# K-STATE

Graduate Catalog

1993-1995

Kansas State
University

# K-State Graduate Catalog 1993–1995



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## Information

You may call toll-free information about admission to Kansas State University.

### Undergraduate students

Dial 1-800-432-8270 from any place in Kansas 24 hours a day. Outside of Kansas dial (913) 532-6250.

Prospective students should contact the Office of Admissions, 119 Anderson Hall, Kansas State University, Manhattan, KS 66506–0102.

### Graduate students

Dial 1-800-232-0133, ext. 6194. Outside the United States dial (913) 532-6191.

Prospective students should contact the Graduate School, 102 Fairchild Hall, Kansas State University, Manhattan, KS 66506–1103.

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# Contents

# About the Catalog

The *K-State Graduate Catalog* is a reference for those interested in academic policies, procedures, and programs of the university. Refer to the table of contents or the index for specific topics of interest.

Degree requirements and programs are organized by colleges and departments. Courses listed in this catalog are those that may be taken for graduate credit.

## Course Descriptions

The following course description key explains the system used for courses listed throughout the catalog.

### Sample course description

**ECON 810. History of Economic Thought.** (3) I. Development of economic ideas and doctrines and the relation of these to conditions existing when they were formulated. Pr: ECON 110.

The letters *ECON* denote the department in which the course is offered (in this case, Economics).

The three digits of the course number *810* represent the level of the course.

**Level numbers:**

| | |
|---|---|
| 000-099 | Not applicable toward degree requirements. |
| 100-299 | Lower division undergraduate. Designed as freshman or sophomore course. |
| 300-499 | Upper division undergraduate. Designed as junior or senior course. |
| 500-699 | Upper division undergraduate. Primarily for a junior or senior, but also may be taken for graduate credit only in a minor field. A course numbered 600 may be taken for credit in a graduate student's major. |
| 700-799 | Graduate and upper division, primarily for graduate level. |
| 800-899 | Graduate level for master's course or professional course beyond the undergraduate level. |
| 900-999 | Graduate level, primarily for doctoral candidate. |

The number in parenthesis *(3)* following the course title indicates the units of credit given for the course. Each credit unit usually represents one 50-minute period of lecture or recitation each week of the semester.

The *I, II, S*, and/or *intersession* following the course title indicate the semester, or semesters, each course is usually offered; I stands for fall semester, II for spring, S for summer school, and intersession for the term between semesters.

The abbreviation *Pr.* indicates prerequisites for the course. In the sample course, students would be required to have completed ECON 110 before enrolling for ECON 810. Some courses may allow or require concurrent enrollment in other courses. This is indicated by the abbreviation *Conc.*

## Contacts

All phone numbers are (913) area code, except where noted. All addresses, are Manhattan, Kansas, 66506, except where noted.

## Other Publications

Other K-State publications are available on request from the offices listed below.

### Graduate School
101 Fairchild Hall, 532-6191

*The Graduate School*: an introduction to K-State's graduate programs that includes photos and admission information.

### Office of Admissions
119 Anderson Hall, 532-6250

*K-State Admissions Guide*: an introduction to Kansas State University, including photographs and undergraduate application information and forms.

### Division of Continuing Education
College Court Building, 532-5687

*Summer School Bulletin*: course descriptions and admission information. Available in early spring.

*After Hours*: information and course descriptions for classes starting after 4 p.m. on campus during fall and spring semesters. Available in December and July.

### K-State Union Bookstore
K-State Union, First Floor, 532-6583

*Class Schedule*: a description of the courses offered during an academic semester/session.

*K-State Undergraduate Catalog*: descriptions of undergraduate programs, courses, and policies.

# About the University

## Kansas State University

Kansas State University was founded February 16, 1863, as a land-grant institution under the Morrill Act. Initially located on the grounds of the old Bluemont Central College, chartered in 1858, the university moved to its present site in 1875.

The 664-acre campus is in Manhattan, 125 miles west of Kansas City via Interstate 70 in the rolling Flint Hills of northeast Kansas. The campus is convenient to both business and residential sections of the city. Under an enactment of the 1991 Kansas Legislature, the Salina campus, 70 miles west of Manhattan, was established through a merger of the former Kansas College of Technology with the university.

Additional university sites include 18,000 acres in the four branch locations of the Agricultural Experiment Station—Hays, Garden City, Colby, and Parsons—and 8,600 acres in the Konza Research Prairie jointly operated by the AES and the Division of Biology.

One of the six universities governed by the Kansas Board of Regents, Kansas State University continues to fulfill its historic educational mission in teaching, research, and public service.

## Objective of the educational program

The objective of the educational program at Kansas State University is to develop individuals capable of applying enlightened judgment in their professional, personal, and social lives.

To that end the university program is designed:

**I.** To provide full and efficient counseling and guidance to students at the university. Specifically, this means to:

A. Learn and make known to students all that is possible and useful about their interests, aptitudes, and abilities.

B. Apply that knowledge to the students' choice of courses and curricula as fully as possible without encroaching harmfully on their initiative and feeling of self-responsibility.

C. Provide continuing guidance for students according to their needs.

**II.** To prepare students for an occupation or a profession which includes an organized body of information and theory so they may realize their creative potential. More specifically this means that students should acquire:

A. The ability to recognize and master fundamental principles in their fields of specialization.

B. The knowledge basic to their special fields of study.

C. The ability to reason critically from facts and recognized assumptions to useful technical conclusions.

D. The basic skills associated with their fields of study.

E. A professional attitude in their chosen work.

**III.** To provide all students with an opportunity to gain the knowledge and abilities members of a democratic society need, whatever occupation or profession they expect to enter. Specifically, this means that through its program the university undertakes to help the student:

A. Develop communication skills.

B. Develop the ability to apply critical and creative thinking to the solution of theoretical and practical problems.

C. Understand the basic concepts of the natural sciences, the interrelations of the natural and social sciences, and the impact of science on society.

D. Comprehend and evaluate the processes and institutions in society at home and abroad, and develop a dynamic sense of personal responsibility as effective citizens in a democratic society.

E. Develop habits of self-evaluation, responsibility, and enterprise that will increase the effectiveness of the educative process in college, and provide the basis for continued self-improvement.

