, Brazil; Ph. D., Universidad Nacional de Cuyo, Argentina.

*FRANKLIN, ALBERT B., Director, South Asia Center; Professor Political Science (1968). A. B., 1930, University of Miami; A. M., 1936, Ph. D., 1938, Harvard University.

*FRAZIER, JOHN CARROLL, Professor of Biology Emeritus (1926, 1970). A. B., 1925, DePauw University; M. A., 1926, University of Nebraska; Ph. D., 1939, University of Chicago.

FRAZIER, ROBERT H., Assistant Football Coach (1967). B. S., 1965, University of Tennessee.

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*FRIEDMANN, EUGENE ALVIN, Professor, Head, Department of Sociology and Anthropology (1965). A. B., 1947, M. A., 1949, Ph. D., 1953, University of Chicago.

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***PERKINS, JR., CHARLES C.**, Professor of Psychology (1969). B. A., 1941, Harvard; M. A., 1942, Ph. D., 1946, State University of Iowa.

***PERNG, SHIAN-KOONG**, Assistant Professor of Statistics (1968). B. S., Chung-Hsien University, Taiwan; M. S., 1961, Virginia Polytechnic Institute; Ph. D., 1967, Michigan State University.

***PETERS, GEORGE R.**, Assistant Professor of Sociology (1967). B. A., 1962, M. A., 1964, Ph. D., 1968, University of Nebraska.

***PETRULLO, HELEN B.**, Assistant Professor of English (1967). B. A., 1944, University of Alabama; M. A., 1954, Ph. D., 1967, Syracuse University.

***PETTIS, DOROTHY BRADFORD**, Associate Professor of Modern Languages Emerita (1927, 1966). B. A., 1919, M. A., 1924, University of Nebraska; 1922, Middlebury College; Certificate, 1939, University of Paris.

***PHARES, E. JERRY**, Professor and Head, Department of Psychology (1955, 1964). B. A., 1951, University of Cincinnati; M. A., 1953, Ph. D., 1955, Ohio State University.

PIGNO, LOUIS, Assistant Professor of Mathematics (1969). B. S., 1961, Polytechnic Institute of Brooklyn; M. A., 1965, University of Connecticut; Ph. D., 1969, SUNY at Stony Brook.

POOLE, MIRIAM PICK, Instructor in Physical Education (1961). B. S., 1943, Savage School for Physical Education and Columbia University; M. A., 1945, Columbia University.

POWELL, DONALD G., Assistant Football Coach (1967). B. S., 1956, M. S., 1958, Florida State University.

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RATCLIFFE LAMAR CECIL, Instructor in Mathematics (1964). B. S., 1933, United States Military Academy; M. A. T., 1964, Duke University.

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RITCHEY, GILBERT GREGORY, Assistant Professor of Speech (1969). B. A., 1961, East Texas State University; M. Ed., 1964, University of Houston.

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RUSSELL, MARY J., Assistant Professor of Mathematics (1969). B. A., 1964, University of Tennessee; M. A., 1967, Ph. D., 1969, Emory University.

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*VIAN, RICHARD W., Assistant Professor of Geology (1966). A. B., 1957, M. S., 1959, Miami University; Ph. D., 1965, University of Michigan.

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***WALKER, WARREN VINCENT**, Associate Professor of Music (194B, 1959). B. A., 1946, University of Washington; M. M., 1948, Cincinnati Conservatory of Music.

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***WALTERS, CHARLES P.**, Associate Professor of Geology (1936, 1958). B. S., 1936, M. S., 1937, Kansas State University; Ph. D., 1957, Cornell University.

WAMPLER, RICHARD S., Assistant Professor of Psychology (1969). A. B., 1964, Indiana University; Ph. D., 1970, University of Pennsylvania.

WARDELL, DAVID B., Gymnastics Coach (1969). B. S., 1963, University of Colorado.

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***WEBER, HARRY OSBORN**, Assistant Professor of English (1970). A. B., 1959, University of Minnesota.

WEIGEL, LAWRENCE N. (1969). 8. S., 1969, M. S., 1969, Kansas State University.

***WEINBERG, ROGER**, Associate Professor of Computer Science (1970). B. S., 1951, Tulane University; Ph. D., 1954, University of Texas; Ph. D., 1970, University of Michigan.

***WEIS, JERRY S.**, Assistant Professor and Assistant Director, Division of Biology; Plant Physiologist, Agr. Exp. Sta. (1966). A. B., 1958, Kansas Wesleyan Unversity; M. A., 1960, Ph. D., 1964, University of Kansas.

***WEST, RONALD R.**, Assistant Professor of Geology (1969). A. A., 1955, Centralia Junior College; B. S., 1958, University of Missouri at Rolla; M. S., 1962, University of Kansas; Ph. D., 1970, University of Oklahoma.

***WHITE, ALFRED EVERETT**, Professor of Mathematics Emeritus (1909, 1950). 8. S., 1904, M. S., 1909, Purdue University.

***WHITE, MARY FRANCES**, Associate Professor of English (1947, 1951). B. S., 1928, M. S., 1930, Kansas State University; Ph. D., 1955, Denver University.

***WILCOXON, GEORGE DENT**, Professor of History (1946, 1948). A. B., 1936, M. A., 1938, Ph. D., 1941, University of California at Los Angeles.

***WILLIAMS, DUDLEY**, Distinguished Regents Professor of Physics (1964). A. B., 1933, M. A., 1934, Ph. D., 1936, University of North Carolina.

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***WILLIAMS, ROBERT E.**, Assistant Professor of Mathematics (1965). B. S., 1959, M. A., 1961, Ph. D., 1965, University of Missouri.

***WILLIAMS, TIMOTHY ALDEN**, Associate Professor of Political Science (1967). A. B., 1954, Davidson College; Ph. D., 1964, University of North Carolina.

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***WILSON, FRED E.**, Assistant Professor of Biology; Physiologist, Agr. Exp. Sta. (1965). A. B., 1958, M. A., 1960, University of Kansas; Ph. D., 1965, Washington State University.

***WIMMER, EDWARD JOSEPH**, Professor of Biology (192B, 1941). A. B., 1925, M. A., 1927, Ph. D., 192B, University of Wisconsin.

WINEGARDNER, CARROLL, Instructor in Art (1966). B. F. A., 1960, Kansas City Art Institute; M. F. A., 1963, University of Oklahoma.

***WISTRAND, LILA MAY**, Assistant Professor of Speech (1969). B. A., 1966, M. A., 196B, Ph. D., 1969, University of Texas.

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***YEE, KANE**, Associate Professor of Mathematics (1968). B. S., 1957, M. S., 1958, Ph. D., 1963, University of California, 8erkeley.

***ZIMMERMAN, JOHN L.**, Associate Professor of Biology (1963, 1968). B. S., 1953, M. S., 1958, Michigan State University; Ph. D., 1963, University of Illinois.

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***GILKISON, PAUL D.**, Associate Professor of Business Administration (1962, 1967). B. S., 1959, M. B. A., 1960, University of Kansas; D. B. A., 1964, University of Colorado.

GRAHAM, JOHN, Assistant Professor of Business Administration (1970). B. A., 1967, Kansas State University; M. B. A., 196B, University of Arkansas.

GUDGELL, DOROTHY B., Assistant Professor of Business Administration (1943, 1954). B. S., 1938, M. S., 1946, Kansas State University.

***GUGLER, MERLE E.**, Associate Professor of Business Administration (1947, 1959). B. S., 1940, Kansas State Teachers College (Emporia); M. S., 194B, Kansas State University; C. P. A., 1956, Kansas.

HOLLINGER, ROBERT D., Instructor in Business Administration (1966). B. S., 1964, M. S., 1968, Kansas State University.

HUBBARD, CHARLES W., Assistant Professor of Business Administration (1970). B. A., 1963, M. B. A., 1965, University of Houston; Ph. D., 1970, University of Arkansas.

JONES, C. CLYDE, Professor of Business Administration (1960). A. B., 1944, Marshall University; M. A., 1950, Ph. D., 1954, Northwestern University.

KING, ALBERT S., Assistant Professor (1969). B. B. A., 1962, M. B. A., 1966, West Texas State University; D. B. A., 1970, Texas Technological University.

***LAUGHLIN, EUGENE J.**, Associate Dean; Professor of Business Administration (1955, 1964, 1967). B. S., 1951, Rockhurst College; M. S., 1959, Kansas State University; C. P. A., 1960, Kansas; Ph. D., 1965, University of Illinois.

***LYNN, ROBERT A.**, Dean, Professor of Business Administration (1968). B. S., 1951, Maryville College; M. S., 1955, University of Tennessee; Ph. D., 1958, University of Illinois.

McMANIS, DONALD L., Assistant Professor of Business Administration (1970). B. S., 1949, M. B. A., 196B, University of Iowa.

***MULANAX, ALVIN EDGAR**, Associate Professor of Business Administration (1947, 1951). B. S., 1946, M. S., 1951, Kansas State University.

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RICHARDS, VERLYN D., Associate Professor of Business Administration (1965, 1969). B. S., 1956, M. S., 1960, Kansas State University; C. P. A., 1961, Kansas; Ph. D., 1966, University of Illinois.

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***BAKER, HARRY LEIGH**, Professor of Education Emeritus (1946, 1963). A. B., 1920, LL. D., 1951, Baker University; B. S., 1922, Kansas State University; A. M. 192B, University of Chicago; Ph. D., 1934, Yale University.

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***BRADLEY, HOWARD RALEY**, Associate Professor of Education (1951, 1963). B. S., 1930, M. S., 1937, Kansas State University.

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GRIFFITH, MARY EVAN, Associate Professor (1969). B. S., 1950, Kansas State University; M. S., 1957, Iowa State University; Ph. D., 1966, Ohio State University.

***HALL, LAWRENCE FENOR**, Associate Professor of Education Emeritus (1926, 1966). B. S., 1923, M. S., 1927, Kansas State University.

***HAUSE, RICHARD G.**, Associate Professor of Education (1966). A. B., 1954, M. A., 1955, Colorado State College; Ed. D., 1966, University of Colorado.

HAZLETT, EMERSON L., Instructor in Education, Economics and Commerce (1969). B. S., 1948, M. S., 1964, University of Kansas.

HUDSON, WANDA L., Instructor in Education (1966). B. S., 1949, M. Ed., 1957, University of Texas.

***JAMES, ROBERT K.**, Assistant Professor (1969). B. S., 1959, Northwest Missouri State; M. A., 1962, University of Northern Iowa; Ph. D., 1969, University of Iowa.

***KAISER, HERBERT EMIL**, Associate Professor of Education (1961, 1969). B. S., 1941, Concordia Teachers College; M. S., 1943, Oklahoma State University; Ph. D., 1959, University of Nebraska.

***KASPER, EUGENE C.**, Dean of Students, Associate Professor of Education (1968). B. S., 1956, M. S., 1956, Ed. D., 1963, Kansas State Teachers College.

***KEYS, SAMUEL R.**, Professor and Dean of College of Education (1969). A. B., 1948, Olivet College, Kankakee, Illinois; M. A., 1949, University of Missouri-Kansas City; Ph. D., 1958, University of Minnesota.

KING, KENNETH L., Assistant Professor of Education (1969). A. A., 1962, Sayre Junior College, Sayre, Oklahoma; B. A., 1964, Southwestern State College, Weatherford, Oklahoma; M. Ed., 1968, Ed. D., 1969, University of Oklahoma.

***KITTLESON, HOWARD M.**, Assistant Professor of Education (1969). B. S., 1965, M. A., 1966, Ph. D., 1969, University of Minnesota.

***LAUGHERY, WAYNE W.**, Associate Professor of Education (1967). B. S., 194B, M. A., 1955, San Diego State College; Ed. D., 1958, Teachers College, Columbia University.

***LITTRELL, J. HARVEY**, Professor of Education (1954, 1966). B. A., 1935, Iowa State Teachers College; M. A., 1939, State University of Iowa; Ed. D., 1950, University of Missouri.

***LOEB, JOE HENRY**, Assistant Professor of Education (1956). B. A., 194B, Northeastern State College; M. S., 1951, Kansas State Teachers College (Pittsburg); Ed. D., 1957, University of Arkansas.

***McANARNEY, HARRY EDWARD**, Associate Professor of Education (1957, 1966). B. S., 1943, Kansas State Teachers College (Emporia); M. S., 1947, Ed. D., 1958, University of Kansas.

***MEISNER, ROBERT G.**, Associate Professor and Head, Department of Adult and Occupational Education (1969). B. S., 194B, Oklahoma A & M College; M. S., 1957, Oklahoma State University; Ed. D., 1967, University of California, Berkeley.

***MOGGIE, MAURICE CHARLES**, Professor of Education (1930, 1945). B. S., 1929, M. S., 1931, Kansas State University; Ph. D., 1941, Ohio State University.

***MOORE, ARNOLD J.**, Professor of Education and Head, Department of Curriculum and Instruction (1967). B. A., 1949, State College of Iowa; M. A., 1955, Ph. D., 1961, State University of Iowa.

***O'FALLON, OWEN KENNETH**, Professor of Education (1950, 1958). A. B., 1937, M. A., 1941, Western State College of Colorado; Ed. D., 1952, University of Colorado.

***OLSON, GEORGE ARTHUR**, Professor of Education Emeritus (1949, 1969). A. B., 1928, A. M., 1931, University of Kansas; Ph. D., 1953, Northwestern University.

***OWENS, RICHARD E.**, Associate Professor of Education (1964, 1969). A. B., and B. S., 1949, Northwest Missouri State College; M. A., 1953, Ed. D., 1964, Colorado State College.

PAUL, WARREN I., Assistant Professor of Education (1969). A. B., 1954, Rutgers, the State University; A. M., 1966, Newark State College, Union, N. J.

***PECCOLO, CHARLES M.**, Professor of Education and Head of Department of Administration and Foundations of Education (1962, 1968). A. B., 1949, M. A., 1949, Adams State College; Ph. D., 1962, University of Iowa.

***PRICE, FLOYD HAMILTON**, Associate Professor of Education (1963, 1965). A. B., 1951, Friends University; M. Ed., 1957, Wichita State University; Ed. S., 1960, George Peabody College; Ed. D., 1965, University of Oklahoma.

REPLOGLE, RENATA J., Instructor in Education and Art (1966). A. B., 1963, A. M., 1964, Colorado State College.

***ROSCOE, JOHN T.**, Associate Professor of Education (196B). B. E., 1961, Colorado State University; A. M., 1963, Ph. D., 1965, Colorado State College.

***RUST, LUCILE OSBORN**, Professor of Education Emerita (1924, 1960). B. S., 1921, Kansas State Teachers College (Pittsburg); M. S., 1922, Kansas State University.

***SARTHORY, JOSEPH A.**, Associate Professor of Education (1969). B. A., 1961, M. A., 1964, Ph. D., 1967, University of New Mexico.

***SCHELL, LEO M.**, Assistant Professor of Education (1966). A. B., 1955, Bethany College; M. S., 1962, University of Kansas; Ph. D., 1964, University of Iowa.

SMETHERS, HOWARD DEWIGHT, Assistant Professor of Education (1947, 1951). B. S., 1927, Kansas State Teachers College (Emporia); M. S., 1935, Kansas State University.

STEFFEN, JOHN D., Instructor, Counseling Center (1967). B. A., 1956, Hamline University; Ph. D., 196B, University of Minnesota.

***STRICKLAND, VIVAN LEWIS**, Professor of Education Emeritus (1917, 1950). A. B., 1906, M. S., 1915, Ph. D., 1925, University of Nebraska.

SULLIVAN, RITA J., Instructor in Education (1966). B. S., 1956, Kansas State Teachers College (Pittsburg); M. S., 1964, University of Kansas.

***TRENNEPOHL, HARLAN JEAN**, Associate Professor of Education (1956, 1963). B. S., 1947, M. S., 1951, Kansas State Teachers College (Emporia); Ed. D., 1956, University of Colorado.

***UTSEY, JORDAN**, Associate Professor of Education (1969). B. A., 1952, College of Idaho; M. Ed., 1958, Ed. D., 1963, University of Oregon.

WISSMAN, JANICE R., Instructor in Education (1968). B. S., 1963, M. S., 1968, Kansas State University.

Faculty of the College of Engineering

Includes only those with rank of instructor or above.

***AGUILAR, ANTONIO MANUEL**, Associate Professor of Civil Engineering (1965). B. S., 1951, University of Havana; M. S., 1965, Purdue. Professional Engineer in Cuba, 1952.

***AHMED, NASIR**, Assistant Professor of Electrical Engineering (1968). B. S., 1961, University College of Engineering, Bengalore, India; M. S., 1962, Ph. D., 1966, University of New Mexico.

***AKINS, RICHARD GLENN**, Associate Professor of Chemical Engineering (1963, 1967). B. S., 1957, M. S., 195B, University of Louisville; Ph. D., 1962, Northwestern University.

ANDERSON, CARL ELMER, Instructor in Agricultural Engineering, Agr. Exp. Sta. (1967). B. S., 1962, Pennsylvania State University; M. E., 1965, University of Arizona. Professional Engineer, 1968.

***ANNIS, JASON CARL**, Assistant Professor of Mechanical Engineering (1959, 1969). B. S., 1953, University of Minnesota; M. S., 1956, Michigan College of Mining and Technology; Ph. D., 1969, Kansas State University.

***APPL, FREDRIC CARL**, Professor of Mechanical Engineering and Jennings Distinguished Professor (1960, 1964, 1967). B. S., 1954, M. S., 1955, Ph. D., 195B, Carnegie Institute of Technology.

***ASHOUR, ELSAID A.**, Associate Professor of Industrial Engineering (1967). Diploma, 1955, Technische Hochschul, Munchen, Germany; M. S., 1964, University of Minnesota; Ph. D., 1967, University of Iowa.