F. Develop a well-adjusted personality, good character traits, and a sound philosophy of life.

G. Prepare for effective participation in family life.

H. Utilize actively and fully the capacity for aesthetic 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 that the institution serves.

## Accreditation

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

## Faculty

The faculty at Kansas State University are dedicated to excellence in teaching, student advising, research, extension education, scholarly achievement, and creative endeavor.

K-State recognizes superior teaching with annual faculty awards. Citations for the Outstanding Teachers of the Year and for Distinguished Graduate Faculty Members are presented at commencement. The university also honors faculty members who contribute to the expansion of knowledge in their respective fields.

The faculty assume a major responsibility to participate in outreach activities that serve the citizens of the state, and many hold leadership positions in their disciplines and in professional organizations.

# Calendar

*Denotes Graduate School deadlines

## Fall Semester 1993

**August 18–20, Wednesday–Friday**
Enrollment and fee payment.

**August 21, Saturday, 9 a.m.–noon**
Part-time express enrollment and fee payment.

**August 23, Monday**
Classes, late fee of $15, and drop/add begin.

**August 23–26, Monday–Thursday**
Late enrollment and fee payment.

**August 23–26, Monday–Thursday**
Evening enrollment and fee payment.

**August 27, Friday**
Last day to add a course without instructor permission, and for faculty, staff, and teachers to enroll without late fee.

**September 3, Friday**
Last day to withdraw with 100% fee refund, to sign up for A/Pass/F grading option for a course that meets the first half of the semester, and to enroll without dean's permission.

**September 6, Monday**
University holiday.

**September 9, Thursday**
Last day to drop a course that meets the first half of the semester without a W being recorded.

***September 15, Wednesday**
Deadline for applications for international graduate students to be in academic departments for spring enrollment.

**September 17, Friday**
Last day to withdraw with 50% fee refund.

**September 20, Monday**
Twentieth class day.

**September 21, Tuesday**
Late fee of $35 begins.

**September 24, Friday**
Last day to drop a course that meets the first half of the semester.

**September 27, Monday**
Last day to drop a full semester course without W being recorded.

***October 1, Friday**
Graduation check sheet due in the Graduate School for notification of intent to graduate in December.

**October 29, Friday**
Last day to drop a full semester course or a course that meets only the second half of the semester.

**November 3, Wednesday**
Last day to drop a course that meets the second half of the semester without a W being recorded.

**November 8–19, November 29–December 3, Monday–Friday**
Early enrollment for spring 1994 courses.

***November 15, Monday**
To graduate in December, ballots for all candidates and final copies of dissertation, thesis, or report due in the Graduate School.

**November 19, Friday**
Last day to drop a course that meets the second half of the semester. Classes resume.

**November 24–28, Wednesday–Sunday**
Student holiday.

**November 24–25, Thursday–Friday**
University holiday.

**December 7–8, Tuesday–Wednesday**
Winter 1994 intersession enrollment.

**December 11, Saturday**
Commencement.

**December 13–17, Monday–Friday**
Semester examinations.

**December 20, Monday, noon**
Deadline for grades to be submitted to the Enrollment Services.

**December 24, Friday**
University holiday.

## Winter 1994 Intersession

**December 7–8, Tuesday–Wednesday**
Winter 1994 intersession enrollment.

**December 27, 1993–January 11, 1994, Monday–Friday**
Winter 1994 intersession.

## Spring Semester 1994

**January 1, Wednesday**
University holiday.

**January 8, Saturday, 9 a.m.–noon**
Part-time express enrollment and fee payment.

**January 10–11, Monday–Tuesday**
Enrollment and fee payment.

**January 12, Wednesday**
Classes, late fee of $15, and drop/add begin.

**January 12–13, 18, 24, Wednesday–Thursday, Tuesday, Monday**
Late enrollment and fee payment.

**January 12–13, 18, 24, Wednesday–Thursday, Tuesday, Monday**
Evening enrollment and fee payment.

***January 14, Friday**
Deadline for applications for international graduate students to be in academic departments for summer enrollment.

**January 17, Monday**
University holiday.

**January 19, Wednesday**
Last day to add a course without instructor's permission, and for faculty, staff, and teachers to enroll without late fee.

**January 21, Friday**
Last day to withdraw with 100% fee refund, to sign up for A/Pass/F grading option for a course that meets the first half of the semester, and to enroll without dean's permission.

**January 31, Monday**
Last day to drop a course that meets the first half of the semester without a W being recorded.

**February 4, Friday**
Last day to withdraw with 50% fee refund.

**February 9, Wednesday**
Twentieth class day.

**February 10, Thursday**
Late fee of $35 begins.

**February 11, Friday**
Last day to drop a course that meets the first half of the semester.

***February 15, Tuesday**
Graduation check sheet due in the Graduate School for notification of intent to graduate in May.

**February 16, Wednesday**
Last day to drop a full semester course without a W being recorded.

**March 18, Friday**
Last day to drop a full semester course.

**March 19–27, Saturday–Sunday**
Student holiday.

**March 28, Monday**
Classes resume.

**March 30, Wednesday**
Last day to drop a course that meets the second half of the semester without a W being recorded.

**April 6–22, Monday–Friday**
Early enrollment for summer and fall 1994 courses.

**April 15, Friday**
Last day to drop a course that meets the second half of the semester.

***April 15, Friday**
To graduate in May, ballots for all candidates and final copies of dissertation, thesis or report due in the Graduate School. Deadline for applications for international graduate students to be in academic departments for fall enrollment.

**April 27–28, Wednesday–Thursday**
Spring 1994 intersession enrollment.

**May 5, Thursday**
No classes.

**May 5–7, 9–11, Thursday (7 p.m.)–Saturday, Monday–Wednesday**
Semester examinations. Final examinations for courses that meet only on Thursday night begin at 7 p.m.

**May 13–14, Friday–Saturday**
Commencement.

**May 16, Monday, noon**
Deadline for submitting grades to the Enrollment Services.

**May 30, Monday**
Deadline for international student applications for fall 1994.

## Spring 1994 Intersession

**April 27–28, Wednesday–Thursday**
Spring 1994 intersession enrollment.

**May 16–June 3, Monday–Friday**
Spring 1994 intersession.

## Summer Term 1994

**June 6, Monday**
Summer term enrollment.

**June 7, Tuesday**
Classes, late fee of $15, and drop/add begin.

**June 10, Friday**
Last day to withdraw from an eight-week course with 100% fee refund; to enroll without dean's permission; and for faculty, staff, and teachers to enroll without late fee.

***June 15, Wednesday**
Graduation check sheet due in the Graduate School for notification of intent to graduate in July.

**June 17, Friday**
Last day to withdraw with 50% fee refund.

**June 21, Tuesday**
Late fee of $35 begins.

**June 23, Thursday**
Last day to drop an eight-week course without a W being recorded.

**July 4, Monday**
University holiday.

**July 8, Friday**
Last day to drop an eight-week course.

***July 8, Friday**
To graduate in July, ballots for all candidates and final copies of dissertation, thesis, or report due in the Graduate School.

**July 29, Friday**
Last day for summer term examinations.

**August 1, Monday, Noon**
Final grade sheets due in the Enrollment Services.

## Fall Semester 1994

**August 17–19**
Registration.

**August 22**
Semester begins.

**September 5**
University holiday.

**November 23–27**
Student holiday.

**November 24–25**
University holiday.

**December 9**
Last day of semester.

**December 10**
Commencement.

**December 12–16**
Semester examinations.

## Winter 1995 Intersession

**December 17, 1994–January 10, 1995**
Intersession.

## Spring Semester 1995

**January 9–10**
Registration.

**January 11**
Semester begins.

**January 16**
University holiday.

**March 20–26**
Student holiday.

**May 3**
Last day of semester.

**May 4–10**
Semester examinations.

**May 12–13**
Commencement.

## Spring 1995 Intersession

**May 15–June 2**
Intersession.

## Summer Term 1995

**June 5**
Registration.

**June 6**
Term begins.

**July 8**
Last day of term.

# Glossary and Abbreviations

**A/Pass/F**: An alternative grading option in which a student earning a grade of A in a course will have an A recorded for that course; a grade of B, C, or D will be recorded as a Pass; and a grade of F will be recorded as an F.

**Academic load:** The total number of semester hours for which a student is enrolled in one semester.

**Advanced standing:** Having credit awarded for previous work or testing.

**Advisor:** A faculty member who provides information and makes recommendations on courses, requirements, prerequisites, and programs of study.

**Audit:** To attend a class regularly without participating in class work and without receiving credit.

**B.A.:** Bachelor of arts degree. Courses selected from a variety of disciplines although concentrations are in one or two areas. A modern language is required for a B.A. degree.

**B.S.:** Bachelor of science degree. A specified program of required courses with fewer electives than the B.A. A modern language may be taken but is not required.

**Baccalaureate:** Refers to the bachelor's degree.

**Classification:** Level of progress toward a degree with classifications of freshman, sophomore, junior, or senior, depending on the number of semester hours completed.

**College:** An academic unit of the university. Kansas State University has nine colleges and a Graduate School.

**Concurrent enrollment:** Taking a course during the same semester as another. Abbreviation: Conc.

**Course:** A unit of study a student enrolls in during a semester.

**Credit by examination:** Credit received when a student takes an oral or written examination without registering for a course.

**Credit hour:** A unit of measurement used in determining the quantity of work taken. Each credit hour is roughly equivalent to one hour of class time per week. For example, a class meeting three hours a week would be a three-credit-hour class. Abbreviation: Cr.

**Credit/No Credit:** An grading option in which the successful completion of a course is recorded as Credit and failure is recorded as No Credit. No other grades are given for such courses and they are not figured into the grade point average.

**Curriculum:** A program of courses that meet the requirements for a degree in a particular field of study.

**Degree program:** Courses required for completion of a particular degree.

**Department:** A unit within a college representing a discipline.

**Discipline:** An area of study representing a branch of knowledge, such as mathematics.

**Dismissal:** A student who neglects his or her academic responsibilities may be dismissed on recommendation of an academic dean.

**Double major:** Having two programs of academic study.

**Drop/Add:** Changing the student's course schedule by adding and/or dropping a course, or both.

**Dual degree:** A student may elect in some cases to earn two degrees at one time.

**Ed.D.:** Doctor of Education degree. A post-baccalaureate degree awarded upon completion of at least three years of full-time specialized study, together with a major research contribution to the discipline that demonstrates independence as a scholar. The degree culminates with a formal dissertation.

**Electives:** Courses chosen by a student that are not required for the major or minor. The number of hours of electives required varies according to a student's major.

**Enrollment:** The process of selecting courses and having courses reserved.

**Equiv.:** Equivalent.

**Extracurricular:** Activities such as band or debate for which a student may earn credit toward graduation. Extracurricular activities are counted as electives.

**Financial aid:** Help for a student who lacks funds to pay for college. Aid is available from grants, loans, scholarships, and work/study employment.

**Grade point average (GPA):** A measure of scholastic performance. A GPA is obtained by dividing the number of grade points by the hours of work attempted, an A = 4 points, a B = 3 points, a C = 2 points, a D = 1 point, and an F = 0 points.

**Graduate student:** A student who has completed a bachelor's degree and has met all the requirements for admission to the Graduate School.

**Hour:** The unit by which course work is measured. The number of semester hours assigned to a course is usually determined by the number of hours a class meets per week.

**Intersession:** Courses offered between fall and spring semesters and after spring semester.

**Lec.:** Lecture. A class wherein the teaching is done primarily through oration.

**M.A.:** Master of arts degree. A post-baccalaureate degree awarded upon completion of about 30 semester hours in the humanities or social sciences. May or may not include research and a thesis, depending on the field of study.

**Major:** The subject or subject areas upon which a student chooses to place principal academic emphasis.

**M.S.:** Master of science degree. A post-baccalaureate degree awarded upon completion of about 30 semester hours in the sciences or professions. Research and a thesis are required in most of the sciences.

**Option:** An approved group of courses creating a specialty within a major field of study.

**Orientation:** Activities and programs designed to help the new student become acquainted with the university.

**Ph.D.:** Doctor of philosophy degree. A post-baccalaureate degree awarded upon completion of at least three years of full-time specialized study, together with a major research contribution to the discipline that demonstrates independence as a scholar. The degree culminates with a formal dissertation.