***AZER, NAIM ZAKI**, Associate Professor of Mechanical Engineering (1958, 1964). B. S., 1950, M. S., 1954, University of Alexandria, Egypt; Ph. D., 1959, University of Illinois.

BALL, HERBERT DEAN, Instructor in Mechanical Engineering (195B). B. S., 1956, M. S., 195B, University of Nebraska.

***BATES, HERBERT TEMPLETON**, Professor of Chemical Engineering (1958, 1960). B. S., 1935, Iowa State University; M. S., 1938, Virginia Polytechnic Institute; Ph. D., 1941, Iowa State University.

BAUGHER, EARL EUGENE, Assistant Professor of Agricultural Engineering (1967). B. S., 195B, M. S., 1964, Kansas State University.

BELL, CLARENCE ALTON, Instructor in Mechanical Engineering (1964). B. S., 1953, M. S., 1955, Kansas State University.

BENNETT, CORWIN A., Professor of Industrial Engineering (1970). B. S., 1950, Iowa State University; M. A., 1951, Ph. D., 1954, University of Nebraska.

***BERNOTSKI, DENNISON ROSS**, Assistant Professor of Electrical Engineering (1969). B. S., 195B, University of Nevada; M. S., 1961, Ph. D., 1969, University of Washington.

***BEST, CECIL HAMILTON**, Associate Dean, Professor of Applied Mechanics (1961, 1964, 1968). B. S., 1955, M. S., 1956, Ph. D., 1960, University of California. Professional Engineer, 1962.

***BLACKBURN, JACK BAILEY**, Professor; Head, Department of Civil Engineering; Civil Engineer, Engg. Exp. Sta. (1963). B. S., 1947, Oklahoma University; M. S., 1949, Ph. D., 1955, Purdue University. Professional Engineer, 1950.

* Graduate faculty.

*BOWYER, JR., JAMES MARSTON, Professor of Mechanical Engineering (1963, 1965). B. S., 1942, M. S., 1949, Kansas State University; Ph. D., 1956, University of California.

BRAINARD, BOYD BERTRAND, Professor of Mechanical Engineering Emeritus (1923, 1938, 1967). B. S., 1922, University of Colorado; S. M., 1931, Massachusetts Institute of Technology. Professional Engineer, 1945.

BYERS, EARLE CONRAD, Assistant Professor of Industrial Engineering (1946, 1956). A. B., 1941, Greenville College; M. S., 1954, Kansas State University.

CHEN, SUNG JEN, Research Assistant in Chemical Engineering (1969). B. S., 1962, National Taiwan University; M. S., 1965, Kansas State University; M. S., 1967, California Institute of Technology.

*CHEZEM, CURTIS G., Professor; Head, Department of Nuclear Engineering (1969). B. A., 1951, M. A., 1952, University of Oregon; Ph. D., 1957, Oregon State University.

*CHUNG, DO SUP, Assistant Professor of Agricultural Engineering (1965, 1966). B. S., 1958, Purdue University; M. S., 1960, Ph. D., 1965, Kansas State University.

CLACK, ROBERT WYNANDUS, Assistant Professor of Nuclear Engineering, Director of Nuclear Reactor Facility (1955, 1959, 1969). B. S., 1943, U. S. Naval Academy. Professional Engineer, 1956.

*CLARK, STANLEY JOE, Associate Professor of Agricultural Engineering, Agr. Exp. Sta. (1966). B. S., 1954, M. S., 1959, Kansas State University; Ph. D., 1964, Purdue University. Professional Engineer, 1969.

CLARK, STANLEY R., Instructor in Agricultural Engineering (1969). B. S., 1967, Kansas State University.

*CLIFTON, JOHN PAUL, Associate Professor of Industrial Engineering; Industrial Engineer, Engg. Exp. Sta. (1947, 1956). B. S., 1929, University of Kansas; M. S., 1956, Kansas State University. Professional Engineer, 1956.

*COOPER, PETER B., Associate Professor of Civil Engineering (1966, 1968). B. S., 1957, M. S., 1960, Ph. D., 1965, Lehigh University. Professional Engineer, 1969.

CORN, JACKSON LEE, Research Associate in Mechanical Engineering (1966).

*COTTOM, MELVIN CLYDE, Assistant Professor of Electrical Engineering (1955). B. S., 1945, M. S., 1948, University of Kansas. Professional Engineer in Kansas, 1947; in Missouri, 1952.

*CRANK, ROBERT EUGENE, Associate Professor of Mechanical Engineering (1947, 1951). B. S., 1947, M. S., 1950, Kansas State University. Professional Engineer, 1949.

CRARY, JAMES FRED, Associate Professor of Applied Mechanics (1947, 1952). B. S., 1947, Kansas State University; M. S., 1969, Oklahoma State University. Professional Engineer, 1948.

CRAWFORD, WILLIAM WESLEY, Associate Professor of Civil Engineering Emeritus (1923, 1942, 1949). B. Di., 1903, M. Di., 1905, Iowa State Teachers College; A. B., 1912, B. S., 1917, Iowa State University.

DARBY, EARL G., Professor of Industrial Arts Emeritus (1941, 1952, 1963). B. S., 1923, M. S., 1943, Kansas State University.

DIETRICH, HARVEY F., Assistant Professor of Industrial Arts Emeritus (1948, 1957, 1967). B. S., 1957, Kansas State University.

DOLLAR, JOHN PAUL, Instructor in Electrical Engineering (1960). B. S., 1956, M. S., 1966, Kansas State University.

*DONNERT, HERMANN JAKOL ANTON, Professor of Nuclear Engineering (1966, 1969). Ph. D., 1951, Franzens University, Austria.

*DUNCAN, ALLEY H., Professor of Mechanical Engineering (1942, 1954). B. S., 1937, M. S., 1949, Kansas State University, Professional Engineer, 1948.

DURLAND, MERRILL AUGUSTUS, Dean and Director Emeritus; Professor of Mechanical Engineering Emeritus (1919, 1961, 1967). B. S., 1918, M. S., 1923, Kansas State University. Professional Engineer, 1935.

*ECKHOFF, N. DEAN, Assistant Professor of Nuclear Engineering; Director of Neutron Activation Analysis Laboratory (1961, 1968). B. S., 1961, M. S., 1963, Ph. D., 1968, Kansas State University.

*ERICKSON, LARRY EUGENE, Associate Professor of Chemical Engineering (1964, 1968). B. S., 1960, Ph. D., 1964, Kansas State University.

ERVIN, PATRICK F., Research Assistant in Nuclear Engineering (1969). B. S., 1968, Kansas State University.

*FAIRBANKS, GUSTAVE EDMUND, Professor of Agricultural Engineering; Agricultural Engineer, Agr. Exp. Sta. (1941, 1957). B. S., 1941, M. S., 1950, Kansas State University. Professional Engineer, 1948.

*FAN, LIANG-TSENG, Professor and Head of Chemical Engineering; Director, Systems Institute; Kansas Power and Light Distinguished Professor (1957, 1963, 1967). B. S., 1951, National Taiwan University; M. S., 1954, Kansas State University; Ph. D., 1957, West Virginia University. Professional Engineer in China, 1951.

*FAW, RICHARD EARL, Professor of Nuclear Engineering; Director of Shielding Facility (1962, 1966, 1968). B. S., 1959, University of Cincinnati; Ph. D., 1962, University of Minnesota.

FENTON, FREDERICK CHARLES, Professor of Agricultural Engineering Emeritus; Agricultural Engineer, Agr. Exp. Sta. (1928, 1961). B. S., 1914, M. S., 1930, Iowa State University. Professional Engineer, 1947.

*FLINNER, ARTHUR ORAN, Professor of Mechanical Engineering (1929, 1947). B. S., 1929, M. S., 1934, Kansas State University; S. M., 1937, Massachusetts Institute of Technology. Professional Engineer, 1937.

FRAZIER, FORREST FAYE, Professor of Civil Engineering Emeritus (1911, 1922, 1954). B. S., 1910, Ohio State University. Professional Engineer, 1931.

FUNK, MONROE LYLE, Assistant Professor of Civil Engineering (1956, 1961). B. S., 1956, M. S., 1960, Kansas State University. Professional Engineer, 1960.

*GALLAGHER, RICHARD RAY, Assistant Professor of Electrical Engineering (1968). B. S., 1964, M. S., 1966, Ph. D., 1968, Iowa State University.

GOERING, EUGENE H., Instructor in Agricultural Engineering (1969). B. S., 1969, Kansas State University.

*GORTON, ROBERT LESTER, Associate Professor of Mechanical Engineering (1960, 1969). B. S., 1953, Louisiana Polytechnic Institute; M. S., 1960, Louisiana State University; Ph. D., 1966, Kansas State University. Professional Engineer, 1953.

*GOWDY, KENNETH KING, Associate Professor of Mechanical Engineering and Assistant Dean of Engineering (1957, 1965, 1969). B. S., 1955, M. S., 1961, Kansas State University; Ph. D., 1965, Oklahoma State University.

GROSH, DORIS LLOYD, Assistant Professor of Industrial Engineering (1965, 1968). B. S., 1946, University of Chicago; M. S., 1949, Ph. D., 1969, Kansas State University.

*GROSH, LOUIS E., Associate Professor of Industrial Engineering (1965, 1966). B. S., 1944, Louisiana State University; B. S., 1947, M. S., 1949, Ph. D., 1954, Purdue University.

*HAFT, EVERETT EUGENE, Professor of Applied Mechanics (1961). B. S., 1947, M. S., 1951, Ph. D., 1955, University of Wisconsin. Professional Engineer in Wisconsin, 1952.

*HALL, RAYMOND CLARENCE, Assistant Professor of Chemical Engineering (1950, 1952). B. S., 1941, Iowa State University; M. S., 1951, Kansas State University.

HANSEN, CARL ULLMAN, Assistant Professor of Industrial Engineering (1957, 1962). B. S., 1936, Kansas State University; M. S., 1961, University of Nebraska. Professional Engineer, 1961.

*HARRIS, FLOYD WAYNE, Associate Professor of Electrical Engineering (1965, 1969). B. S., 1956, University of Oklahoma; M. S., 1960, Ph. D., 1965, Oklahoma State University.

HEARN, JR., NORVAL KELLY, Instructor in Electrical Engineering (1964, 1969). B. S., 1957, M. S., 1966, Kansas State University.

HELANDER, LINN, Professor of Mechanical Engineering Emeritus (1935, 1961). B. S., 1915, University of Illinois. Professional Engineer, 1941.

HEYMACH, GEORGE JOHN, Assistant Professor of Chemical Engineering (1969). B. E., 1964, City College of New York; M. S., 1966, Ph. D., 1969, University of Pennsylvania.

HIGHTOWER, RAY E., Assistant Professor of Nuclear Engineering (1961, 1969). B. S., 1964, Kansas State University.

HOBSON, LELAND STANFORD, Professor of Mechanical Engineering (1946, 1968). B. S., 1927, Kansas State University. Professional Engineer, 1946.

*HODGES, TEDDY OMAR, Professor of Agricultural Engineering; Agricultural Engineer, Agr. Exp. Sta. (1959). B. S., 1950, Texas A and M; M. S., 1951, Iowa State University; Ph. D., 1959, Michigan State University. Professional Engineer in Iowa, 1952.

*HONSTEAD, WILLIAM HENRY, Professor of Chemical Engineering, Engg. and Agr. Exp. Sta.; Kansas Industrial Extension Service (1943, 1960, 1968). B. S., 1939, M. S., 1946, Kansas State University; Ph. D., 1946, Iowa State University. Professional Engineer, 1948.

HOSTETTER, ABRAM ELDRED, Professor of Industrial Engineering Emeritus; Metallurgist, Engineering Exp. Sta. (1931, 1952, 1969). B. S., 1925, McPherson College; M. S., 1932, Ph. D., 1938, Kansas State University.

*HU, KUO-KUANG, Assistant Professor of Applied Mechanics (1968, 1969). Graduation, 1956, Taiwan Provincial Taipei Institute of Technology; M. S., 1966, Ph. D., 1969, Kansas State University.

*HUANG, CHI-LUNG, Associate Professor of Applied Mechanics (1964, 1968). B. S., 1954, National Taiwan University; M. S., 1960, University of Illinois; Dr. of Engg., 1964, Yale University.

HUMMELS, DONALD R., Assistant Professor of Electrical Engineering (1970). B. S., 1967, M. S., 1968, Ph. D., 1969. Arizona State University.

*HUNT, ORVILLE DON, Professor of Electrical Engineering Emeritus (1923, 1947). B. S., 1923, Washington State University; M. S., 1930, Kansas State University. Professional Engineer, 1947.

*HWANG, CHING-LAI, Associate Professor of Industrial Engineering (1959, 1968). B. S., 1953, National Taiwan University; M. S., 1960, Ph. D., 1962, Kansas State University.

IOTTI, ROBERT C., Instructor in Nuclear Engineering (1967). B. S., 1964, M. S., 1967, Kansas State University.

*JOHNSON, GARY LEE, Assistant Professor of Electrical Engineering (1966). B. S., 1961, M. S., 1963, Kansas State University; Ph. D., 1966, Oklahoma State University.

JOHNSON, WILLIAM H., Professor; Head, Department of Agricultural Engineering. B. S., 1948, M. S., 1953, Ohio State University; Ph. D., 1960, Michigan State University.

JORGENSON, LOUIS, Professor of Electrical Engineering Emeritus (1925, 1951, 1954). B. S., 1907, M. S., 1931, Kansas State University.

*KAUFMAN, DALE EDWARD, Assistant Professor of Electrical Engineering (1965, 1967). B. S., 1959, M. S., 1963, Ph. D., 1967, Kansas State University.

KERCHNER, RUSSELL MARION, Professor of Electrical Engineering Emeritus (1922, 1964). B. S., 1922, University of Illinois; M. S., 1927, Kansas State University. Professional Engineer, 1945.

*KIPP, JOHN EDWARD, Associate Professor of Applied Mechanics (1956, 1964). B. S., 1951, M. S., 1955, University of Kansas; Ph. D., 1968, Oklahoma State University. Professional Engineer, 1960.

*KIRMSER, PHILLIP GEORGE, Professor; Head, Department of Applied Mechanics (1942, 1958, 1962). B. S., 1939, M. S., 1944, Ph. D., 1958, University of Minnesota. Professional Engineer, 1961.

* Graduate faculty.

KLOEFFLER, ROYCE GERALD, Professor of Electrical Engineering Emeritus (1916, 1960). B. S., 1913, University of Michigan; M. S., 1930, Massachusetts Institute of Technology. Registered Engineer, 1945.

***KNOSTMAN, HARRY DANIEL**, Assistant Professor of Applied Mechanics (1957, 1965). B. S., 1951, M. S., 1961, Kansas State University; Ph. D., 1965, Colorado University. Professional Engineer, 1959.

***KOEPSEL, WELLINGTON WESLEY**, Professor; Head, Department of Electrical Engineering; Electrical Engineer, Engg. Exp. Sta. (1964). B. S., 1944, M. S. 1951, University of Texas; Ph. D., 1960, Oklahoma State University. Professional Engineer in Texas, 1952.

***KONZ, STEPHAN ANTHONY**, Professor of Industrial Engineering (1964, 1969). B. S., 1956, M. B. A., 1956, University of Michigan; M. S., 1960, State University of Iowa; Ph. D., 1964, University of Illinois.

***KYLE, BENJAMIN GAYLE**, Professor of Chemical Engineering (195B, 1964). B. S., 1950, Georgia Institute of Technology; M. S., 1955, Ph. D., 195B, University of Florida.

***LARSON, GEORGE HERBERT**, Professor of Agricultural Engineering; Agricultural Engineer, Agr. Exp. Sta. (1939, 1956). B. S., 1939, M. S. 1940, Kansas State University; Ph. D., 1955, Michigan State University. Professional Engineer, 1947.

***LEE, E. STANLEY**, Professor of Industrial Engineering (1966). B. S., 1953, Ordnance Engineering College, China; M. S., 1957, North Carolina State College; Ph. D., 1962, Princeton University.

***LENHERT, DONALD H.**, Associate Professor of Electrical Engineering (1966, 1969). B. S., 1956, Kansas State University; M. S., 195B, Syracuse University; Ph. D., 1966, University of New Mexico.

***LINDHOLM, JOHN C.**, Associate Professor of Mechanical Engineering (1960). B. S. B. A., B. S. M. E., 1949, Kansas State University; M. S., 1957, University of Kansas; Ph. D., 1961, Purdue University. Professional Engineer, 1954.

LINDLY, EDWIN CURGUS, Associate Professor of Applied Mechanics (1949, 1954, 1965). B. S., 1942, Oklahoma State University; M. S., 1949, Purdue University; M. S., 1957, Kansas State University; Ph. D., 1964, Iowa State University. Professional Engineer, 1950.

***LIPPER, RALPH IDENS**, Associate Professor of Agricultural Engineering; Associate Agricultural Engineer, Agr. Exp. Sta. (1946, 1957). B. S., 1941, M. S., 1950, Kansas State University. Professional Engineer, 1953.

***LUCAS, MICHAEL S. P.**, Professor of Electrical Engineering (1968). M. S., 1962, Ph. D., 1964, Duke University.

MANGES, HARRY LEO, Assistant Professor of Agricultural Engineering; Assistant Agricultural Engineer, Agr. Exp. Sta. (1946, 1963). B. S., 1949, M. S., 1959, Ph. D., 1969, Kansas State University.

MARSTALL, JAMES J., Instructor in Agricultural Engineering (1969). B. S., 1959, M. S., 1966, Kansas State University.

***MATTHEWS, JOHN CARTER**, Assistant Professor of Chemical Engineering (1962). B. S., 1959, D. Sc., 1965, Washington University.