**Prerequisite:** A requirement, usually credit in another course, which must be met before a particular course can be taken. Abbreviation: Pr.

**Probation:** Probation is an academic warning that a student is in academic difficulty which could lead to dismissal from the university.

**Rec.:** Recitation. A small section usually taken in conjunction with a lecture.

**Scholastic honors:** An award and undergraduate receives based on the excellence of K-State academic work.

**Secondary major:** Interdisciplinary major which must be completed along with a first major course of study.

**Special student:** A graduate student taking courses at K-State but not regularly enrolled in work toward a degree.

**Transcript:** An official copy of a student's permanent academic record.

**Transfer student:** A student who terminates enrollment in another college or university and subsequently enrolls in K-State.

**Undergraduate student:** A university student who has not received a bachelor's degree.

**V/Var.: Variable**. The credits earned in some courses may vary.

# Graduate Study

With 60 master's programs and 42 doctoral programs, Kansas State University offers preparation for a variety of scholarly and research careers as well as for a wide range of professional positions.

Since research is the mode of learning at the limits of knowledge, a common objective of all the graduate programs is to develop the capacities needed for independent study and research. All doctoral programs and most master's programs develop such capacities through both advanced course work and original research under the direction of faculty members who are experts in their fields.

A crucial part of the process involves the preparation and publication of a research study in the form of a thesis or dissertation and a defense of the study before the faculty. Some professional master's programs emphasize preparation for professional practice and consequently offer a nonthesis option, but in these, too, the student should gain a thorough understanding of research and research methodology.

## Master's degrees

**Master of science**
Agricultural economics
Agricultural engineering
Agronomy
Anatomy and physiology
Animal sciences
Architectural engineering
Agricultural technology management
Biochemistry
Biology
Chemical engineering
Chemistry
Civil engineering
Clothing, textiles, and interior design
Computer and information sciences
Education
- Adult, occupational, and continuing education
- Educational administration
- Elementary education
- Secondary education
- Special education
- Student counseling and personnel services

Electrical and computer engineering
Entomology
Food science
Foods and nutrition
Genetics
Geology
Grain science
Horticulture
Human development and family studies
Industrial engineering
Institution management
Kinesiology
Mass communications
Mathematics
Mechanical engineering
Microbiology
Nuclear engineering
Physics
Plant pathology
Psychology
Statistics
Surgery and medicine
Veterinary laboratory medicine
Veterinary pathology

**Master of arts**
Economics
English
Geography
History
Modern languages
Political science
Radio and television
Sociology
Speech

**Master of accountancy**

**Master of architecture**

**Master of business administration**

**Master of fine arts**

**Master of landscape architecture**

**Master of music**

**Master of public administration**

**Master of regional and community planning**

## Doctoral degrees

**Doctor of education**
Adult, occupational, and continuing education
Curriculum and instruction
Educational administration
Educational psychology
Special education
Student counseling and personnel services

**Doctor of philosophy**
Agronomy
Animal sciences
Biochemistry
Biology
Chemistry
Computer science
Economics
- Agricultural
- Arts and sciences

Education
- Adult, occupational, and continuing education
- Curriculum and instruction
- Student counseling and personnel services

Engineering
- Agricultural engineering
- Chemical engineering
- Civil engineering
- Electrical and computer engineering
- Industrial engineering
- Mechanical engineering
- Nuclear engineering

Entomology
Food science
Foods and nutrition
Genetics
Geology (Cooperative with University of Kansas)
Grain science
History
Human ecology
Horticulture
Mathematics
Microbiology
Physics
Physiology
Plant pathology
Psychology
Sociology
Statistics
Veterinary pathology

# Resources for Graduate Study and Research

## Advanced Manufacturing Institute

Farhad Azadivar, Director

Designated as a Center of Excellence by the Kansas Technology Enterprise Cooperation, the institute conducts basic and applied research likely to have direct commercial application or impact on the economic development of Kansas. The AMI specializes in automated manufacture and assembly of mechanical parts and systems, processing of engineered materials, special developmental efforts such as electric and hybrid vehicles, and technology transfer. The AMI supports research in total quality management, concurrent engineering, CAD/CAM, feature-based design, vision systems, optimization using artificial intelligence, and the general application of expert systems and neural networks.

## Agricultural Experiment Station

Marc A. Johnson, Interim Director
George E. Ham, Associate Director
Michael D. Lorenz, Assistant Director
Barbara S. Stowe, Assistant Director

113 Waters Hall
532-6147

The Kansas Agricultural Experiment Station conducts mission-oriented research to enhance the capability of agriculture to provide adequate food and fiber and improve rural living and human nutrition for present and future generations.

Research is conducted both on and off campus (on state-owned and leased land), and researchers have access to laboratories and scientific equipment. Twenty-four departments in five colleges are involved. The station is also strongly allied with the Graduate School; interested graduate students are encouraged to seek research assistantships.

Off-campus research is centered at two research-extension centers, two branch stations, and 11 experiment fields in various parts of the state.

Research is organized into more than 600 projects divided into six scientific program areas: agricultural product development and utilization; animal systems; economic and social issues; environment and natural resources; food, nutrition, and health; and plant systems.

Results of research are published in scientific journals; in station bulletins, pamphlets, reports of progress, research papers, and reports at field days and other special events; and in popular journals and news releases to the press and radio and television stations. Requests for station publications should be sent to the Distribution Center, Umberger Hall.

### Fort Hays Branch Station

Patrick I. Coyne, Head and Professor

Professors Brethour, Harvey, and Martin; Associate Professors Kofoid, Seifers, Stahlman, and Stegmeier; Assistant Professors Thompson and Van Zant.

The Fort Hays Branch Station, south of Hays in Ellis County, owns 3,260 acres, and 465 acres are leased from Fort Hays State University. Some research is cooperative with that university. Investigations are primarily related to problems peculiar to western Kansas, where rainfall is limited. They include beef grazing, feeding, and breeding studies; crop improvement, with special emphasis on wheat, sorghum, millet, and sunflower; soil management; weed control; plant diseases; and insects.

### Northwest Research–Extension Center

Richard S. White, Head and Professor
Reba B. White, Associate Head

Associate Professors Schwulst and Sunderman; Assistant Professor Lamm.