***McCORMICK, FRANK JAMES**, Professor of Applied Mechanics (1939, 1947). B. S., 1927, M. S., 1931, Iowa State University. Professional Engineer, 1944.

McDONALD, CHARLES RICHARD, Instructor in Agricultural Engineering (1969). B. S., 1960, Kansas State University.

McMILLAN, ALAN DREW, Instructor in Agricultural Engineering, Agr. Exp. Sta. (1967). B. S., 1967, Kansas State University.

***McNALL, PRESTON ESSEX**, Professor; Head Department of Mechanical Engineering; Associate Director, Environmental Research Laboratory (1965, 196B). B. S., 1947, University of Wisconsin; M. S., 1949, Ph. D., 1951, Purdue University.

***MERKLIN, JOSEPH FREDERICK**, Associate Professor of Nuclear Engineering (1967). B. S., 1957, Manhattan College of New York; Ph. D., 1963, University of Minnesota.

***MESSENHEIMER, ALVA ERNEST**, Associate Professor of Mechanical Engineering (1942, 1963). B. S., 1924, Kansas State University. Professional Engineer, 194B.

***MEYER, WALTER**, Professor of Nuclear Engineering (1964, 1968). B. S., 1956, M. S., 1957, Syracuse University; Ph. D., 1964, Oregon State University.

***MILLER, JR., PAUL LEROY**, Associate Professor of Mechanical Engineering (195B, 196B, 1969). B. S., 1957, M. S., 1961, Kansas State University; Ph. D., 1966, Oklahoma State University. Professional Engineer, 1962.

***MINGLE, JOHN ORVILLE**, Professor of Nuclear Engineering; Director, Institute for Computational Research in Engineering (1956, 1965). B. S., 1953, M. S., 1958, Kansas State University; Ph. D., 1960, Northwestern University. Professional Engineer, 1961.

MORSE, REED FRANKLIN, Professor of Civil Engineering Emeritus (1923, 1947, 1968). B. A., 1921, Cornell College; B. S., 192B, Iowa State University; M. S., 1933, Kansas State University; Ph. D., 1941, Cornell University. Professional Engineer, 1939.

***MURPHY, JAMES PATRICK**, Instructor in Agricultural Engineering (196B). B. S. Ag. E., 1968, B. S. B. A., 1968, Kansas State University.

NAITO, MASAAKI, Assistant Professor of Chemical Engineering (1968). B. S., 1962, M. S., 1964, Kyoto University, Kyota.

NASH, RODNEY TRUMAN, Instructor in Mechanical Engineering (1968). B. S., 1967, M. S., 1969, Kansas State University. Professional Engineer, 1968.

MUNGER, HAROLD HAWLEY, Associate Professor of Applied Mechanics Emeritus (1939, 1954, 1961). B. S., 1939, M. S., 1941, Kansas State University. Professional Engineer, 1941.

NELSON, CLARENCE LESLIE, Instructor in Industrial Engineering (1943).

NESMITH, DWIGHT ALVIN, Associate Professor of Engineering; Director, Engg. Exp. Sta. (194B, 1965, 1969). B. S., 1948, Northwestern University; M. S., 1952, Kansas State University. Professional Engineer, 1962.

***NEVINS, RALPH GRIFFITH**, Professor and Dean; Mechanical Engineer, Engg. Exp. Sta.; Director, Environmental Research Lab. (194B, 1963, 1967). B. M. E., 1947, M. S., 1948. University of Minnesota; Ph. D., 1953, University of Illinois. Professional Engineer, 1948.

PAULI, ROSS IRWIN, Assistant Professor of Mechanical Engineering (1947, 1954). B. A., 1941, Westmar College; M. S., 1947, Kansas State College of Pittsburg.

RAZAK, C. KENNETH, Professor of Engineering. B. S., 1936, M. S., 1942, University of Kansas.

***RETZLOFF, DAVID G.**, Assistant Professor of Chemical Engineering (1969). B. S., 1963, M. S., 1965, Ph. D., 1967, University of Pittsburgh.

REYNOLDS, ROGER S., Research Assistant in Nuclear Engineering (1969).

***ROBINSON, MARION JOHN**, Associate Professor of Nuclear Engineering (1966, 1969). B. S., 1960, M. S., 1962, Ph. D., 1965, University of Michigan. Professional Engineer in Michigan 1966, in Kansas, 1967.

***ROHLES, JR., FREDERICK HENRY**, Professor of Mechanical Engineering; Associate Director, Environmental Research Lab. (1963, 1965). B. S., 1942, Roosevelt University, Chicago; M. A., 1949, Ph. D., 1956, University of Texas.

***ROSEBRAUGH, VERNON HART**, Associate Professor of Civil Engineering (1953, 1954). B. S., 1933, Oregon Institute of Technology; B. S., 193B, Oregon State University; M. A., 1952, University of Portland; C. E., 1956, Oregon State University. Professional Engineer, 1954.

***ROTH, THOMAS A.**, Assistant Professor of Industrial Engineering (1965). B. S., 1960, M. S., 1961, Ph. D., 1966, University of Wisconsin.

RUBIN, CAROL ANN, Instructor in Applied Mechanics (1968). B. S., Columbia University, New York.

SANDMAN, BRUCE E., Instructor in Applied Mechanics (1969). B. S., 1965, Cornell College.

***SCHMID, LAWRENCE A.**, Assistant Professor of Civil Engineering (196B). B. S., 1962, M. S., 1963, Iowa State University; Ph. D., 1968, University of Kansas.

SEATON, ROY ANDREW, Dean and Director Emeritus; Professor of Applied Mechanics Emeritus (1904, 1920, 1954). B. S., 1904, M. S., 1910, Kansas State University; S. B., 1911, Massachusetts Institute of Technology; Sc. D., 1942, Northeastern University. Professional Engineer, 1931.

SHAHIN, RIAD MOHAMMED, Instructor in Applied Mechanics (1968). B. S., 1962, M. S., 1965, American University of Beirut, Lebanon.

SCHULTIS, J. KENNETH, Assistant Professor of Nuclear Engineering (1970). B. A., 1964, University of Toronto; M. S., 1965, Ph. D., 196B, University of Michigan.

SITZ, EARL LEROY, Professor of Electrical Engineering Emeritus (1927, 1948, 1969). B. S., 1927, Iowa State University; M. S., 1932, Kansas State University. Professional Engineer, 1947.

***SMALTZ, JACOB JAY**, Professor of Industrial Engineering (1939, 1952). B. S., 1939, Bradley Polytechnic Institute; M. S., 1946, Kansas State University. Professional Engineer, 1960.

***SMITH, BOB LEE**, Professor of Civil Engineering (1948, 1965). B. S., 1944, M. S., 1953, Kansas State University; Ph. D., 1963, Purdue University. Professional Engineer, 1953.

SMUTZ, FLOYD ALONZO, Professor of Machine Design Emeritus (1918, 1934, 1960). B. S., 1914, Kansas State University.

***SNELL, ROBERT ROSS**, Professor of Civil Engineering (1957, 1968). B. S., 1954, M. S., 1961, Kansas State University; Ph. D., 1963, Purdue University. Professional Engineer, 1959.

SPILLMAN, CHARLES KENNARD, Assistant Professor of Agricultural Engineering (1969). A. S., 1958, Vincennes University; B. S., 1960, M. S., 1963, University of Illinois; Ph. D., 196B, Purdue University.

***SPRAGUE, CLYDE HOWARD**, Associate Professor of Mechanical Engineering (1963, 1964). B. S., 195B, M. S., 1963, Kansas State Unisity; Ph. D., 196B, Purdue University.

***STEVENSON, PAUL NELSON**, Associate Professor of Farm Mechanics (1957). B. S., 194B, University of Missouri; M. S., 1957, Iowa State University.

***STIRLAND, DEREK JOHN**, Associate Professor of Electrical Engineering (1969). B. S., 1950, Bristol University, England.

SWART, ROGER RALPH, Instructor in Civil Engineering (1969). B. S., 1969, Kansas State University.

***SWARTZ, STUART ENDSLEY**, Assistant Professor of Civil Engineering (196B). B. S., 1959, M. S., 1962, Ph. D., 196B, Illinois Institute of Technology.

***SWEARINGEN, THOMAS BURKE**, Assistant Professor of Mechanical Engineering (1965). B. S., 1954, Kansas State University; M. S., 1961, Washington State University; Ph. D., 1966, University of Arizona.

***TAYLOR, DELOS CLIFTON**, Professor of Applied Mechanics Emeritus (1931, 1956). B. S., 1925, M. S., 1937, Kansas State University. Professional Engineer, 194B.

TENEYCK, GEORGE ROBERT, Instructor in Agricultural Engineering; Superintendent, Sandyland Experimental Field (1964, 1969). B. S., 1951, Kansas State University.

THIESING, JAMES W., Instructor in Nuclear Engineering (1966, 1968). B. S., 1966, Kansas State University.

***TILLMAN, FRANK AUBREY**, Professor; Head, Department of Industrial Engineering; Associate Director of Systems Institute (1965, 1966, 1969). B. S., 1960, M. S., 1961, University of Missouri; Ph. D., 1965, State University of Iowa.

***TRIPP, WILSON**, Professor of Mechanical Engineering (1936, 1947). B. S., 1930, M. S., 1933, University of California; Ph. D., 1955, University of Illinois. Professional Engineer, 1946.

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* Graduate faculty.

*TURNQUIST, RALPH OTTO, Associate Professor of Mechanical Engineering (1959, 1969). B. S., 1952, M. S., 1961, Kansas State University; Ph. D., 1965, Case Institute of Technology.

VERSER, FORT A., Instructor of Nuclear Engineering (1970). B. S., 1948, M. S., 1950, Texas A and M.; M. S., 1960, U. S. Naval Post Graduate School.

WAKABAYASHI, ISAAC, Instructor in Electrical Engineering (1955). B. S., 1953, University of California.

*WALAWENDER, WALTER P., Assistant Professor of Chemical Engineering (1969). B. A., 1963, Utica College of Syracuse University; M. S., 1967, Ph. D., 1969, Syracuse University.

*WALKER, HUGH SANDERS, Associate Professor of Mechanical Engineering (1964, 1968). B. S., 1957, M. S., 1960, Louisiana State University; Ph. D., 1965, Kansas State University.

WARD, E. DAWSON, Instructor in Mechanical Engineering (1965). B. S., 1964, Kansas State University; M. S., 1965, Massachusetts Institute of Technology.

*WARD, JR., JOSEPH EVANS, Professor of Electrical Engineering (1940, 1961). B. S., 1937, The University of Texas; M. S., 1940, University of Illinois. Professional Engineer, 1958.

*WILLIAMS, WAYNE WATSON, Associate Professor of Civil Engineering (1965). B. S., 1951, M. S., 1953, Iowa State University.

*WIRTZ, LEO ANDREW, Associate Professor of Electrical Engineering (1947, 1962). B. S., 1947, B. S., 1951, M. S., 1957, Kansas State University. Professional Engineer, 1954.

WOOD, JOE NATE, Professor of Mechanical Engineering (1936, 1947). B. S., 1936, University of Iowa. Professional Engineer, 1948.

WOODARD, CLAUDE LOWELL, Associate Professor of Industrial Engineering (1949, 1954). B. S., 1948, Kansas State University; M. S., 1961, Ph. D., 1968, University of Missouri School of Mines.

Faculty of the College of Home Economics

Includes only those with rank of instructor or above.

*AGAN, ANNA TESSIE, Associate Professor of Family Economics Emerita; Agr. Exp. Sta. (1929, 1944, 1968). B. S., 1927, University of Nebraska; M. S., 1930, Kansas State University.

*ALDOUS, CORAL KERR, Associate Professor of Family and Child Development Emerita (1940, 1958). B. S., 1911, Utah State Agricultural College; M. A., 1940, Columbia University.

*ANNIS, PATTY SMITH, Assistant Professor of Family Economics, Agr. Exp. Sta. (1958, 1961). B. S., 1955, Mississippi State College for Women; M. S., 1957, University of Tennessee.

BAILEY, JANICE A., Instructor of Family and Child Development (1968). B. A., 1963, Colorado College; M. S., 1969, Kansas State University.

*BARFOOT, DOROTHY, Professor of Art Emerita (1930, 1962, 1966). B. A., State University of Iowa; M. A., 1928, Columbia University.

*BARNES, JANE WILSON, Assistant Professor Emerita (1939, 1963). B. S., 1912, M. S., 1932, Kansas State University.

BEREUTER, CAROL A., Instructor of Clothing, Textiles and Interior Design (1969). B. S., 1968, M. A., 1970, University of Nebraska.

BERGEN, BETSY, Instructor of Family and Child Development (1966). A. B., 1949, Ottawa University; M. S., 1964, Kansas State University.

*BOLLMAN, STEVE RAY, Associate Professor of Family and Child Development; Agr. Exp. Sta. (1966, 1969). B. S., 1957, M. S., 1963, Ph. D., 1966, Iowa State University.

*BOWERS, JANE RAYMOND, Associate Professor of Foods and Nutrition; Agr. Exp. Sta. (1966). B. S., 1962, M. S., 1963, Ph. D., 1967, Kansas State University.

BRAUN, AUDREY A., Instructor of Clothing, Textiles and Interior Design (1969). B. S., 1967, M. S., 1969, University of Nebraska.

*BROCKMAN, HELEN L., Professor of Clothing, Textiles and Interior Design (1967). B. A., 1926, University of Iowa.

*BROWNING, NINA MYRTLE, Associate Professor of Foods and Nutrition (1930, 1943). B. S., 1923, M. S., 1927, Kansas State University.

*CAUL, JEAN FRANCES, Distinguished Professor of Foods and Nutrition; Agr. Exp. Sta. (1967). A. B., 1937, Lake Erie College; M. A., 1938, Ph. D., 1942, Ohio State University.

COATES, CAROLYN, Instructor of Family and Child Development (1969). B. S., 1953, and M. Ed., 1962, Temple University.

*CORMANY, ESTHER MARGARET, Associate Professor of Clothing, Textiles and Interior Design; Agr. Exp. Sta. (1936, 1941). B. S., 1926, M. S., 1932, Kansas State University.

*CRAIGIE, BARBARA, Assistant Professor of Clothing, Textiles and Interior Design (1954, 1963). B. A., 1932, University of Minnesota; M. A., 1942, University of Missouri.

FASSE, WILLIAM R., Instructor of Family Economics; Agr. Exp. Sta. (1969). B. A., 1968, Washburn University; M. S., 1970, Kansas State University.

*FINKELSTEIN, BEATRICE, Professor of Foods and Nutrition; Agr. Exp. Sta. (1967). B. A., 1933, Hunter College; M. S., 1939, Columbia University.

FRIEND, SHIRLEY E., Assistant Professor of Clothing, Textiles and Interior Design; Agr. Exp. Sta. (1969). B. S., 1962, University of Arkansas; M. S., 1964, University of Missouri; Ed. D., 1969, University of Arkansas.

*FRYER, BETH ALSUP, Associate Professor of Foods and Nutrition; Agr. Exp. Sta. (1959). B. S., 1945, University of New Mexico; M. S., 1949, Ohio State University; Ph. D., 1959, Michigan State University.

*HARRISON, DOROTHY LUCILE, Professor of Foods and Nutrition; Agr. Exp. Sta. (1947, 1963). B. S., 1938, Dakota Wesleyan University; M. S., 1943, Ph. D., 1947, Iowa State University.

*HESS, KATHARINE PADDOCK, Associate Professor of Clothing and Textiles Emerita (1925, 1950). B. S., 1900, M. S., 1925, Kansas State University.

*HILL, OPAL BROWN, Associate Professor of Clothing, Textiles and Interior Design Emerita (1944, 1954, 1965, 1969). B. S., 1944, M. S., 1950, Kansas State University.

*HOEFLIN, RUTH, Associate Dean; Professor of Home Economics (1957, 1960). B. S., 1940, Iowa State University; M. A., 1945, University of Michigan; Ph. D., 1950, Ohio State University.

*HOFFMAN, DORETTA, Dean; Professor of Home Economics; Associate Director, Agr. Exp. Sta. (1954). B. S., 1941, University of Nebraska; M. S., 1943, Michigan State University; Ph. D., 1949, Cornell University; D. Sc., 1966, University of Nebraska.

*HOWE, HAZEL DELL, Associate Professor of Clothing and Textiles Emerita (1936, 1947, 1967). B. S., 1921, M. S., 1935, Kansas State University.

*KELL, LEONE BOWER, Professor of Family and Child Development Emerita; Agr. Exp. Sta. (1927, 1947, 1965). B. S., 1923, M. S., 1928, Kansas State University.

*KRAMER, MARTHA MORRISON, Professor of Home Economics Emerita (1922, 1960). B. S., 1916, University of Chicago; M. S., 1919, Ph. D., 1922, Columbia University.

*LATZKE, ALPHA CORINNE, Professor of Clothing and Textiles Emerita (1927, 1960, 1965). B. S., 1919, M. S., 1928, Kansas State University.

*LIENKAEMPER, GERTRUDE ELISE, Associate Professor of Clothing and Textiles Emerita (1941, 1948, 1966). B. S., 1921, Oregon State College; M. A., 1938, University of Washington.

*McCORD, IVALEE HEDGE, Professor of Family and Child Development (1957, 1963). B. S., 1933, M. S., 1951, Kansas State University; Ph. D., 1964, Purdue University.

*McMILLAN, EVA M., Associate Professor of Foods and Nutrition Emerita (1930, 1937, 1939, 1958). M. S., 1918, Ph. D., 1929, University of Chicago.

*MIDDLETON, RAYMONA, Assistant Professor of Institutional Management; Agr. Exp. Sta. (1962, 1966). B. S., 1937, University of Nebraska; M. S., 1941, Kansas State University.