The Northwest Research-Extension Center occupies 727 acres. Major areas of research are crop improvement, soil and water management, sheep production, and horticulture. Extension emphasis includes specialists in agronomy, economics, forestry, home economics, and livestock.

### Southwest Research–Extension Center

James A. Schaffer, Head and Associate Professor
Paul Hartman, Associate Head

Professor Greene; Associate Professors Buschman, Norwood, Schlegel, and Witt; Assistant Professors Currie and Spurgeon.

The Southwest Research-Extension Center provides more than 800 acres for research. Current investigations involve irrigation research, dryland soil and crop management, crop improvement, weed control, insect and other pest control in crops and livestock, specialty crops, soil and fertilizer relationships, beef cattle nutrition, and management studies. Many research projects are conducted jointly between station and on-campus scientists.

### Southeast Kansas Branch Station

Lyle W. Lomas, Head and Associate Professor

Associate Professors Coffey, Moyer, and Sweeney; Assistant Professors Kelley and Long.

The Southeast Kansas Branch Experiment Station in Labette County operates 1,093 acres, 764 acres of which are owned and 329 of which are leased. Soil studies in relation to water conservation, yield and quality of crops, weed control research, field crop investigations, 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 experiment fields of 20 to 320 acres each. Fields, most of which are leased, are Cornbelt (Powhattan), North Central Kansas (Belleville), Irrigation (Scandia), Sandyland Irrigation and Dryland (St. John), South Central Kansas (Hutchinson), Harvey County (Hesston), East Central (Ottawa), and Kansas River Valley Irrigation (Topeka, Rossville, and Silver Lake).

Experimental work is devoted to horticultural and forest crops at three fields: Horticulture Research Center (Wichita), Pecan Experiment Field (Chetopa), and East Central Horticulture Field (DeSoto).

### Affiliated agencies

**Kansas Water Resources Research Institute**
Cooperating with the Water Resources Institute, University of Kansas
Hyde S. Jacobs, Director

The Kansas Water Resources Research Institute conducts basic and applied research on water use and to train scientists in water resources. Representatives of K-State and the University of Kansas participate in institute policy making and research. Research is focused on finding the most effective ways of conserving, using, and distributing available water.

**Food and Feed Grain Institute**
C. W. Deyoe, Director

The Food and Feed Grain Institute has these goals: to develop effective methods of milling and processing grains; to evaluate and improve the quality and nutritional properties of food grains; to find new uses for grains; and to improve the handling, transporting, storing, and domestic and international use of grains and grain food products. Institute scientists are faculty members of the Departments of Grain Science and Industry, Agricultural Economics, Agricultural Engineering, and personnel of agencies such as the U.S. Grain Marketing Research Center.

**Statistical Laboratory**
James J. Higgins, Director

The Statistical Laboratory serves scientists associated with the Agricultural Experiment Station. Both consulting and computational services are available.

# Art Collection

**Marianna Kistler Beach Art Museum**
Nelson Britt, Director
KSU Foundation Center
2323 Anderson Avenue
532-7511

The permanent art collection provides opportunities for education, scholarship, research, community outreach, and general enjoyment. Its purpose is to acquire, maintain, improve, interpret, and exhibit works of art, and to enhance the understanding of, and appreciation for, artworks as they reflect the cultural traditions of Middle America. The substantial strength of the collection is 20th-century American art with a special emphasis on Midwest Regionalism. The diverse collection of approximately 1,500 items is comprised largely of works of art on paper, including a collection of photographs by Gordon Parks. Paintings, sculpture, and ceramic artwork created by renowned European and American artists make up a smaller proportion of the holdings.

A selection of unpublished materials, artists files, catalogs, and brochures complement the scope of the art collection and are available to scholars, researchers, faculty, and students upon request.

# BioServe Space Technologies

The Division of Biology, in cooperation with Aerospace Engineering Sciences at the University of Colorado, has been selected by the National Aeronautics and Space Administration to lead BioServe Space Technologies, a Center for the Commercial Development of Space. The division directs the life science activities of the center, which adds a vast new dimension to the scientific education of future generations of students. This space training and research program gives young biologists, plant scientists, engineers, and others an awareness of opportunities in space sciences that will intellectually involve them in space missions of the future. Initial research projects are directed towards an understanding of many biological processes in the absence of gravity. Projects also are focused on areas of significant market value, such as biotechnology and bioengineered pharmaceuticals, synthetic organ products, and high-efficiency agriproducts and agrigenetic materials.

# Center for Basic Cancer Research

The Center for Basic Cancer Research offers numerous educational and research opportunities. Each year the center offers research awards to allow deserving undergraduate students an opportunity to participate in cancer research that is ongoing in the Division of Biology. The anticancer drug laboratory, a research facility that opened during the 1982–1983 academic year, allows students to focus research on anticancer compounds—determining the mode of action of these compounds, their molecular action, the reasons for their toxicity, and the reasons why some cancers have developed a resistance to them. The anticancer drug laboratory is an integral part of the Center for Basic Cancer Research and it allows for the training of basic cancer research scientists.

# Center for Molecular and Solid State Energetics

This center was established to facilitate interdisciplinary research and training in the areas of chemistry, physics, and engineering. Interactions among students, postdoctoral researchers, and faculty are enhanced through regular seminars scheduled to hear reports of work in progress and related work from outside scientists. The center provides state-of-the-art research facilities in materials sciences. Through the center, students pursuing a graduate degree can have a wider exposure to research opportunities, broader access to faculty expertise, and more flexibility in course selection to pursue research at the forefront of the field.

# Center for Science Education

Created to improve science education in the public schools through research, teacher preparation, and demonstration programs, this center is located in the College of Education but involves faculty from the science departments as well. Current projects study the use of technology in the classroom and focus on elementary teacher preparation in mathematics, science, and environmental education.

# Computer and Information Systems

The university mainframe computer used for academic and research purposes is an IBM 3084Q that runs at a speed of 27 MIPS and has 96 megabytes of main memory and 13 gigabytes of associated direct-access storage. A UNIX system with 32 megabytes of memory and 4 gigabytes of disk storage is also available. Remote computing laboratories containing work stations, personal computers, or terminals are found throughout the campus and provide interactive access to users. The public micro-computer laboratories operate with Novell netware and have software such as WordPerfect, Lotus 1-2-3, dBASE, Calculus, and other discipline-oriented software.