*MORSE, RICHARD L. D., Professor; Head, Department of Family Economics; Agr. Exp. Sta. (1955). B. A., 1938, University of Wisconsin; Ph. D., 1942, Iowa State University.

MOXLEY, VIRGINIA, Assistant to Dean; Instructor of Home Economics (1970). B. S., 1968, M. S., 1969, Kansas State University.

*MULLEN, IVA MANILLA, Assistant Professor of Foods and Nutrition Emerita (1936, 1964). B. S., 1925, Kansas State University; M. S., 1928, Iowa State University.

MUNSON, DEANNA M., Instructor of Clothing, Textiles and Interior Design (1967). B. S., 1966, M. S., 1967, Kansas State University.

NEWBY, FRANCES ANN, Instructor of Clothing, Textiles and Interior Design (1963). B. F. A., 1961, Kansas City Art Institute.

NEWELL, KATHLEEN, Assistant Professor of Foods and Nutrition (1962). B. S., 1944, Kansas State University; M. S., 1951, University of Wisconsin.

PETERSON, MARY D., Instructor of Clothing, Textiles and Interior Design (1968). B. S., 1958, M. S., 1959, University of Tennessee.

RAFFINGTON, MARGARET ELIZABETH, Assistant Professor of Family and Child Development Emerita (1938, 1939, 1966, 1970). B. S., 1924, M. S., 1928, Kansas State University; Professional Diploma, 1954, Columbia University.

*RASMUSSEN, ALBIE C., Assistant Professor of Family Economics (1966, 1967). B. S., 1942, University of Alaska; M. S., 1964, Kansas State University.

REEHLING, JEAN ELIZABETH, Assistant Dean; Assistant Professor of Home Economics (1964, 1967). B. S., 1962, Kansas State University; M. A., 1963, Colorado State College.

RIEMANN, NANCY E., Instructor of Family Economics (1969). B. S., 1963, Michigan State University; M. S., 1968, Kansas State University.

ROACH, FAITH RUSSELL, Instructor of Institutional Management (1965). B. S., 1947, M. S., 1966, Kansas State University.

SEGO, R. JEAN WHEELER, Assistant to Dean; Instructor of Home Economics (1967). B. A., 1960, Friends University; M. S., 1967, Kansas State University.

*SHUGART, GRACE SEVERANCE, Professor; Head, Department of Institutional Management; Agr. Exp. Sta. (1951, 1961). B. S., 1931, State College of Washington; M. S., 1938, Iowa State University.

SMOCK, PAUL, Assistant Professor of Family and Child Development (1970). B. A., 1965, Oklahoma Baptist University; M. S., 1966, Oklahoma State University; Ph. D., 1970, Brigham Young University.

*STITH, MARJORIE MAY, Professor; Head, Department of Family and Child Development; Agr. Exp. Sta. (1961). B. S., 1943, Alabama State College for Women; M. S., 1958, Ph. D., 1961, Florida State University.

*TINKLIN, GWENDOLYN LaVERNE, Professor of Foods and Nutrition; Agr. Exp. Sta. (1943, 1956). B. S., 1940, M. S., 1944, Kansas State University.

*WAKEFIELD, LUCILLE MARIAN, Professor; Head, Department of Foods and Nutrition; Agr. Exp. Sta. (1966). B. S., 1949, M. S., 1956, University of Connecticut; Ph. D., 1965, Ohio State University.

*WARDEN, JESSIE A., Professor; Head, Department of Clothing, Textiles and Interior Design; Agr. Exp. Sta. (1960). B. S., 1940, Northeast Missouri State Teachers College; M. A., 1946, Columbia University; Ph. D., 1955, Pennsylvania State University.

*WEST, BESSIE BROOKS, Professor of Institutional Management Emerita (1928, 1960). A. B., 1924, M. A., 1928, University of California; M. S., 1951, Michigan State Normal College.

* Graduate faculty.

*WILLIAMS, JENNIE, Professor of Family and Child Development Emerita (1932, 1959). B. S., 1910, M. S., 1933, Kansas State University; Graduate, 1925, University of Michigan School of Nursing.

WITT, CHERYL A., Instructor of Clothing, Textiles and Interior Design (1969). B. S., 1968, M. S., 1969, Kansas State University.

Faculty of the College of Veterinary Medicine

Includes only those with rank of instructor or above.

*ANDERSON, NEIL V., Associate Professor of Comparative Gastroenterology (1967). B. S., 1953, Mankato State College; B. S., 1959, D. V. M., 1961, University of Minnesota.

*ANTHONY, HARRY D., Associate Professor and Director of Diagnostic Laboratory (1955, 1967). D. V. M., 1952, M. S., 1957, Kansas State University.

BARNHART, JAMES L., Temporary Instructor of Physiological Chemistry (1966). B. S., 1965, Kansas State University.

BAUGH, ROBERT C., Instructor of Anatomy (1955, 1968). D. V. M., 1965, Kansas State University.

BERRY, JAMES, Assistant Professor of Comparative Dermatology (1969). B. S., 1958, D. V. M., 1960, Washington State University.

*BESCH, EMERSON L., Associate Professor and Head, Department of Physiological Sciences (1967, 1968). B. S., 1952, M. A., 1955, Southwest Texas State College; Ph. D., 1964, University of California.

BLAUCH, BRUCE S., Instructor of Small Animal Medicine (1965). B. S., 1949, Pennsylvania State University; D. V. M., 1956, University of Pennsylvania.

BRANDLY, CARL A., Professor of Comparative Medicine (1968, 1969). D. V. M., 1923, M. S., 1930, Kansas State University.

BRANDT, GARY W., Assistant Professor of Equine Medicine (1969). B. S., 1964, D. V. M., 1966, University of Illinois.

*BURROUGHS, ALBERT L., Associate Professor of Pathology (1960). B. S., 1938, University of Wyoming; D. V. M., 1958, Texas A&M College; M. S., 1941, Montana State College; Ph. D., 1946, University of California.

BURWASH, WAYNE, Instructor of Equine Medicine (1969). D. V. M., 1969, University of Saskatchewan.

*BUTLER, HUGH C., Professor of Surgery (1968). D. V. M., 1954, M. S., 1968, Washington State University.

*CARDINET, GEORGE H. III, Associate Professor of Anatomy (1966). A. A. 1957, Diablo Valley College; B. S., 1960, D. V. M., 1963, Ph. D., 1966, University of California.

CARNAHAN, DAVID L., Assistant Professor of Obstetrics and Gynecology (1961, 1964). B. S., 1959, D. V. M., 1959, M. S., 1964, Kansas State University.

CHAPMAN THOMAS E., Assistant Professor of Physiological Chemistry (1969). B. S., 1962, D. V. M., 1964, Ph. D., 1969, University of California.

CHEN, CHAO L., Assistant Professor of Physiology (1969). B. S., 1960, D. V. M., 1960, Nat'l. Taiwan University; M. S., 1966, Iowa State University; Ph. D., Pend., Michigan State University.

*CLARENBURG, RUDOLF, Associate Professor of Physiological Chemistry (1966). B. S., 1954, Ph. D., 1959, State University of Utrecht.

*COLES, JR., EMBERT H., Professor and Head, Department of Infectious Diseases (1954, 1968). D. V. M., 1945, Ph. D., 1958, Kansas State University; M. S., 1948, Iowa State College.

*COOK, JAMES E., Professor of Pathology (1969). Diplomate, 1956, American College of Veterinary Pathologists; D. V. M., 1951, Oklahoma State University; Ph. D., 1970, Kansas State University.

*CORNELIUS, CHARLES E., Dean; Professor of Physiology and Associate Director, Agr. Exp. Sta. (1966). B. S., 1949, D. V. M., 1953, Ph. D., 1958, University of California.

*DENNIS, STANLEY M., Professor and Head, Department of Pathology (1966, 1968). F. R. C. V. S., 1962, B. V. Sc., 1949, Ph. D., 1961, University of Sidney.

ERICHSEN, DEBORAH, Temporary Instructor of Physiology and Pharmacology (1968). B. S., 1966, D. V. M., 1968, Kansas State University.

*FEDDE, M. ROGER, Associate Professor of Physiology (1964, 1968). B. S., 1957, Kansas State University; M. S., 1959, Ph. D., 1963, University of Minnesota.

FRANK, EDWARD R., Professor of Surgery Emeritus (1926, 1935, 1962). B. S., 1918, D. V. M., 1924, M. S., 1929, Kansas State University.

*FREY, RUSSELL A., Associate Professor of Physiology (1963, 1964). D. V. M., 1952, Ph. D., 1970, Kansas State University.

*FRICK, EDWIN J., Professor, Department of Surgery and Medicine Emeritus (1919, 1935, 1966). D. V. M., 1918, Cornell University.

*GELATT KIRK N. Assistant Professor of Comparative Ophthalmology (1967). B. S. 1961, Pennsylvania State University; V. M. D., 1965, University of Pennsylvania.

GRAY, ANDREW P., Assistant Professor of Pathology (1964, 1966). D. V. M., 1953, M. S., 1963, Ph. D., 1966, Kansas State University.

*GRONWALL, RONALD R., Associate Professor of Physiology (1966). B. S., 1960, D. V. M., 1962, Ph. D., 1966, University of California.

*GUFFY, MARK M., Associate Professor of Radiology (1963, 1969). D. V. M., 1949, M. S., 1966, Colorado State University.

HARRIS, STANLEY G., Assistant Professor of Comparative Cardiology (1964, 1969). B. S., 1958, D. V. M., 1960, M. S., 1967, Kansas State University.

HARTKE, GLEN T., Instructor in Anatomy (1962). B. S., 1958, D. V. M., 1960, M. S., 1965, Kansas State University (AID Nigeria, 1966-1970).

HENRY, JR., JACK D., Instructor in Surgery and Medicine (1968). B. A., 1960, D. V. M., 1968, Kansas State University.

JERNIGAN, LOYCE D., Temporary Assistant Professor of Medicine (1965). D. V. M., 1945, Kansas State University.

*KELLY, DONALD C., Professor of Pathology (1958, 1969). Diplomate, American Board of Veterinary Public Health. D. V. M., 1935, M. S., 1952, Kansas State University.

KIMBALL, ALICE DAY, Instructor in Pathology, Parasitology and Public Health Emeritus (1934, 1955). B. S., 1935, Kansas State University.

*KITSELMAN, CHARLES H., Professor of Pathology Emeritus (1919, 1933, 1965). V. M. D., 1918, University of Pennsylvania; M. S., 1927, Kansas State University.

*KLEMM, ROBERT D., Assistant Professor of Anatomy (1967). B. S., 1957, Capital University; M. S., 1959, Ohio University; Ph. D., 1964, Southern Illinois University.

KRUCKENBERG, SAMUEL M., Instructor in Surgery; Director of Animal Resources (1966, 1967). D. V. M., 1963, M. S., 1965, Kansas State University.

*LEASURE, ELDEN E., Dean Emeritus; Professor of Pathology, Parasitology and Public Health (1926, 1948, 1964). D. V. M., 1923, M. S., 1930, Kansas State University.

*LELAND, STANLEY E., Professor of Pathology (1967). B. S., 1949, M. S., 1950, University of Illinois; Ph. D., 1953, Michigan State University.

*LINDQUIST, WILLIAM D., Professor of Infectious Diseases (1968). B. S., 1940, M. S., 1942, University of Idaho; Sc. D., 1949, Johns Hopkins University.

*LUMB, JOHN W., Professor of Anatomy Emeritus (1924, 1957). D. V. M., 1910, M. S., 1930, Kansas State University.

*McGAVIN, MATTHEW D., Associate Professor of Pathology (1968). B. V. Sc., 1952, M. V. Sc., 1962, University of Queensland; Ph. D., 1964, Michigan State University; Diplomate, American College of Veterinary Pathologists, 1963.

MILES, DELBERT G., Instructor of Pathology (1969). B. S., 1964, D. V. M., 1966, University of Missouri.

MILLERET, ROY J., Assistant Professor of Food Animal Medicine (1960, 1964). D. V. M., 1944, M. S., 1959, Kansas State University.

MINOCHA, HARISH C., Associate Professor of Infectious Diseases (1969). B. V. Sc., 1955, Indian; M. S., 1963, Ph. D., 1967, Kansas State University.

*MOORE, WILLIAM E., Assistant Professor of Infectious Diseases (1968). B. S., 1956, D. V. M., 1958, Cornell University; Ph. D., 1968, University of Minnesota.

*MOSIER, JACOB E., Professor; Head, Department of Surgery and Medicine (1945, 1961). D. V. M., 1945, M. S., 1948, Kansas State University.

MUNGER, LADDIE L., Instructor of Pathology (1968). B. S., 1962, D. V. M., 1962, University of Missouri.

*NOORDSY, JOHN L., Professor of Surgery (1966). B. S., 1943, South Dakota State College; D. V. M., 1946, M. S., 1962, Kansas State University.

*OEHME, FREDERICK W., Associate Professor of Toxicology and Medicine (1969). B. S., 1957, D. V. M., 1958, Cornell University; M. S., 1962, Kansas State University; Ph. D., 1969, University of Missouri.

*OSBALDISTON, GEORGE W., Associate Professor of Pathology (1967). B. V. Sc., 1956, Queensland University; M. R. C. V. S., 1960, London; M. A., 1963, Ph. D., 1965, Cambridge University.

RIDLEY, ROBERT K., Assistant Professor of Infectious Diseases (1969). A. B., 1958, Bowdoin College; M. S., 1960, University of Kentucky; Ph. D., 1967, Florida State University.

SCHONEWEIS, DAVID A., Instructor of Food Animal Medicine (1966). B. S., 1956, D. V. M., 1956, Kansas State University.

SCHONING, POLLY A., Temporary Instructor in Anatomy (1967). B. S., 1962, D. V. M., 1964, Kansas State University.

*SMITH, JOSEPH E., Associate Professor of Pathology (1969). B. S., 1959, D. V. M., 1961, Texas A&M; Ph. D., 1964, University of California.

*STRAFUSS, ALBERT C., Associate Professor of Pathology (1968). B. S., 1952, D. V. M., 1954, M. S., 1958, Kansas State University; Ph. D., 1963, University of Minnesota.

TAUSSIG, ROBERT A., Assistant Professor of Small Animal Medicine (1966). D. V. M., 1945, Colorado State University; M. S., 1970, Kansas State University.

*TROTTER, DONALD M., Associate Dean; Professor of Anatomy (1956, 1967). Diplomate, 1951, American College of Veterinary Pathologists; D. V. M., 1946, M. S., 1957, Kansas State University.

*UNDERBJERG, G. K. L., Professor of Physiology (1948). B. S., 1926, Royal Veterinary and Agricultural College, Copenhagen; D. V. M., 1943, Ph. D., 1939, Iowa State University.

*UPSON, DAN W., Associate Professor of Pharmacology (1959, 1969). D. V. M., 1952, M. S., 1962, Ph. D., 1969, Kansas State University.

VESTWEBER, JEROME G. E., Instructor of Food Animal Medicine (1967). B. S., 1962, D. V. M., 1964, University of Minnesota.

*WALLACE, LARRY J., Associate Professor of Surgery and Medicine (1966, 1969). B. S., 1960, D. V. M., 1962, M. S., 1964, Michigan State University.

*WESTFALL, JANE A., Associate Professor of Anatomy (1967). A. B., 1950, College of Pacific; M. A., 1952, Mills College; Ph. D., 1965, University of California.

WILCOX, GRAHAM E., Assistant Professor of Pathology (1969). B. V. Sc., 1964, Ph. D., 1969, University of Queensland.

* Graduate faculty.

Division of Cooperative Extension

Includes only those with rank of instructor or above.

Residence Staff

AHLSCHWEDE, GEORGE ALLEN, Assistant Professor; Extension Specialist in Meats (1965). B. S., 1962; M. S., 1965; Ph. D., 1969, Kansas State University.

ALLEN, GERTRUDE EDNA, Professor Emeritus; Extension Specialist in Foods and Nutrition (1929, 1947). B. S., 1923, University of Minnesota; M. S., 1936, Kansas State University.

AMSTEIN, WILLIAM GERALD, Professor; Extension Specialist, International Participant Training (1929, 1965, 1968). B. S., 1927, University of Massachusetts; M. S., 1928, Kansas State University.

ANDERSON, ELINOR, Assistant Professor; Extension Specialist, Home Management (1957, 1963). B. S., 1939, M. S., 1952, Kansas State University.

***APEL, J. DALE,** Professor; Associate State Club Leader (1962, 1967). B. S., 1950, Kansas State University; M. S., 1961, The American University; Ph. D., 1966, University of Chicago.

APPLEBY, MARIELLEN J., Assistant Professor; District Extension Home Economist (1955, 1965). B. S., 1955, Kansas State University; M. S., 1965, University of Maryland.

APPLEBY, THOMAS E., Instructor; Extension Economist in Farm Management (1960, 1963, 1967). B. S., 1959, M. S., 1967, Kansas State University.

AREA, MARJORIE JOANN, Assistant Professor; Extension Specialist, 4-H Club Work (1964). B. S., 1956, M. S., 1961, Kansas State University.

ATCHISON, FRED DOWNS, Instructor; District Extension Forester (1964). B. S., 1954, University of Georgia.

ATKINSON, DAISY ELIENE, Assistant Professor; Extension Specialist in Foods and Nutrition (1959). B. A., 1938, University of Iowa; M. S., 1954, University of Alabama.

BAIRD, HARRY CHARLES, Professor Emeritus; District Agricultural Agent (1920, 1952). B. S., 1914, Kansas State University.

BAKER, E. KIRK, Assistant Professor; Extension Economist, Resource Development (1955, 1966). B. S., 1949, Oklahoma State University; M. S., 1966, Kansas State University.

BALDING, JAMES LEWIS, Extension Assistant; Extension Specialist in Formula Feeds Manufacturing (1965). B. S., 1960, Kansas State University.

BARTLETT, CLARENCE EDWARD, Instructor Emeritus; Extension Economist in Farm Management (1947). B. S., 1929, University of Nebraska.

BATES, JR., CHARLES THOMAS, Assistant Professor; Extension Specialist in 4-H Club Work (1956, 1961). B. S., 1951, Oklahoma A & M; M. S., 1960, University of Wisconsin.

BIEBERLY, FRANK GEARHARD, Professor; Section Leader and Extension Specialist in Crops and Soils (1941, 1949). B. S., 1938, M. S., 1949, Kansas State University.

BILES, LARRY E., Instructor; Area Extension Forester, Watershed Project (1967). B. S., 1967, University of Missouri.

BISWELL, CLIFFORD R., Assistant Professor; Assistant State Extension Forester (1957, 1965, 1967). B. S., 1954, M. S., 1965, University of Missouri.

BLANKENHAGEN, ELMER W., Assistant Professor; Coordinator, Schedules and Reports (1950, 1956, 1969). B. S., 1948, Kansas State University.

BLECHA, FRANK OTTO, Professor Emeritus; District Agricultural Agent (1919, 1948). B. S., 1918, M. S., 1924, Kansas State University.

BOHANNON, ROBERT ARTHUR, Professor; Director of Extension (1951, 1968). B. S., 1949, Michigan State University; M. S., 1951, Kansas State University; Ph. D., 1957, University of Illinois.

BONEWITZ, EDWIN RALPH, Associate Professor; Extension Specialist in Dairy Science (1943, 1949). B. S., 1941, M. S., 1955, Kansas State University.

BORST, WILLIAM H., Associate Professor; Extension Specialist, 4-H Nutrition Program (1953, 1955, 1967, 1970). B. S., 1950, Kansas State University; M. S., 1962, Colorado State University.

BRATTON, GERALD F., Instructor; Area Extension Forester, Watershed Project (1967). B. S., 1966, Colorado State University.

BREWER, DONALD I., Instructor; Extension Specialist, Radio and TV (1967). B. A., 1953, University of Tulsa.

BRIGGS, VIVIAN BAHR, Assistant Professor Emeritus; Extension Specialist in Family Life (1946, 1951). B. S., 1942, University of Nebraska; M. S., 1952, Kansas State University.

BRILL, MARTHA E., Assistant Professor; Extension Specialist in Health (1946, 1948). B. S., 1940, Kansas State University; R. N., 1940, University of Kansas.

BROOKS, HOWARD LEROY, Assistant Professor; Extension Specialist, Insecticides (1965). B. S., 1960, M. S., 1963, University of Arkansas; Ph. D., 1967, Kansas State University.

BURKE, JACK M., Associate Professor; Manager of Radio Station KSAC (1958). B. A., 1953, M. E., 1963, North Dakota State University.

***BUSSET, GLENN M.,** Professor; Department Head and State Club Leader (1941, 1966). B. S., 1941, Kansas State University; M. S., 1957, Cornell University; Ph. D., 1965, University of Wisconsin.

CALEY, HOMER K., Associate Professor; Extension Specialist in Veterinary Medicine (1965). D. V. M., 1952, Kansas State University.

CARLSON, JEAN K., Assistant Professor; Extension Specialist, Home Management (1950, 1966, 1969). B. S., 1950, Kansas State University; M. S., 1965, Oklahoma State University.

CLEAVINGER, EUGENE A., Professor Emeritus; Extension Specialist in Crops and Soils (1926, 1947). B. S., 1925, Kansas State University.

COEN, LINDA L., Instructor; Area Extension Specialist, 4-H Nutrition Program (1970). B. A., 1968, Graceland College.

COLLINS, BILL D., Instructor; Extension Economist, Farm Management (1954, 1965). B. S., 1951, Kansas State University; M. S., 1962, University of Wisconsin.

COOLIDGE, JOHN H., Professor Emeritus; Extension Economist in Farm Management (1926, 1948). B. S., 1925, M. S., 1932, Kansas State University.

COPPERSMITH, ROBERT L., Professor; Extension Economist, Livestock Marketing (1960). B. S., 1948, Kentucky State College; M. S., 1950, University of Kentucky; Ph. D., 1953, University of Illinois.

COX, LAWRENCE J., Associate Professor; District Extension Supervisor (1952, 1959, 1967). B. S., 1948, Oklahoma State University; M. S., 1960, Kansas State University; Ed. D., 1970, North Carolina State University.

COZART II, H. THAYNE, Assistant Professor; Assistant Extension Editor (1969). B. S., 1964, Kansas State University; M. S., 1967, Oklahoma State University.

CRANDALL, MARDELL L., Instructor; Extension Editorial Assistant, 4-H Nutrition Program (1970). B. S., 1970, Kansas State University.

CRIST, ROSEMARY A., Assistant Professor; District Extension Home Economist (1950, 1965). B. S., 1947, Kansas State University; M. A., 1967, University of Nebraska.

***DAUGHERTY, HOPE S.,** Associate Professor; Extension Specialist 4-H Child and Youth Development (1969). B. S., 1940, Missouri State College; M. Ed., 1964, University of Missouri; Ph. D., 1967, University of Oklahoma.

DeLANO, FREDRICK D., Instructor; Extension Economist in Farm Management (1964, 1967). B. S., 1961, Kansas State University.

DEUTSCH, HENRY, Assistant Professor; District Extension Forester (1964). B. S., 1957, M. S., 1964, University of Missouri.

DeWEESE, PAUL F., Assistant Professor; Extension Specialist, Radio and Television (1948, 1966). B. S., 1947, Kansas State University.

DICKEN, D. DEAN, Assistant Professor; Area Extension Specialist, Crops and Soils (1942, 1963). B. S., 1937, Kansas State University; M. S., 1942, University of Illinois.

DICKINSON, ANNABELLE J., Associate Professor; Associate State Leader, Home Economics (1940, 1959, 1969). B. S., 1933, Fort Hays Kansas State College; M. S., 1954, University of Missouri.

DICKSON, WILLIAM M., Instructor, Extension Economist in Farm Management (1961, 1966). B. S., 1956, M. S., 1961, Kansas State University.

DIERKING, GARY R., Instructor, Extension Specialist, Visual Aids (1961). B. F. A., 1958, University of Kansas.

DUNHAM, JAMES R., Assistant Professor; Extension Specialist, Dairy Science (1969). B. S., 1959, M. S., 1967, Ph. D., 1969, Kansas State University.

EDELBLUTE, DALE HENRY, Assistant Professor; Area Extension Specialist, Crops and Soils (1947, 1955). B. S., 1934, Kansas State University.

ELLING, CARL GEORGE, Professor Emeritus; Extension Specialist in Animal Husbandry (1907, 1951). B. S., 1904, Kansas State University.

ELLITHORPE, VERA MAY, Associate Professor; Extension Specialist, Home Management (1938, 1947). B. S., 1935, M. S., 1939, Kansas State University; Ph. D., 1963, Ohio State University.

ERICKSON, DONALD B., Associate Professor; Section Leader and Extension Economist, Resource Development (1966). B. S., 1955, M. S., 1960, University of Wyoming; Ph. D., 1964, Purdue University.

EYESTONE, Cecil L., Associate Professor; Extension Specialist in 4-H Club Work (1943, 1958). B. S., 1944, Kansas State University; M. S., 1958, Colorado State University.

FAIDLEY, DONALD L., Instructor, Extension Economist in Farm Management (1956, 1966). B. S., 1953, Kansas State University.

FERGUSON, JOHN M., Professor Emeritus; State Leader, Extension Engineering (1937, 1958). B. S., 1934, Kansas State University.

FIGURSKI, DONALD L., Assistant Professor; District Extension Economist, Farm Management (1960). B. S., 1952, M. S., 1959, Colorado State University.

FRANCIS, EUGENE N., Associate Professor; Area Extension Specialist, Animal Science (1967). B. S., 1949, Kansas State University; M. S., 1953, Iowa State University.

FRAZIER, LESLIE PAUL, Assistant Professor; Extension Economist, Resource Development (1943, 1965). B. S., 1942, Oklahoma State University; M. A., 1962, Colorado State University.

FREDERICK, HOBART, Instructor; Extension Economist in Farm Management (1941, 1960). B. S., 1941, Kansas State University.

GALLAHER, HAROLD G., Professor; Assistant Department Head of Horticulture, Extension, and State Extension Forester (1951, 1965). B. S., 1949, University of Missouri; M. S., 1959, Kansas State University.

GATES, DELL E., Associate Professor; Extension Specialist in Entomology (1948, 1964). B. S., 1948, M. S., 1952, Kansas State University.

GEISLER, JAMES C., Instructor, District Extension Forester (1966). B. S., 1964, University of Missouri.

GLOVER, OTIS BENTON, Associate Professor Emeritus; District Agricultural Agent (1929, 1963). B. S., 1917, Kansas State University.

GOULD, LEONARD KEITH, Instructor; Area Extension Forester, Utilization and Marketing (1963, 1965). B. S., 1956, Colorado State University.

GRAHAM, RALF O., Associate Professor; Assistant Extension Editor (1961). A. B., 1948, Peru State Teachers College; M. A., 1955, University of Minnesota.

GREENE, LAURENZ S., Instructor, Extension Economist in Farm Management (1952, 1960). B. S., 1950, Kansas State University.

GREY, GENE W., Assistant Professor; Assistant State Extension Forester (1962, 1967). B. S., 1956, University of Missouri; M. S., 1969, Michigan State University.

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*GRIFFITH, PAUL W., Professor; Associate Director of Extension (1935, 1950). B. S., 1934, M. S., 1948, Kansas State University; Ph. D., 1961, University of Wisconsin.

GUTHRIE, GERSILDA, Assistant Professor; District Home Management Specialist (1937, 1958, 1967). B. S., 1934, Kansas State University; M. A., 1949, Columbia University.

GUY, WILLIAM D., Instructor, Extension Economist in Farm Management (1951, 1953). B. S., 1942, Kansas State University.

HACKLER, RAYMOND F., Instructor, Extension Economist in Farm Management (1960, 1965). B. S., 1952, M. S., 1966, Oklahoma State University.

HAGANS, FRANK ALEXANDER, Associate Professor Emeritus; District Agricultural Agent (1930, 1956). B. S., 1925, Kansas State University.

HAGEMAN, CHARLES A., Instructor Emeritus; Extension Economist in Farm Management (1936, 1953). B. S., 1936, Kansas State University.

HALAZON, GEORGE C., Associate Professor; Extension Specialist in Wildlife Management (1954, 1956). Ph. B., 1943, M. S., 1953, University of Wisconsin.

HANNA, JOHN B., Associate Professor; Extension Specialist in 4-H Club Work (1934, 1960). B. S., 1932, M. S., 1954, Kansas State University.

HARPER, HAROLD B., Associate Professor; Extension Specialist in Soil Conservation (1932, 1946). B. S., 1933, M. S., 1957, Kansas State University.

HENDERSON, F. ROBERT, Assistant Professor; Extension Specialist, Wildlife Damage Control (1968). B. S., M. S., 1956, Fort Hays Kansas State College.

HEROD, JON C., Instructor, Extension Economist in Farm Management (1957, 1967). B. S., 1957, Kansas State University.

HERPICH, RUSSELL L. Professor; Extension Irrigation Engineer (1951, 1958). B. S., 1950, M. S., 1953, Kansas State University.

HOLMES, ELWYN S., Associate Professor; Extension Agricultural Engineer (1966). B. S., 1943, M. S., 1953, Texas A & M University.

HONSTEAD, ARLISS E., Associate Professor; Extension Specialist in 4-H Club Work (1946, 1961). B. S., 1937, Kansas State University; M. S., 1960, Columbia University.

HOSS, RAY M., Associate Professor; District Extension Supervisor (1935, 1958). B. S., 1930, Kansas State University.

HOWE, JERELDINE E., Instructor; Extension Specialist, Clothing and Textiles (1965). B. S., 1951, M. S., 1965, Kansas State University.

HYDE, ROBERT M., Associate Professor; Extension Specialist, Range Management (1966). B. S., 1959, M. S., 1961, Fort Hays Kansas State College; Ph. D., 1963, University of Wyoming.

JACCARD, CLARENCE ROY, Professor Emeritus; Coordinator of Extension Program Planning (1922, 1957). B. S., 1914, Kansas State University.

JACKSON, MARION E., Associate Professor; Extension Economist, Poultry Marketing and Production (1945). B. S., 1941, Purdue University; M. S., 1955, Kansas State University.

JEPSEN, RICHARD L., Assistant Professor; Extension Specialist, Rural Civil Defense (1953, 1962). B. S., 1950, M. S., 1963, Kansas State University.

JOHNSON, J. HAROLD, Professor Emeritus; State 4-H Club Leader (1927, 195B). B. S., 1927, Kansas State University; M. S., 1942, George Washington University.

JOHNSON, NAOMI M., Associate Professor; Extension Specialist, Clothing and Textiles (193B, 1950). B. S., 1932, M. S., 1949, Kansas State University.

*JOHNSON, ROBERT L., Professor; Coordinator of Extension Personnel Training (1965). B. S., 1951, University of Nebraska; M. S., 1956, Ph. D., 195B, University of Wisconsin.

*JONES, HAROLD E., Professor; Extension Specialist. Crops and Soils (1946, 1956, 1968). B. S., 1940, Kansas State University; M. S., 1942, Ph. D., 1949, Purdue University.

JONES, MILAM T., Instructor; Area Extension Specialist, Horticulture (1966). B. S., 1964, M. S., 1966, Kansas State University.

KEPLEY, LARRY R., Instructor; Extension Economist in Farm Management (1954, 1967). B. S., 1961, Kansas State University.

KETCH, KARLA A., Instructor; Extension Specialist, Radio and Television (1967). B. F. A., 1963, University of Oklahoma.

KING, CLAUDE L., Professor; Extension Specialist in Plant Pathology (1934, 1954). B. S., 1932, M. S., 1953, Kansas State University.

KING, JR., RICHARD F., Associate Professor; District Extension Supervisor (193B, 1962). B. S., 1938, M. S., 1957, Kansas State University.

KINGSLEY, KENNETH E., Instructor; Extension Economist, Resource Development (1970). B. S., 1964, Kansas State University.

KOENIG, MARGARET A., Professor Emeritus; Associate Home Economics Leader (1929, 1959). B. S., 1928, Kansas State University; M. S., 1958, University of Wisconsin.

KUEHN, LOWELL D., Instructor; Extension Television Producer (1962). B. S., 1950, Iowa State University.

*LANGEMEIER, LARRY N., Assistant Professor; Extension Specialist, Farm Management Studies (196B). B. S., 1963, University of Nebraska; M. S., 1965, Ph. D., 196B, University of Missouri.

LEUTHOLD, LARRY D., Instructor; Extension Specialist, Ornamental Horticulture (1966). B. S., 1959, M. S., 1966, Kansas State University.

LIND, RUEBEN CARL, Professor Emeritus; Extension Specialist in Soil Conservation (1933, 1950). B. S., 1923, Kansas State University.

LOUCKS, WILLIAM L., Instructor; Area Extension Forester (1967). B. S., 1963, Colorado State University.

McADAMS, VERL E., Associate Professor; Extension Specialist, Animal Science (1934, 1952). B. S., 192B, M. S., 1957, Kansas State University.

McCLELLAND, EVERETT L., Instructor Emeritus; Extension Economist in Farm Management (1936, 1954). B. S., 1928, Kansas State University.

McMASTER, GERALD O., Assistant Professor; Area Extension Specialist, Crops and Soils (1951, 1967). B. S., 1940, M. S., 1951, Kansas State University.

McREYNOLDS, KENNETH L., Assistant Professor; Extension Economist in Farm Management (1949, 1960). B. S., 1950, M. S., 1954, Kansas State University.

MANN, RAY H., Associate Professor; Area Extension Director (1956, 1966, 1967, 1969). B. S., 1951, Oklahoma State University; M. S., 1965, Kansas State University.

MEANS, EARL T., Instructor Emeritus; Extension Economist in Farm Management (1944, 1952). B. S., 1922, Kansas State University.

MEDLIN, ROGER C., Assistant Professor; Assistant Extension Editor (1967). B. S., 194B, M. S., 1969, Kansas State University.

MEYER, ELLA MARIE, Assistant Professor Emeritus; District Home Economics Agent (1925, 1956). B. S., 1907, Kansas State University.

MILLER, ELSIE LEE, Assistant Professor; Extension Specialist, Foods and Nutrition (1941, 1962). B. S., 1934, M. S., 1942, Kansas State University.

MORRISON, FRANK D., Associate Professor; Extension Specialist, Horticulture (1966). B. S., 1951, M. S., 1959, University of Idaho; Ph. D., 1966, Michigan State University.

MOYER, WENDELL A., Professor; Section Leader and Extension Specialist, Animal Science (1941, 1956). B. S., 1941, M. S., 1955, Kansas State University.

MOYER, WILLIAM J., Assistant Professor; Area Extension Forester (1969). B. S., 1964, Oklahoma State University; M. A., 196B, Ball State University.

MULLEN, W. GALE, Instructor; Extension Economist in Farm Management (1961). B. S., 1950, Kansas State University.

MYERS, GLADYS, Associate Professor Emeritus; Extension Specialist in Home Management (1930, 1947). B. S., 1923, Kansas State University; M. S., 1939, Cornell University.

NAGEL, JOHN C., Instructor; Extension Television Producer (1967, 1969). B. S., 1967, Kansas State University.

NAUGHTON, GARY G., Instructor; Area Extension Forester (1966, 1969). B. S., 1959, Utah State University; M. S., 1968, University of Missouri.