Programming languages on the mainframe system include FORTRAN, COBOL, PL/1, SPITBOL, PASCAL, and Assembler. Generalized applications packages for mathematical, statistical, and simulation tasks are available using SPSS, SAS, BMD, IMSL, GPSS/H, MPSIII, and LISREL. The Conversational Monitor System (CMS) is the interactive system that supports communications terminals using BASIC, SCRIPT, VS Assembler, GPSS/H, FORTRAN 77, PASCAL, PL/I, COBOL, SAS, SPSS, SQL/DS, WATFOR 77, and WATFIV. The UNIX system also provides FORTRAN and the IMSL libraries, along with the standard UNIX system utilities and languages.

Graduate students have virtually unrestricted access to university computing resources. Noncredit courses are offered periodically to familiarize students with the capabilities of the computer and its program environment.

Many colleges or departments have other computers dedicated to their specialized users and needs. Most notable among these is the College of Arts and Sciences, with a Scientific Computing Systems SCS-40 especially well suited to vector and matrix operations. With a parallel pipelined architecture and a VAX front end, the SCS-40 runs the CTSS operating system at a speed of 18 MIPS with 40 megaflops. It has 32 megabytes of main memory and 1.2 gigabytes of disc storage.

Most campus computing facilities are nodes on the Internet, and the mainframe provides BITNET access. The university is a member of MIDNET, a consortium of Midwestern universities that provides faculty and graduate students with direct access to the nation's largest supercomputers via NSFNET.

# Engineering Experiment Station

Gale G. Simons, Associate Dean for Research and Director

Established in 1910 to perform research of engineering and manufacturing value to Kansas, and to collect and present technical information for use by industry and the people of the state, the Engineering Experiment Station represents all research faculty members in all departments of the College of Engineering.

Funding obtained from state appropriations, the federal government, and private sources supports basic and applied research, including a large number of graduate research assistantships. The director of the Engineering Experiment Station also coordinates college planning for research performed in the Center of Excellence in Computer-Controlled Automation, the Hazardous Substance Research Center, the Center for Energy Studies, the Institute for Environmental Research, the Institute for Computational Research in Engineering, the Institute for Systems Design and Optimization, and the Office of Radiation Protection Research and Information.

# Evapotranspiration Laboratory

How to organize crop and soil management systems to provide efficient use of water resources has been a main concern of this laboratory since its establishment. Scientists study processes of water use by evaporation from soil and transpiration from plants.

Their studies involve such measurements as water movement in soils, plant photosynthesis, leaf temperatures, leaf area, solar radiation, air temperature, precipitation, and relative humidity.

# Hazardous Substance Research Center

Larry E. Erickson, Director
Stanley C. Grant, Associate Director

Kansas State University leads a seven-university consortium looking for ways to minimize the production of hazardous substances and manage those that are produced. Located in the College of Engineering and funded by the U.S. Environmental Protection Agency, the center concentrates on problems related to mining, manufacturing practices and energy production, and large-scale agricultural practices that have a potentially detrimental impact on water, land, and air quality.

# Huck Boyd National Center for Community Media

This new center works to sustain and enhance the positive qualities of rural communities through nurturing and strengthening community media. Activities of the center include research, service to media and community, training programs for community media personnel, assistance with technology integration, collection and dissemination of information, and academic activities related to community media.

# Institute for Environmental Research

Byron W. Jones, Director
Elizabeth A. McCullough, Associate Director

This institute is one of the few centers in the world with the controlled environmental chambers and supporting instrumentation necessary to study aspects of human comfort. Research is conducted on the insulating properties of clothing, on protective garments worn by workers under hazardous or extreme conditions, and on the relation of temperature, humidity, and air movement to human comfort in buildings. The institute also conducts cross-cultural studies of clothing and human comfort.

# Institute for Social and Behavioral Research

M. Duane Nellis, Director
532-6727

The Institute for Social and Behavioral Research promotes, encourages, and facilitates research and graduate studies in the social, behavioral, and statistical sciences. This interdisciplinary institute conducts its own research, enhances research by K-State faculty, assists faculty in securing research funding, assists graduates and undergraduates through special fellowship programs, and provides outreach services to public agencies and institutions in Kansas. Research colloquia and programs coordinated by the ISBR include the Population Research Laboratory, the Geographic Information Systems/Spatial Analysis Laboratory, the Labor Studies Program, the Statistical Design and Analysis Unit, the Survey Research Laboratory, the Center for Exercise Research, and the Advanced Research Development Program.

# International Grains Program

C. W. Deyoe, Director

Established in 1978 with funds provided by the Kansas legislature, the International Grains Program promotes the marketing of wheat, corn, soybeans, sorghum, and other U.S. grains. As part of the effort to expand existing markets and to develop new ones for those agricultural commodities, program participants are trained in the processing and handling of U.S. food and feed grains, instructed in the use of the end products, and given a thorough understanding of the workings of the U.S. grain marketing system.

# International Trade Institute

Dr. Wayne Norvell, Director
2323 Anderson Avenue, Suite 110
Manhattan KS 66502-2912
532-6799

Affiliated with the College of Business Administration, the International Trade Institute conducts research and outreach programs designed to increase the competitiveness of American business and industry in the international marketplace.

# Kansas Center for Rural Initiatives

This center focuses the resources of the university on the problems faced by rural areas of the state. It conducts research as well as outreach programs and makes use of the expertise of faculty members and graduate students in all relevant departments throughout the university. Projects currently under way stress community and economic development.

# Konza Prairie

Konza Prairie Research Natural Area is an 8,616-acre area within a few miles of the university dedicated to ecological research by the Division of Biology and the Kansas

Agricultural Experiment Station. This nationally important research facility provides an opportunity for basic research on the prairie and for baseline information needed to assess the nature and magnitude of the ecological changes resulting from human activity.

# Laser Center

The Laser Center is used by faculty and students in chemistry, physics, and engineering. The center has the following lasers: rare gas halide pulsed, continuous wave argon ion, dye, carbon dioxide, nitrogen, and neodymium-YAG. A wide range of laser frequencies and laser powers can be provided for a variety of experiments. The Laser Center also has computers and a wide selection of spectroscopic equipment that can be used for monitoring laser-induced physical or chemical changes.