NEFF, LEONARD FAY, Associate Professor Emeritus; Coordinator of Extension Personnel Training (1924, 1958). B. S., 1922, Purdue University.

NEUFELD, DOROTHY H., Assistant Professor; District Extension Home Economist (1957, 1962, 1969). B. S., 1950, Texas Technological College; M. S., 1964, Kansas State University.

NIGHSWONGER, JAMES J., Assistant Professor; Extension Specialist, Landscape Architecture (1961, 1965). B. S., 1960, M. S., 1970, Kansas State University.

NILSON, ERICK B., Associate Professor; Extension Specialist, Herbicides (1965). B. S., 1950, M. S., 1955, University of Nebraska; Ph. D., 1963, Kansas State University.

*NORBY, OSCAR W., Professor; District Extension Specialist (1942, 1961, 1969). B. S., 1942, Kansas State University; M. S., 1959, Ph. D., 1961, University of Wisconsin.

OLSEN, DUANE A., Assistant Professor; Area Extension Economist, Resource Development (1963, 1966). B. S., 1961, University of Minnesota; M. S., 1964, Purdue University.

OLSON, ROSS A., Instructor; Extension Economist in Farm Management (196B). B. S., 1965, M. S., 196B, Kansas State University.

OSBURN, MELVIN W., Associate Professor Emeritus; Extension Specialist, Veterinary Medicine (1952, 1954). D. V. M., 1934, Iowa State University.

OVERLEY, FRANK L., Assistant Professor; Extension Economist in Farm Management (1960). B. S., 1950, Kansas State University; M. S., 1957, Michigan State University.

PARKER, LEONARD C., Instructor; Extension Economist in Farm Management (1956, 1961). B. S., 1952, Kansas State University.

PARRIS, FRED M., Associate Professor; Assistant Extension Editor (1963). B. S., 1942, Kansas State University; M. A., 1951, Iowa State University.

PASS, INEZ, Assistant Professor; Extension Specialist, Foods and Nutrition (1947, 1951). B. S., 1941, M. S., 1960, Oklahoma State University.

PECK, ERNEST G., Assistant Professor; Extension Specialist, Visual Aids (1955, 1961). B. S., 1950, M. S., 1965, Kansas State University.

PETERSON, EDMUND J., Administrative Assistant (1966). B. S., 1959, Kansas State University.

PETERSON, GERALD W., Instructor; Extension Specialist, Visual Aids (196B). B. A., 1962, Kearney State Teachers College.

PETERSON, VERLIN H., Associate Professor; Area Extension Specialist, Crops and Soils (194B, 1965). B. S., 194B, M. S., 1949, Kansas State University.

PHAR, PHILIP A., Associate Professor; Extension Specialist, Beef Cattle Nutrition and Management (1967). B. S., 1959, University of Illinois; M. S., 1961, Ph. D., 1967, University of Kentucky.

PINKERTON, LESTER R., Assistant Professor; Area Extension Forester (1964, 1967). B. S., 1963, M. S., 1967, Colorado State University.

*PRAWL, WARREN L., Professor; Extension Specialist, Personnel Training (1952, 1966). B. S., 1954, Kansas State University; M. S., 195B, Ed. D., 1962, Cornell University.

PRETZER, DON D., Instructor; Extension Economist, Farm Management (195B, 1964, 1967, 1969). B. S., 1955, M. S., 1970, Kansas State University.

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REDEKER, NORMA J., Assistant Professor; Extension Specialist, Human Resources Development (1962, 1966, 1969). B. S., 1961, Kansas State Teachers College (Emporia); M. S., 1964, Kansas State University.

REGNIER, ROGER E., Professor Emeritus; Extension Specialist, Resource Development (1934, 1966). B. S., 1924, M. S., 1932, Kansas State University.

REIMER, ERVIN C., Instructor; Extension Economist in Farm Management (1965, 1967, 1969). B. S., 1964, Kansas State University.

RICHARDS, JACK A., Associate Professor; Extension Economist, Marketing Information (1967). B. S., 1954, University of Wyoming; M. S., 1963, Montana State University; Ph. D., 1967, Oregon State University.

***RINGLER, WILBER E.**, Professor, Assistant Director of Extension (1957). B. S., 1948, M. S., 1949, University of Nebraska; Ph. D., 195B, University of Wisconsin.

***ROSS, EUGENE**, Professor; District Extension Supervisor (1955, 1966). B. S., 1952, Oklahoma State University; M. S., 1962, Kansas State University; Ph. D., 1966, University of Wisconsin.

ROWLAND, JACK J., Assistant Professor; Area Extension Forester (1969). B. S., 1968, M. S., 1970, University of Missouri.

SCHAAF, JANE M., Instructor; Extension Specialist in Home Management (1969). B. S.. 1966, Montana State University.

SCHINDLER, DALE E., Associate Professor; Extension Architect (1955, 1961). B. Arch., 1953, M. S., 1960, Kansas State University. Registered Architect, M. A., 1960, Kansas State University.

SCHLENDER, JOHN R., Assistant Professor; Extension Economist in Farm Management (1961, 1969). B. S., 1951, Kansas State University; M. S., 1960, Oregon State University; Ph. D., 1969, Purdue University.

SCHOEFF, ROBERT W., Professor; Section Leader and Extension Economist in Marketing and Utilization of Formula Feeds (1960). B. S., 1942, M. S., 1947, Ph. D., 1952, Purdue University.

SCHROEDER, MARY M., Assistant Professor; District Extension Home Economist (1961, 1966). B. S., 1938, M. S., 1968, Kansas State University.

SELBY, WALTER E., Associate Professor; Extension Agricultural Engineer (1944, 1947). B. S., 1929, Kansas State University; M. S., 1957, University of Nebraska.

SELF, ETHEL W., Associate Professor Emeritus; Extension Specialist, Home Management (1929, 1953). B. S., 1926, M. S., 1952, Kansas State University.

SHANKLAND, HAROLD G., Associate Professor Emeritus; Associate Extension Editor (1943, 1949). A. B., 1924, College of Emporia.

SHREVE, LOY W., Instructor; Area Extension Forester (1964, 1965). B. S., 1951, West Virginia University.

SHUYLER, LYNN R., Assistant Professor; Extension Irrigation Engineer (1965). B. S., 1961, M. S., 1969, Kansas State University.

SMERCHEK, JOHN F., Instructor; Extension Economist in Farm Management (1942, 1950). B. S., 1929, Kansas State University.

SMURTHWAITE, GEORGIANA HOPE, Professor Emeritus; Extension Specialist, Home Economics Program Development (1924, 1954). B. S., 1911, Utah State College; M. S., 1931, Kansas State University.

SMYTHE, PATRICK E., Assistant Professor; Extension Economist, Resource Development (1956, 1966). B. S., 1953, M. S., 195B, Kansas State University.

SPOON, DARRELL D., Assistant Professor; Extension Specialist, Family Life (1970). B. A., 1965, University of Iowa; M. S., 1969, Kansas State University.

SPRINGER, DONALD M., Assistant Professor; Extension Television Producer (1957, 1962). B. S., 1957, M. S., 1966, Kansas State University.

STARKEY, WINONA M., Assistant Professor; Extension Specialist, Home Furnishings (1944, 1956). B. S., 1947, M. S., 1954, Kansas State University.

STIELOW, KENNETH L., Instructor; Extension Economist in Farm Management (1969). B. S., 1967, M. S., 1969, Kansas State University.

STOCKARD, JOHN R., Assistant Professor; Extension Motion Picture Producer (1966). B. S., 1955, University of North Carolina; M. S., 1969, Kansas State University.

STOVER, HAROLD E., Professor Emeritus; Extension Agricultural Engineer (1936, 1954). B. S., 1929, Kansas State University.

STRICKLER, JOHN K., Assistant Professor; Associate State Extension Forester (1961, 1965, 1967). B. S., 1957, University of Missouri; M. S., 1967, Kansas State University.

SULLINS, WILLIAM S., Extension Assistant; Assistant Extension Editor (1969). B. S., 1953, University of Oklahoma.

TEAGARDEN, EARL HICKS, Professor Emeritus; Coordinator, Extension Studies (1929, 1952). B. S., 1920, Kansas State University.

TENNANT, MARJORIE A., Assistant Professor; Assistant Extension Editor (1947, 1952). B. S., 1946, M. S., 1957, Kansas State University.

THOMAS, KENNETH E., Professor; Head, Department of Extension Information (1951, 1963). A. B., 1951, Southwestern College; M. S., 1952, Kansas State University; Ph. D., 1961, University of Wisconsin.

THOMAS, WILTON B.. Associate Professor; Section Leader and Extension Economist, Farm Management (1946, 1960). B. S., 1937, M. S., 1960, Kansas State University.

TITUS, RALPH S., Associate Professor; Assistant Manager, Radio Station KSAC (1951, 1965). B. S., 1955, M. S., 1964, Kansas State University.

TOBIN, LESLIE W., Assistant Professor; Extension Specialist, Soil Fertility (1967). B. S., 1948, M. S., 1951, Ph. D., 1960, Michigan State University.

TRAYER, DANNY D., Instructor; Extension Economist in Farm Management (1950, 1960). B. S., 195T, M. S., 1967, Kansas State University.

TREAT, JAY L., Assistant Professor; Extension Economist in Farm Management (1960). B. S., 1949, University of Arkansas; M. A., 1952, University of Missouri.

***TRIEB SYKES E.**, Professor; Extension Economist, Retail Marketing (1954, 1964). B. S., 1950, M. S., 1960, Kansas State University; Ph. D., 1967, Ohio State University.

UNRUH, CHESTER R., Associate Professor; Assistant Extension Editor (1961). A. B., 1940, Bethel College; M. S., 1956, Kansas State University.

URBAN, KENNETH E., Instructor; Extension Economist in Farm Management (1954, 1966). B. S., 1952, M. S., 1957, Kansas State University.

VACIN, GARY L., Assistant Professor; Extension Economist, Resource Development Information (1966). B. S., 1960, M. S., 1964, Kansas State University.

WALKER, MILDRED L., Associate Professor; Extension Economist, Consumer Marketing (1956). B. S., 1952, Kansas State University; M. S., 1960, Pennsylvania State University.

WARNER, EUGENE D., Professor; Extension Editor (1935, 1947). B. S., 1934, Kansas State University.

WELLS, RUTH I., Assistant Professor; Extension Specialist, Limited Resources Program (1953, 195B, 1969). B. S., 1943, Central Missouri State College; M. S., 1948, Kansas State University.

WENDLING, LEO T., Professor; State Leader, Extension Engineering (1947, 195B, 1969). B. S., 1947, M. S., 1956, Kansas State University.

WESTMEYER, HERMAN W., Assistant Professor; Extension Specialist, Animal Science (1936, 1961). B. S., 1936, University of Missouri; M. S., 1965, Kansas State University.

WHIPPS, LOREN E., Assistant Professor; District Extension Economist, Farm Management (1946, 1966). B. S., 193B, Kansas State University; M. S., 1953, Colorado State University.

***WHITE, SHIRLEY A.**, Professor; State Leader, Extension Home Economics (1965). B. S., 1953, University of Nebraska; M. S., 1960, University of Wisconsin; Ph. D., 1966, Michigan State University.

WHITEHAIR, NORMAN V., Professor; Assistant Head, Department of Economics and State Leader of Extension Marketing, Management and Resource Development (1946, 1961). B. S., 1943, M. S., 1953, Kansas State University; Ph. D., 1964, Purdue University.

WHITNEY, DAVID A., Associate Professor; Extension Specialist, Soil Testing (1966). B. S., 1961, M. S., 1963, University of Nebraska; Ph. D., 1966, Iowa State University.

WIGGINS, M. CHRISTINE, Associate Professor; Extension Specialist, Clothing and Textiles (1930, 1947). B. S., 1929, Kansas State University; M. A., 193B, Columbia University.

WILCOX, ROBERT A., Professor; Quality Control Specialist, Formula Feeds (1965). B. S., 1945, M. S., 1949, Ph. D., 1960, South Dakota State University.

WILKINS, HOWARD D., Associate Professor; Extension Specialist, Crops and Soils (1959). B. S., 1953, M. S., 1954, Kansas State University.

WILLIS, WILLIAM G., Associate Professor; Extension Specialist, Plant Pathology (1951, 1962). B. S., 1951, M. S., 1964, Ph. D., 1967, Kansas State University.

ZOELLNER, KEITH O., Associate Professor; Extension Specialist, Animal Science and Industry (1962). B. S., 1953, M. S., 1957, South Dakota State University; Ph. D., 1962, University of Missouri.

County Extension Directors

DUCKERS, JR., HARRY G., Wyandotte County (1943, 1967). Kansas City.
GRIGGS, OTIS R., Reno County (1951, 1960, 1967). Hutchinson.
HALL, C. T., Johnson County (1934, 1939, 1967). Olathe.
HAMILTON, DONALD F., Saline County (1960, 1964, 1967). Salina
INGLE, DONALD W., Sedgwick County (1930, 1947, 1967). Wichita.
NEWSOME, B. W., Riley County (1955, 1960, 1967). Manhattan.

County Extension Agricultural Agents

ALBRIGHT, KENNETH B., Ellis County (1955, 1957). Hays.
ALLEN, KENNETH A., Phillips County (1969). Phillipsburg.
AUFDENGARTEN, CHARLES H., Washington County (1963). Washington.
BACHMAN, DALE L., Gray County (196B, 1969). Cimarron.
BARBER, ARNOLD, Atchison County (1955). Effingham.
BARNES, CARL L., Clark County (1964), Ashland.
BARNES, JOHN H., Harvey County (1953, 1965). Newton.
BIBY, VIRGIL H., Rice County (1966). Lyons.
BLAIR, W. LAWARENCE, Linn County (1960, 1961). Mound City.
BLISS, FRANCIS E., Elk County (1946, 1966). Howard.
BLUME, WILLIS L., Haskell County (194B). Sublette.
BOZWORTH, ROBERT W., Franklin County (1960, 1965). Ottawa.
BULK, HERBERT W., Shawnee County (1949). Topeka.
BURKHART, PEYTON H., Nemaha County (1962, 1966). Seneca.
BYARLAY, LOWELL H., Osborne County (1959, 1960). Osborne.
CARLSON, VIRGIL P., Ellsworth County (1957, 1966). Ellsworth.
CARSON, JAMES D., Stevens County (1967). Hugoton.
CHISAM, DONALD L., Labette County (196B). Altamont.
COX, M. LESTER, Gove County (1955, 1962). Gove.
COX, WILLIAM E., Crawford County (1957, 195B). Girard.
DAUBER, DONALD D., Hodgeman County (196B). Jetmore.
DAVIES, DAVID R., Kiowa County (1960, 1961). Greensburg.
DAVIS, DEAN L., Morris County (1968). Council Grove.
DUNAVAN, WILBUR J., Smith County (1960). Smith Center.
ETHERIDGE, RAY W., Barber County (1954, 1959). Medicine Lodge.
FINLEY, PHILIP B., Decatur County (1967). Oberlin.
FISH, G. KEITH, Trego County (195B, 1959). WaKeeney.

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FORD, ROY D., Stanton County (1964). Johnson.
FROMM, KENNETH W., Mitchell County (1953, 1965). Beloit.
GEBHART, JEWELL O., Sheridan County (1945, 1963). Hoxie.
GOERTZ, HARVEY E., Brown County (1937). Hiawatha.
GOLLADAY, RICHARD E., Hamilton County (1957). Syracuse.
GOTTSCH, ALBERT HAROLD, Butler County (1954, 1964). ElDorado.
GREENWOOD, WILLIAM L., Scott County (1960, 1962). Scott City.
GRIFFITH, LESTER E., Marion County (1949, 1960). Marion.
HARDING, WARREN G., Rooks County (1955). Stockton.
HARRINGTON, MAURICE C., Anderson County (1958, 1960). Garnett.
HARRIS, A. EUGENE, Meade County (1938, 1940). Meade.
HENDERSHOT, ROGER L., Harper County (1941, 1951). Anthony.
HENDERSHOT, ROYAL C., Morton County (1956, 1967). Elkhart.
HENRY, LARRY G., Cheyenne County (1956, 1966). St. Francis.
HOLLINGSWORTH, CLARENCE A., Greenwood County (1937, 1953). Eureka.
HOSIE, DARREL D., Jewell County (1968). Mankato.
JEFFREY, FORREST DUANE, Chautauqua County (1965, 1968). Sedan.
JEPSEN, DELBERT D., Russell County (1962, 1966). Russell.
JOHNSON, ARTHUR R., Jefferson County (1958, 1960). Oskaloosa.
KELLY, PAUL W., Chase County (1966, 1967). Cottonwood Falls.
KIVETT, HARRY L., Rawlins County (1957, 1966). Atwood.
KOPP, FRED A., Leavenworth County (1968, 1969). Leavenworth.
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, 1949). Lakin.
LINN, JACK A., Wilson County (1966). Fredonia.
LOHMANN, VERNON E., Neosho County (1968). Erie.
LOTZ, WILLIAM R., Edwards County (1964, 1967). Kinsley.
LOYD, DONALD G., Greeley County (1968). Tribune.
McKAY, BEN D., Ness County (1954, 1960). Ness City.
McWILLIAMS, DONALD D., Wallace County (1956, 1966). Sharon Springs.
MADDUX, ALBERT G., Finney County (1959, 1965). Garden City.
MALEY, ALVIN E., Lyon County (1953, 1963). Emporia.
MANRY, E. CLIFFORD, Pawnee County (1940, 1947). Larned.
MARLOW, DAROLD D., Wabaunsee County (1950). Alma.
MAXWELL, THOMAS R., Allen County (1954, 1956). Iola.
McCAMMON, RONALD W., Lincoln County (1968). Lincoln.
MEIREIS, CLIFFORD L., Norton County (1955, 1967). Norton.
NEILL, JOE P., Cloud County (1946, 1960). Concordia.
NELSON, ROSS M., Logan County (1959, 1966). Oakley.
NEWCOMER, GLENN R., Bourbon County (1965, 1966). Fort Scott.
NUTTELMAN, R. F., Montgomery County (1941, 1944). Independence.
OLTMANNS, PAUL G., Marshall County (1964, 1968). Marysville.
ORR, BRYCE, Coffey County (1952, 1953). Burlington.
ORWIG, THOMAS W., Dickinson County (1955, 1960). Abilene.
PHERIGO, DAN L., Douglas County (1958, 1966). Lawrence.
PLILER, JAMES A., Lane County (1954, 1967). Dighton.
ROBERTSON, JOHN F., Comanche County (1956, 1959). Coldwater.
ROLPH, RICHARD D., Saline County (1967). Salina.
ROWE, JR., SAMUEL S., Sumner County (1965). Wellington.
RUTHERFORD, ROBERT E., Reno County (1969). Hutchinson.
SALLEE, LESLIE H., Clay County (1957, 1960). Clay Center.
SCHILLING, DALE R., Sherman County (1958, 1968). Goodland.
SCHLESENER, NORMAN E., Kingman County (1965, 1967). 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, 1969). Yates Center.
SPENCER, ALBERT E., Pottawatomie County (1960, 1962). Westmoreland.
STAGG, BEVERLY R., McPherson County (1940, 1960). McPherson.
STROADE, RICHARD D., Republic County (1959, 1962). Belleville.
STROUD, NELSON E., Geary County (1952). Junction City.
VAN CLEVE, JOSEPH E., Seward County (1948). Liberal.
VAN METER, EARL L. Rush County (1960, 1964). La Crosse.
WALKER, JR., MARSHALL F., Grant County (1951). Ulysses.
WAREHAM, ROBERT E., Jackson County (1968). Holton.
WARY, JR., RAYMOND E., Cherokee County (1958, 1960, 1969). Columbus.
WHITE, CHARLES R., Riley County (1966, 1967). Manhattan.
WILES, DON K., Ford County (1956, 1964). Dodge City.
WILSON, JACK H., Wichita County (1951). Leoti.
WILSON, PAUL H., Barton County (1946, 1947). Great Bend.
YAUK, DON O., Phillips County (1963, 1966). Phillipsburg.

County Extension Home Economists

ADAMS, ELEANOR O., Mitchell County (1960). Beloit.
ARGANBRIGHT, MAHALA M., McPherson County (1949, 1960). McPherson.
BARNES, HELEN L., Linn County (1964). Mound City.
BERGDALL, NANCY J., Seward County (1963, 1967). Liberal.
BIEHL, FLORENCE F., Johnson County (1962). Olathe.
BLACKWOOD, HELEN H., Reno County (1962, 1962). Hutchinson.
BLECHA, JOYCE E., Elk County (1969). Howard.
BLEVINS, OLETHA L., Douglas County (1959). Lawrence.
BRANDEN, ELSIE P., Finney County (1955, 1961). 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.
CLAASSEN, CHERYL E., Pottawatomie County (1968). Westmoreland.
CLINE, LUCILE G., Pawnee County (1951, 1963). Larned.
CLOUSE, F. ANNETTE, Republic County (1968). Belleville.
CONLEY, JOSEPHINE, Johnson County (1955). Olathe.
CRESS, JEANICE A., Allen County (1955, 1956). Iola.
CURRIE, TRELLA, Cloud County (1955). Concordia.
DeGEER, KATHARINE A., Comanche County (1966, 1968). Coldwater.
DOBSON, MARCIA E., Anderson County (1967, 1968). Garnett.
DOMSCH, L. ANN, Rawlins County (1959). Atwood.
DUERKSON, DOROTHY M., Hodgeman County (1967). Jetmore.
DUGGAN, MARGARET H., Thomas County (1963, 1966). Colby.
EDWARDS, MARY LEE, Woodson County (1961). Yates Center.
FISHER, SHARON GAY, Meade County (1959). Meade.
FRANKENBERRY, SHARON L., Wilson County (1969). Fredonia.
FREY, ALICE L., Grant County (1968). Ulysses.
GASTON, GLORIA J., Marshall County (1960). Marysville.
GEMAEHLICH, MARGARET J., Ellis County (1963, 1967). Hays.
GRABER, VIVIAN E., Kingman County (1955). Kingman.
GRECIAN, PATRICIA A., Stevens County (1969). Hugoton.
GRIGSBY, CAROLE M., Franklin County (1966). Ottawa.
GRUBB, SHIRLEY K., Sherman County (1968). Goodland.
HAYES, MARY M., Smith County (1962, 1967). Smith Center.
HEINLY, FREDA K., Riley County (1957, 1968). Manhattan.
HERNDON, MAY BETH, Rush County (1953). La Crosse.
HESTER, MARIAN V., Barton County (1953). Great Bend.
HODGES, R. JEAN, Sedgwick County (1964). Wichita.
HOLDREN, MARY F., Jewell County (1964). Mankato.
HOWERTON, LELA JEAN M., Rice County (1969). Lyons.
HOWERTON, PHYLLIS Y., Reno County (1966), Hutchinson.
HUND, MARGARET ANN, Jackson County (1960). Holton.
IRVIN, VICKY N., Pratt County (1966). Pratt.
JACKSON, RUTH A., Rice County (1968). Lyons.
JOHNSON, JUANITE B., Crawford County (1948). Girard.
JOHNSTON, VIRGINIA C., Lane County (1966). Dighton.
JONES, MARY LOU, Greenwood County (1967). Eureka.
KANDT, BETTY L., Geary County (1964). Junction City.
KELLOGG, KAROLYN K., Clay County (1969). Clay Center.
KENT, NANCY JO, Ford County (1958, 1964). Dodge City.
KINDLEY, BEVERLY L., Norton County (1951, 1960). Norton.
KNIGHT, PERRY C., Sedgwick County (1965). Wichita.
KRUMSICK, MARY E., Brown County (1963, 1966). Hiawatha.
LAWLESS, VIVIAN J., Lincoln County (1964). Lincoln.
LEACH, GLINDA B., Shawnee County (1967). Topeka.
LEACH, LUCILLE H., Osborne County (1967). Osborne.
LEIKAM, ELEANORA, Gray County (1954). Cimarron.
LEIBBRANDT, PATRICIA L., Cheyenne County (1964, 1967). St. Francis.
LINDBERG, CASANDRA S., Lyon County (1966). Emporia.
McCLEARY, KAY M., Logan County (1969). Oakley.
McFALL, MARGENE H., Barber County (1969). Medicine Lodge.
MAHONEY, LORITA M., Rooks County (1969). Stockton.
MANINGER, SHARON H., Russell County (1966). Russell.
MERIWETHER, NANCY A., Nemaha County (1958, 1960). Seneca.
MEYER, KATHERINE K., Butler County (1967). El Dorado.
MOLZ, DIXIE IRENE, Stafford County (1953). St. John.
MOORE, MIRIAM A., Osage County (1967). Lyndon.
OLSON, SALLY J., Chase County (1966, 1967). Cottonwood Falls.
NEUSCHWANDER, OCIE A., Greeley County (1957). Tribune.
PALMER, RACHEL F., Sedgwick County (1941). Wichita.
PARTCH, SUE L., Scott County (1967). Scott City.
PEARSON, GLENDA N., Washington County (1965, 1967). Washington.
PILAND, JANICE, Wichita County (1968). Leoti.
PRICE, BETTY J., Wyandotte County (1961, 1963). Kansas City.
PRICE, MARJORIE E., Coffey County (1957, 1960). Burlington.
REDIKER, JANET B., Morris County (1966). Council Grove.
RICHARD, BARBARA K., Dickinson County (1966). Abilene.
ROBBINS, EMILY R., Leavenworth County (1964, 1965). Leavenworth.
RYDELL, BARBARA C., McPherson County (1969). McPherson.
SCHMITT, JEANNE M., Republic County (1965, 1967). Belleville.
SCHROEDER, DOROTHEA A., Wyandotte County (1942, 1943). Kansas City.

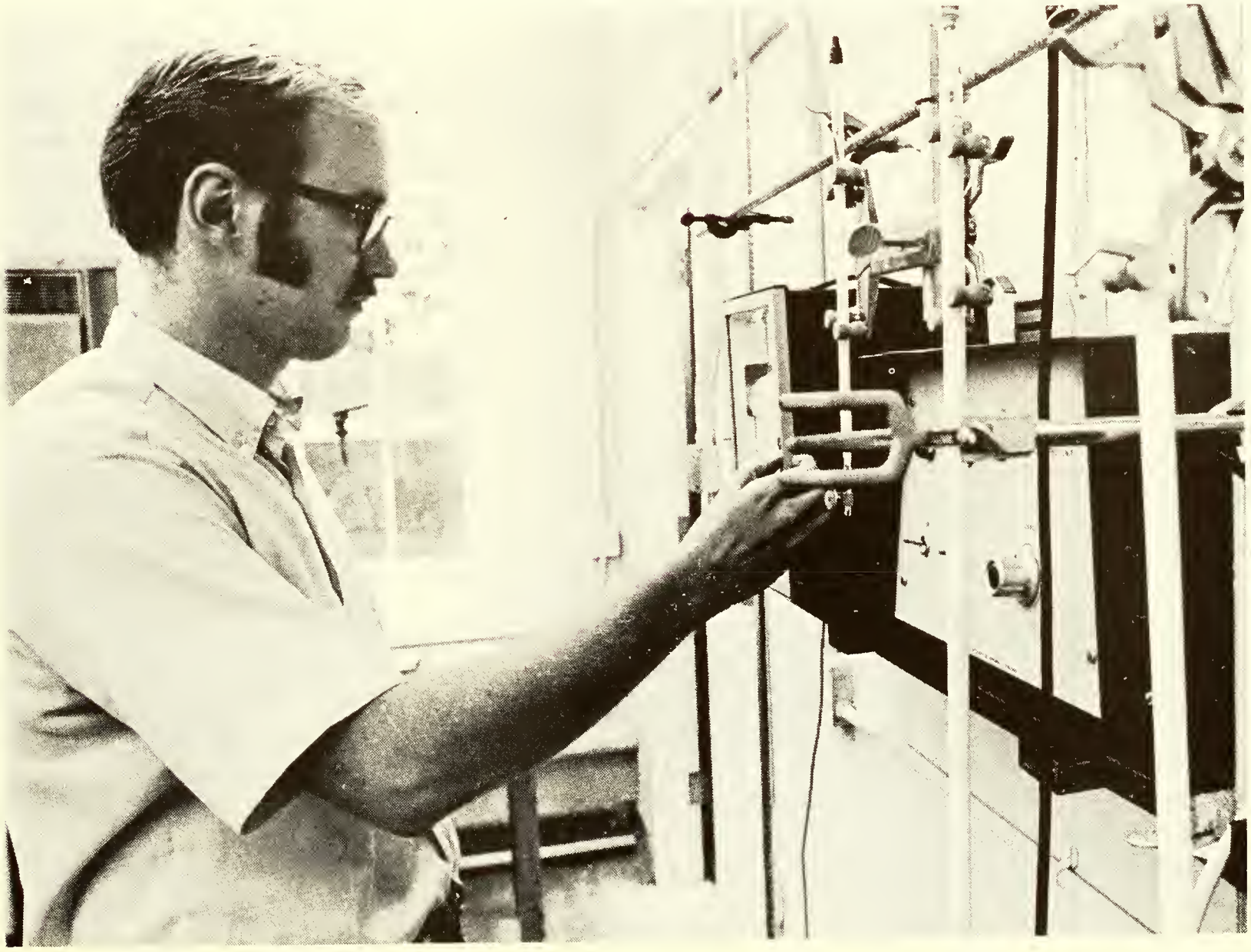
SCOTT, CATHERINE E., Phillips County (1969). Phillipsburg.
SHIELDS, SANDRA A., Ellsworth County (1965). Ellsworth.
SIMPSON, REBEKAH L., Graham County (1969). Hill City.
SHOWERS, JANE A., Wallace County (1969). Sharon Springs.
SMITH, BEVERLY B., Saline County (1961). Salina.
SPEARS, MARY CAROL B., Cowley County (1960). Winfield.
ST. CLAIR, JANICE O., Stanton County (1969). Johnson.
STAUTH, CAROL M., Shawnee County (1966, 1967). Topeka.
THODEN, NADA F., Miami County (1965). Paola.
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, 1947). Altamont.
WEAVER, MAE E., Barton County (1952). Great Bend.
WESSEL, STELLA P., Atchison County (1964). Effingham.
WHITE, REBA B., Sheridan County (1967). Hoxie.
WILKEY, MARGARET M., Ottawa County (1968). Minneapolis.
WONER, ELIZABETH, Harper County (1949, 1950). Anthony.
WUTKE, BETTY D., Bourbon County (1968). Fort Scott.
YOUNG, CAROL H., Sumner County (1966, 1968). Wellington.

County Extension 4-H Agents

ANDEREGG, MARVIN K., Labette County (1968, 1969). Altamont.
BILES, JIMMY L., Cherokee County (1966). Columbus.
CHUMBLEY, JOHN C., Sedgwick County (1967). Wichita.
CLAWSON, ELDON L., Shawnee County (1965, 1967). Topeka.
DAVIDSON, LLOYD A., Saline County (1964, 1967). Salina.
DAVIS, ROBERT J., Sumner County (1967). Wellington.
DUNNING, BEVERLY K., Sedgwick County (1964). Wichita.
FRICK, GALEN G., Ford County (1968). Dodge City.
FULTZ, WILLIAM E., Finney County (1962, 1966). Garden City.
GILLMORE, RALPH E., Rice County (1966, 1969). Lyons.
GOTTLOB, GLENN R., Crawford County (1968). Girard.
HENSLEY, DALE, Montgomery County (1957). Independence.
HUNDLEY, JR., WILLIAM C., Butler County (1965, 1966). El Dorado.
JAHNKE, LOUISE V., Riley County (1968). Manhattan.
JUSTICE, RONALD G., Wyandotte County (1968). Kansas City.
KEELER, GARRY L., Washington County (1967). Washington.
LOWRY, DAVID P., Lyon County (1968). Emporia.
McGINNESS, KENNETH E., Johnson County (1954). Olathe.
MERHOFF, BILLY R., Douglas County (1968, 1969). Lawrence.
PURDY, RAY E., Greenwood County (1967). Eureka.
RECTOR, RALPH B., Leavenworth County (1949, 1956). Leavenworth.
RIAT, LARRY D., Dickinson County (1961). Abilene.
SELLERS, LONNIE D., Miami County (1969). Paola.
STAIGER, GARY L., Seward County (1964, 1966). Liberal.
STUDER, RAYMOND L., McPherson County (1966). McPherson.
UMSCHEID, JR., SYLVESTER C., Reno County (1962, 1966). Hutchinson.
VAN SKIKE, WILLIAM V., Barton County (1950, 1956). Great Bend.
WEAVER, ELDON R., Cowley County (1968). Winfield.

County Extension Horticultural Agents

KIBBY, JIMMY R., Wyandotte County (1966, 1967). Kansas City.
MORRIS, MAX B., Shawnee County (1965, 1967). Topeka.
PAIR, JOHN C., Sedgwick County (1961, 1966). Wichita.
STOUSE, LAWRENCE D., Johnson County (1966). Olathe.
THOLE, H. THOMAS, Barton County (1966). Great Bend.