# Libraries

Brice Hobrock, Dean of Libraries
Farrell Library
532-6516

Farrell Library, named after the eighth president of Kansas State University (1925-1943), is the central unit of the university library system. It is supplemented by four specialized subject libraries: Weigel Library of Architecture and Design (Seaton Hall), Chemistry/Biology (Willard Hall), Math/Physics (Cardwell Hall), and Veterinary Medical (Veterinary Medical Teaching Building).

The libraries contain more than 1.2 million volumes and that number is increasing at the annual rate of about 40,000 volumes. Current journal and serials subscriptions total 9,477. In addition to the volumes cataloged according to the Library of Congress Classification, the libraries contain a document depository collection of U.S. government publications that numbers more than 1.2 million; about 100,000 maps; a complete archival collection of ERIC (Educational Resources Information Center) documents; a curriculum materials collection; and more than 2.2 million pieces of microforms. Audio-visual materials number approximately 47,000 items and include sound recordings, tapes, slides, and printed music scores. A collection of more than 200 newspapers is maintained from Kansas communities, major U.S. cities, and other countries.

Special collections reflecting particular strengths of the library range from the Mackenzie Linnaeana collection of approximately 1,300 volumes by and about the great eighteenth century Swedish biologist Carl Linnaeus to the Fred H. and Jeannette Higginson Collection of nearly 1,000 volumes by or related to Robert Graves, the distinguished English poet and man of letters.

Other notable holdings include a juvenile literature collection numbering about 10,000 volumes; the library's Post-Harvest Documentation Service, one of only two in the nation; the 3,000-volume cookery collection; the historic costume and textile collection; the Charles Stratton Music Collection, with special strengths in Early English opera and hymnody; the Norman Nadel Performing Arts Collection, which features theatrical history; the objectivist poetry collection; the Frank Harris Oriental Art Collection; the Leonora Hering Memorial Poultry Collection; the Equine Collection; and two collections of fine books from private presses.

The library also has a minorities resource/research center featuring books, audiovisuals, serials, posters, prints, photos, games, and art collections related to African Americans, Hispanic Americans, Native Americans, and Asian Americans.

The libraries are at the forefront of applying computer technology, with such services available as Online Search Service (OSS), Explore! End-User Searching, Afterdark, and various databases on compact disc, such as ERIC, DISCLOSURE, Social Sciences Index, General Science Index, AGRICOLA, PsycLIT, Humanities Index, Impact (government publications), and the Business Periodicals Index.

To take advantage of the library resources in the region, the Regents Libraries, cooperatively, operate a courier service twice a week east to Topeka, Lawrence, and Kansas City, and south to Emporia and Wichita. In addition to collections at the libraries of Regents institutions, the vast scientific holdings of the Linda Hall Library in Kansas City are available. The six state-supported institutions of higher education belong to a computerized national network for cataloging and interlibrary loan. They also permit direct borrowing by students and faculty. The libraries are a member of the Kansas Information Circuit, a network of the larger public and system libraries of the state.

# NASA Specialized Center of Research and Training

The Division of Biology is the home of a newly established NASA Specialized Center of Research and Training. Research in this center, which is NASA's only center in gravitational biology, is focused on the potential role of gravity on cell and developmental biology of both plant and animal systems. Investigations are based both on basic sciences and applications for long-term space travel. Both centers have a major emphasis on graduate and post-graduate training, offering a unique opportunity for student preparation in space life sciences.

# Nuclear Reactor

Richard E. Faw, Director

The university operates a TRIGA Mark II nuclear reactor and related equipment. In addition to basic research involving neutron spectroscopy and neutron cross-section studies, the reactor laboratory provides the entire university with neutron activation analysis capabilities for sensitive, non-destructive analysis.

# Particle Accelerators: J. R. MacDonald Laboratory

Kansas State University operates a major facility for the production and the acceleration of atomic ions in cooperation with the U.S. Department of Energy. There are several accelerators in this facility, including a 6 MV tandem Van De Graaff. The laboratory has just completed construction of a new superconducting LINAC booster accelerator with gives energies of greater than 100 MeV. A liquid helium production plant provides up to 500 watts of cryogenic cooling for the LINAC. A new type of ion source called CRYEBIS is being developed for producing high-charge, low-energy ions. A network of four MICRO-VAX work stations is available for the accumulation and analysis of data.

# Sensory Analysis Center

Edgar Chambers, IV, Director

The Department of Foods and Nutrition meets the research and testing needs of the food processing and packaging industries through the Sensory Analysis Center. The center helps companies identify food quality problems and develop testing procedures using flavor profile analyses, attribute scaling, attribute comparison studies, differences testing, and limited nutrient analyses. No other university offers such services, and only a few universities have expertise in sensory analysis.

# Other Research Facilities and Equipment

A variety of specialized facilities is maintained to support research and scholarly work in the humanities, natural sciences, applied sciences, social sciences, and professional areas. Although an exhaustive listing is prohibitive, the following list represents a selection of supporting resources:

Aquatic and terrestrial research laboratories
Arp electronic music synthesizer
Audiovisual materials center
Center for Excellence in Computer-Controlled Automation
Computer-Aided Design Laboratories (human ecology)
Consortium for Political Research data banks
Controlled environment test facility
Early Childhood Laboratory
Editorial offices of major journals
Experimental animal facilities
Fourier transform spectroscopic laboratory
Glassblowing and instrument shops
Greenhouses
Heliodon and wind tunnel
Herbarium and monographic library
Insect reference collection
Interior architectural shops
Near infrared protein laboratory
Nuclear magnetic resonance spectrometers
Physiology of exercise laboratory
Plant disease diagnostic laboratory
Population and demographic laboratory
Recording Raman spectrometer
Scanning electron microscope
Soil testing laboratory
Statistical laboratory
Textile chemistry laboratory
Textile conservation laboratory
Transmission electron microscope
Veterinary diagnostic laboratory
Weather data laboratory
Wind and soil erosion laboratory
X-ray diffractometers

# Scholarly and Professional Publications

### Agricultural Extension
Numerous publications about research, in varied formats for various audiences.

### College of Architecture and Design
*Newsletter of the Rural/Small Town Planning Division,* American Planning Association-information, articles, and essays on the nature of rural/small town planning.