Statistical Summary for Fall Semester 1968-69

Students by States, Foreign Countries, and Kansas Counties — States

Alabama	13	Kentucky	4	North Dakota	12
Alaska	4	Louisiana	7	Ohio	40
Arizona	10	Maine	8	Oklahoma	52
Arkansas	20	Maryland	28	Oregon	10
California	74	Massachusetts	64	Pennsylvania	70
Colorado	49	Michigan	20	Rhode Island	8
Connecticut	28	Minnesota	42	South Carolina	4
Delaware	4	Mississippi	10	South Dakota	36
District of Columbia	3	Missouri	301	Tennessee	7
Florida	30	Montana	5	Texas	52
Georgia	13	Nebraska	157	Utah	3
Hawaii	14	Nevada	6	Vermont	4
Idaho	8	New Hampshire	4	Virginia	37
Illinois	173	New Jersey	131	Washington	9
Indiana	30	New Mexico	16	West Virginia	5
Iowa	69	New York	304	Wisconsin	46
Kansas	10,088	North Carolina	8	Wyoming	4
				Total	12,144

Foreign Countries and Territories Outside the Continental United States

Argentina	2	Guatemala	1	Puerto Rico	11
Australia	2	India	102	Philippines	9
Bolivia	1	Iran	16	Rhodesia	2
Brazil	2	Iraq	7	Saudi Arabia	7
Canada	8	Japan	8	Singapore	1
Canal Zone	3	Jordan	2	Sudan	1
China	114	Kenya	2	Switzerland	1
Colombia	1	Korea	18	Thailand	6
Czechoslovakia	1	Lebanon	2	Turkey	4
Denmark	2	Libya	1	Uganda	2
Ecuador	1	Mexico	3	United Kingdom	13
Egypt	12	Nigeria	12	USSR	1
Ethiopia	2	Norway	1	Venezuela	4
France	1	Pakistan	13	Viet Nam	9
Germany	8	Panama	2	Virgin Islands	1
Greece	1	Peru	1	Yugoslavia	2
				Total	426

Kansas Counties

Allen	45	Greeley	17	Osborne	78
Anderson	31	Greenwood	37	Ottawa	60
Atchison	99	Hamilton	9	Pawnee	64
Barber	58	Harper	34	Phillips	59
Barton	184	Harvey	109	Pottawatomie	118
Bourbon	32	Haskell	17	Pratt	34
Brown	88	Hodgeman	11	Rawlins	53
Butler	88	Jackson	80	Reno	171
Chase	23	Jefferson	44	Republic	107
Chautauqua	24	Jewell	59	Rice	76
Cherokee	23	Johnson	946	Riley	1,408
Cheyenne	55	Kearney	17	Rooks	40
Clark	26	Kingman	39	Rush	36
Clay	131	Kiowa	20	Russell	75
Cloud	132	Labette	46	Saline	369
Coffey	35	Lane	25	Scott	58
Comanche	17	Leavenworth	157	Sedgwick	580
Cowley	115	Lincoln	54	Seward	59
Crawford	34	Linn	16	Shawnee	386
Decatur	40	Logan	42	Sheridan	30
Dickinson	199	Lyon	62	Sherman	48
Doniphan	33	McPherson	131	Smith	73
Douglas	89	Marion	69	Stafford	48
Edwards	45	Marshall	186	Stanton	12
Elk	18	Meade	22	Stevens	33
Ellis	55	Miami	49	Sumner	81
Ellsworth	50	Mitchell	88	Thomas	50
Finney	87	Montgomery	111	Trego	32
Ford	72	Morris	68	Wabaunsee	66
Franklin	46	Morton	22	Wallace	16
Geary	272	Nemaha	118	Washington	111
Gove	32	Neosho	35	Wichita	18
Graham	26	Ness	44	Wilson	28
Grant	23	Norton	69	Woodson	12
Gray	27	Osage	61	Wyandotte	331
				Total	10,088

New and Different Students Enrolled for First and Second Semester and Summer Session

Freshmen	3528
Sophomores	2939
Juniors	2475
Seniors	2374
5th and 6th Years	239
Provisional and Special	695
Graduate	2902
Total	15,152

Degrees Conferred in the Year 1969

College or School	Men	Women	Total
College of Agriculture	226	5	231
Agriculture	210	5	215
Bakery Science and Management	6		6
Biochemistry	1		1
Feed Science and Management	7		7
Milling Science and Management	2		2
College of Architecture	69	3	72
Architecture	46	2	48
Architectural Engineering	1		1
Building Construction	13		13
Landscape Architecture	9	1	10
College of Arts and Sciences	524	261	785
Bachelor of Arts	154	156	310
Bachelor of Science	337	78	415
Bachelor of Music	3	4	7
Physical Education	29	16	45
Music Education	1	7	8
College of Commerce	185	11	196
Business Administration	185	11	196
College of Education	36	262	298
Bachelor of Science	29	66	95
Elementary Education	7	196	203
College of Engineering	211		211
Agricultural Engineering	12		12
Chemical Engineering	17		17
Civil Engineering	34		34
Electrical Engineering	76		76
Industrial Engineering	16		16
Mechanical Engineering	44		44
Nuclear Engineering	12		12
College of Home Economics	5	209	214
Home Economics	1	201	202
Home Economics and Journalism		8	8
Restaurant Management	4		4
College of Veterinary Medicine	70	6	76
Veterinary Medicine	70	6	76
Graduate School (Master of Architecture)	1		1
Graduate School (Landscape Architecture	1		1
Graduate School (Master of Arts)			
Art	1	1	2
Economics	6		6
English	8	2	10
Geography	3	1	4
History	2	2	4
Modern Languages	3		3
Philosophy	2		2
Political Science	3	3	6
Radio and Television	2		2
Sociology	3	2	5
Speech	11	9	20
Graduate School (Master of Regional and Comm. Plan.)	2		2
Graduate School (Master of Science)			
Accounting	4	1	5
Agricultural Economics	7		7
Agricultural Education	9		9
Agricultural Engineering	8		8
Agronomy	13		13
Animal Husbandry	9		9
Applied Mechanics	1		1
Biochemistry	1	1	2
Biology	17	2	19
Business Administration	13		13
Chemical Engineering	9		9
Chemistry	11	1	12
Civil Engineering	23		23
Clothing and Textiles		5	5
Computer Science	2	1	3
Dairy Production	3		3
Education	31	30	61
Electrical Engineering	7		7
Entomology	6		6
Extension Education	2	1	3
Family and Child Development	2	9	11
Family Economics		3	3
Farm Mechanics	1		1
Food Science	4	1	5
Foods and Nutrition		7	7
Genetics	1	1	2
Geology	3		3
Grain Science	5		5
Home Economics Education	1	3	4
Horticulture	7		7
Industrial Engineering	27	1	28
Institutional Management	1	6	7
Mathematics	3		3
Mechanical Engineering	16	1	17
Microbiology	5	1	6
Music	6	2	8
Nuclear Engineering	8		8
Parasitology	2		2
Pathology	5		5
Physical Education	17	3	20
Physical Science Teaching	2		2
Physics	7		7
Plant Pathology	2		2
Poultry Science	1		1
Psychology	5	1	6
Statistics	3		3
Surgery and Medicine	1		1
Technical Journalism	5	2	7
Graduate School (Doctor of Philosophy)			
Agronomy	5		5
Animal Breeding	3		3
Animal Nutrition	1	1	2
Applied Mechanics	2		2
Biochemistry	5	1	6
Biology	7		7
Chemical Engineering	2		2
Chemistry	9		9
Economics	6		6
Electrical Engineering	5		5
English	5	1	6
Entomology	5		5
Food Science	3		3
Foods and Nutrition	1	1	2
Genetics	5		5
Grain Science	5		5
Horticulture	4		4
Mathematics	2		2
Mechanical Engineering	5		5
Microbiology	6		6
Nuclear Engineering	2		2
Parasitology	1		1
Pathology	1		1
Physics	4		4
Physiology	1		1
Plant Pathology	1		1
Psychology	13		13
Statistics	7	1	8
Grand Total	1806	865	2671

Record of Enrollment and Degrees Conferred, 1863-1969

Year	Summer school	Housekeepers' short course	Dairy Mfg. short course	Dairy short course	Farmers' short course	Apprentice	Special	Preparatory	Subfreshman	Vocational school	Freshman	Sophomore	Junior	Senior	Graduate	Counted twice	Net total	Degrees granted
1863-'64	...	...	...	...	...	...	...	92	...	...	14	...	...	...	...	...	106	...
1864-'65	...	...	...	...	...	...	...	91	...	...	14	8	1	...	...	...	114	...
1865-'66	...	...	...	...	...	...	...	99	...	...	21	3	5	...	...	...	127	...
1866-'67	...	...	...	...	...	...	...	118	...	...	11	7	1	5	...	...	142	5
1867-'68	...	...	...	...	...	...	...	103	...	...	6	5	1	...	...	...	115	1
1868-'69	...	...	...	...	...	...	...	137	...	...	10	10	2	...	1	...	160	...
1869-'70	...	...	...	...	...	...	...	119	...	...	10	12	1	...	...	...	142	...
1870-'71	...	...	...	...	...	...	...	118	...	...	13	5	4	5	...	...	145	10
1871-'72	...	...	...	...	...	...	...	129	...	...	20	11	3	5	2	2	168	4
1872-'73	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	173	3
1873-'74	...	...	...	...	...	...	...	137	...	...	24	14	3	6	...	...	184	5
1874-'75	...	...	...	...	...	...	...	103	...	...	26	10	2	2	...	...	143	3
1875-'76	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	238	5
1876-'77	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	232	10
1877-'78	...	...	...	...	...	...	...	75	...	...	42	23	5	5	...	...	152	4
1878-'79	...	...	...	...	...	...	1	...	...	...	89	89	16	12	...	...	214	11
1879-'80	...	...	...	...	...	...	1	...	...	...	166	61	35	11	2	...	276	9
1880-'81	...	...	...	...	...	...	6	...	...	...	178	48	24	9	2	...	267	8
1881-'82	...	...	...	...	...	...	5	...	...	...	227	50	19	11	...	...	312	11
1882-'83	...	...	...	...	...	...	4	...	...	...	241	60	30	12	...	...	347	15
1883-'84	...	...	...	...	...	...	2	...	...	...	255	92	26	18	2	...	395	17
1884-'85	...	...	...	...	...	...	2	...	...	...	271	71	36	16	5	...	401	15
1885-'86	...	...	...	...	...	...	1	...	...	...	273	91	35	24	4	...	428	23
1886-'87	...	...	...	...	...	...	...	...	...	...	303	100	44	24	10	...	481	26
1887-'88	...	...	...	...	...	...	...	...	...	...	305	92	46	27	2	...	472	23
1888-'89	...	...	...	...	...	...	...	...	...	...	266	103	41	28	7	...	445	26
1889-'90	...	...	...	...	...	...	1	...	...	...	307	105	63	28	10	...	514	29
1890-'91	...	...	...	...	...	...	...	...	...	...	343	135	50	53	12	...	593	54
1891-'92	...	...	...	...	...	...	...	...	...	...	336	139	62	37	10	...	584	35
1892-'93	...	...	...	...	...	...	...	...	...	...	339	110	66	43	29	...	587	48
1893-'94	...	...	...	...	...	...	...	...	...	...	275	141	72	42	25	...	555	45
1894-'95	...	...	...	...	...	...	5	...	...	...	276	108	89	64	39	...	572	60
1895-'96	...	...	...	...	...	...	3	...	...	...	353	121	67	71	32	...	647	71
1896-'97	...	...	...	...	...	...	6	67	...	...	321	163	69	62	46	...	734	63
1897-'98	...	...	...	6	...	9	15	77	...	...	316	174	77	82	57	10	803	79
1898-'99	...	...	...	26	...	35	40	110	...	...	306	177	92	65	40	21	871	63
1899-1900	...	24	...	57	47	50	32	162	...	...	376	163	109	69	27	22	1094	61
1900-'01	...	47	...	72	109	79	23	318	...	...	348	183	80	74	40	52	1321	69
1901-'02	...	41	...	66	125	87	19	298	...	...	396	206	120	65	32	59	1396	55
1902-'03	...	63	...	38	123	78	36	342	...	...	471	229	141	86	24	57	1574	55
1903-'04	17	51	...	16	122	72	33	443	...	...	403	206	161	114	20	36	1605	103
1904-'05	15	88	...	24	99	12	30	500	...	...	289	198	122	117	26	43	1462	109
1905-'06	18	92	...	28	118	...	46	598	...	...	373	214	145	110	30	64	1690	100
1906-'07	18	134	...	23	179	Engineering short course	48	144	511	...	411	269	149	133	24	88	1937	124
1907-'08	29	188	...	26	173		42	134	528	...	450	357	202	148	26	82	2192	120
1908-'09	25	168	...	18	197		42	134	521	...	491	381	243	171	28	86	2308	151
1909-'10	22	152	4	111	124		87	89	453	...	456	417	286	170	26	70	2305	146
1910-'11	31	160	9	26	285		107	Milling short course	364	...	533	412	288	248	34	59	2407	207
1911-'12	94	160	14	Lunch room mgt.	280		85		580	...	337	461	288	261	44	81	2523	236
1912-'13	282	175	11		289		129		654	...	444	432	355	268	55	166	2928	234
1913-'14	370	149	12		223		112		Engineering trade courses	658	516	431	324	327	64	159	3027	291
1914-'15	472	127	18		199	98	120			560	575	368	383	321	48	200	3089	229
1915-'16	536	85	17		207	188	175			484	605	454	305	401	76	219	3314	359
1916-'17	586	103	14		228	191	172			422	693	471	378	282	68	279	3339	210
1917-'18	481	84	...	8	119	135	138			231	483	349	294	238	36	190	2406	233
1918-'19	519	25	5	...	160	400	199			216	810	322	254	201	34	144	2991	174
1919-'20	415	57	3	6	117	362	271			224	894	400	297	273	44	167	3376	271
1920-'21	604	30	10	...	96	278	270	8		280	878	602	318	273	42	294	3395	263
1921-'22	820	19	10	...	59	173	221	...		297	931	628	422	296	125	813	3560	300
1922-'23	884	19	8	...	55	83	163	12		220	1004	656	460	401	118	457	3626	372
1923-'24	978	12	7	...	43	57	161	3		167	1160	657	458	413	171	475	3812	385
1924-'25	1120	14	14	...	55	54	139	5		47	1391	679	467	347	185	486	4031	388
1925-'26	947	12	11	...	41	29	89	...		...	1494	725	512	344	182	384	4019	392
1926-'27	959	...	18	...	52	...	71	...	19	...	1311	854	509	411	179	300	4083	434
1927-'28	966	...	20	...	57	...	88	...	7	...	1039	819	584	500	167	418	3878	498
1928-'29	920	...	18	...	51	...	57	...	9	...	1084	743	584	537	197	321	3879	545
1929-'30	902	...	13	...	59	...	70	...	9	...	1128	787	581	554	*432	548	3987	560
1930-'31	995	...	24	...	52	...	50	...	7	...	1077	790	605	528	506	589	4045	515
1931-'32	1059	...	12	...	29	...	54	...	...	...	933	752	633	572	572	688	3928	605
1932-'33	995	...	...	...	...	...	72	...	...	...	666	596	552	590	518	630	3359	641
1933-'34	655	...	...	...	...	...	61	...	...	...	707	558	520	522	327	422	2928	493
1934-'35	722	...	...	...	...	...	52	...	...	...	1081	616	548	557	316	456	3436	522

Record of Enrollment and Degrees Conferred, 1963-1969—Concluded

Year	Summer school	Housekeepers' short course	Dairy Mfg. short course	Dairy short course	Farmers' short course	Apprentice	Special	Preparatory	Subfreshman	Vocational school	Freshman	Sophomore	Junior	Senior	Graduate	Counted twice	Net total	Degrees granted
1935-'36	989	...	...	...	...	...	69	...	...	...	1330	820	660	574	391	572	4261	550
1936-'37	917	...	...	...	...	...	64	...	...	...	1326	947	774	623	440	634	4457	611
1937-'38	890	...	...	...	...	...	67	...	...	...	1297	972	810	787	409	537	4695	729
1938-'39	911	...	...	...	...	...	61	...	...	...	1246	959	864	855	463	559	4800	806
1939-'40	920	...	...	...	...	...	61	...	...	...	1306	958	926	871	490	622	4910	789
1940-'41	935	...	...	...	...	...	40	...	...	...	1284	969	905	900	524	655	4902	819
1941-'42	880	...	...	...	...	...	17	...	...	...	1274	926	807	748	417	590	4479	685
1942-'43	1178	...	...	...	...	...	21	...	...	...	1234	717	587	717	253	846	3861	674
1943-'44†	1181	...	...	...	...	...	21	...	...	...	1234	717	587	717	217	888	3786	...
1943-'44	911	...	...	...	...	...	18	...	...	...	483	371	312	440	193	619	2109	418
1944-'45	881	...	...	...	...	...	48	...	...	...	601	383	289	260	196	594	2064	288
1945-'46	2785	...	...	...	...	...	227	...	...	...	1730	771	524	468	331	1784	5052	519
1946-'47	2859	...	...	...	...	...	183	...	...	...	3453	1910	1019	856	383	2849	7814	881
1947-'48	2446	...	...	...	...	...	97	...	...	...	2100	2325	1595	1123	456	1976	8166	1106
1948-'49‡	2246	...	...	...	...	...	64	...	...	...	1883	1768	1927	1753	550	1825	8366	1666
1949-'50	1808	...	...	...	...	...	44	...	...	...	1941	1692	1512	1952	775	82	7834	2121
1950-'51	1582	...	...	...	...	...	42	...	...	...	1802	1487	1263	1446	850	58	6867	1643
1951-'52	1043	...	...	...	...	...	36	...	...	...	1670	1167	1026	1097	649	47	5598	1210
1952-'53	1032	...	...	...	...	...	47	...	...	...	1987	1170	950	1009	650	82	5731	1116
1953-'54	1246	...	...	...	...	...	94	...	...	...	1976	1287	916	960	759	62	5930	1098
1954-'55	1513	...	...	...	...	...	175	...	...	...	1950	1501	825	1178	812	65	6376	1095
1955-'56	1712	...	...	...	...	...	154	...	...	...	2025	1788	912	1411	912	77	7125	1181
1956-'57	1796	...	...	...	...	...	164	...	...	...	1939	1912	1519	1308	894	...	7736	1346
1957-'58	1973	...	...	...	...	...	185	...	...	...	1838	1767	1595	1584	1077	...	8046	1615
1958-'59	2008	...	...	...	...	...	251	...	...	...	1814	1626	1473	1576	1188	...	7928	1731
1959-'60	2135	...	...	...	...	...	274	...	...	...	1827	1681	1447	1494	1342	...	8065	1533
1960-'61	2460	...	...	...	...	...	327	...	...	...	2197	1692	1466	1541	1517	...	8740	1620
1961-'62	2724	...	...	...	...	...	364	...	...	...	2363	1871	1517	1486	1634	...	9235	1521
1962-'63	2930	...	...	...	...	...	378	...	...	...	2775	1986	1625	1649	1845	...	10258	1628
1963-'64	3448	...	...	...	...	...	441	...	...	...	2491	2283	1630	1821	2032	...	10698	1707
1964-'65	3519	...	...	...	...	...	352	...	...	...	3256	2317	1841	1667	2258	...	11771	1791
1965-'66	3872	...	...	...	...	...	508	...	...	...	3811	2515	1869	1972	2233	...	13008	2014
1966-'67	3750	...	...	...	...	...	683	...	...	...	3493	2863	1988	2036	2534	...	13597	2066

* Figures above this column include neither graduate students in summer session, nor undergraduate students pursuing undergraduate work.

† Beginning with this year this summary is made at the close of the summer session instead of at the close of the spring semester as before.

‡ Beginning with this year, summer school students are included under the captions: Special, Freshman, Sophomore, Junior, Senior, and Graduate.

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