*Oz,* modern architectural trends.

### Department of English
*Kansas Quarterly,* prize-winning literary magazine, short stories, poetry, art, history, literary criticism.

*Literary Magazine Review,* reviews of literary magazines and commentary on the international noncommercial literary magazine scene.

*The Manhattan Project,* proceedings of the summer conference for high school writers.

*Touchstone,* student literary magazine

*Young Kansas Writers,* anthology of creative writing by secondary school students.

### Department of Chemistry
*Applied Spectroscopy,* technical journal on spectroscopic research in chemistry and physics.

### Department of History
*Journal of the West,* history and culture of the U.S. West.

### Department of Modern Languages
*Studies in Twentieth Century Literature,* literary theory and practical criticism of 20th-century literature in French, German, Russian, and Spanish (with University of Nebraska–Lincoln).

### College of Education
*Educational Considerations,* timely papers on educational issues at all levels.

*Media Adult Learning,* research, reviews, papers.

# University Press of Kansas

Fred M. Woodward, Director
329 Carruth
Lawrence, Kansas 66045
KANS-A-N 864-4154

Kansas State University, in association with the other five Regents universities, operates and supports the University Press of Kansas for the purpose of publishing scholarly and regional books on a nonprofit basis. K-State joined the consortium in 1967 when the press was officially reorganized by the Kansas Board of Regents. Until mid-1982, the operation was known as the Regents Press of Kansas.

The University Press of Kansas is the first American university press to operate as a statewide consortium under the specific sponsorship of all the state's universities. A member of the Association of American University Presses since its founding in 1946, the press has published over 450 titles, with some 270 currently in print. Its ongoing American Presidency Series, with 22 titles issued to date, has been praised as "one of the most interesting and rewarding historical series in this country."

The press is governed by a board of trustees, who are the chief academic officers of the sponsoring institutions and who appoint two members and two alternatives from each faculty to serve on the advisory editorial committee.

# Degree Requirements

## Master's Degrees

Subject to the approval of the major department,* the candidate may choose one of the following program options: (1) a minimum of 30 semester hours of graduate credit including a master's thesis of 6 to 8 semester hours; (2) a minimum of 30 semester hours of graduate credit including a written report of 2 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 or production of creative work, as determined by the student's supervisory committee.

Candidates for the master of public administration must complete at least 42 hours, the master of regional and community planning degree a minimum of 48 hours, the master of business administration 33 hours, and the master of fine arts 60 hours.

The student's program of study is prepared with the assistance of a supervisory committee consisting of the major advisor 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 the appropriate department head or program chairman. The program 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 graduate dean.

Three copies of theses and reports are required. All such reports and theses will be sent by the Graduate School to the Kansas State University Libraries and bound in cloth in accordance with specifications for Class A binding of the Library Binding Institute. To cover the cost of binding, students must deposit with their reports or theses a money order made out to the Kansas State University Libraries. If students desire to publish all or part of their theses before the degree is conferred, major professors should notify the Graduate School in advance by letter. If approved by the major professor, master's theses may be placed on file with University Microfilms, which will also publish an abstract in *Master's Abstracts*. The current fee is $35. Since master's theses and reports are submitted as a part of degree requirements, the university retains the right to publish any portion as a contribution to knowledge. Patentable items created under university auspices are subject to the Regents patent policy.

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 the field(s) of study.

*As used in the Graduate School the term "department" refers to interdepartmental groups as well as to departmental faculties in the usual sense.

### Competency revalidation of courses

If a student's program of study includes any course credits more than six years old at the time the student is about to complete all degree requirements, the final master's examination will normally include an examination over the body of course work listed on the program of study. The form and content of this competency examination is determined by each master's program, which may impose additional requirements for revalidating the student's competency in the supporting course work. In a master's program for which such a revalidation examination may be inappropriate, an exception to this policy may be sought from the Dean of the Graduate School.

## Doctoral Degrees

Normally, students admitted to doctoral study hold the master's degree, but some programs allow highly qualified students to proceed directly from the bachelor's degree to the doctorate. Completing a master's degree at Kansas State University does not automatically lead to admission to doctoral study, and a separate application must be made to the department and approved by the graduate dean for those intending to continue to the Ph.D.

Award of a doctorate requires the successful completion of the equivalent of at least three years of full-time study beyond the baccalaureate as well as the completion of a major research study reported in a doctoral dissertation. Completion of the program involves more than the accumulation of credits, and its duration is variable because the time required to finish the research study cannot be anticipated. In completing research and the resulting dissertation, students must adhere to the enrollment requirements described in the later section on registration and enrollment.

During the first year of study beyond the master's degree or its equivalent, a supervisory committee is formed for each student. Committee members are proposed by the student and major advisor, subject to approval by the department head and the dean of the Graduate School. The committee consists of at least four members of the graduate faculty, one of whom is the major advisor. At least one member must be from a program different from that of the major advisor.

The committee aids the student in the preparation of the program of study (which must be approved by the dean of the Graduate School) and has charge of the preliminary examination. At least one semester 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 School. At this time the graduate dean appoints an outside chairperson. 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 that contributes new knowledge or understanding to the candidate's field. On completion of at least three years of graduate study as prescribed by the supervisory committee and on completion of a dissertation, the candidate must pass a final examination.

A full-time doctoral student should normally complete the preliminary examination within three years of entry into the doctoral program, and upon satisfactory completion of the examination, the student is automatically advanced to candidacy for the degree.

The period of candidacy may last up to five years from the end of the semester in which the preliminary examination was passed. If a student fails to complete both the dissertation and final oral examination within this period, the student will be dropped from candidacy. Any student whose candidacy has thus lapsed may regain the status of a doctoral candidate by successfully retaking the preliminary examination.

Failure to maintain continuous enrollment from the completion of the preliminary examination until the dissertation is accepted by the Graduate School also will result in loss of candidacy.

Final dissertation copies with abstracts must be submitted to the dean of the Graduate School as a last requirement to be met for award of the degree. Inasmuch as the dissertation is submitted to the university in satisfaction of degree requirements, the university retains the right to use or publish any portion

thereof as a contribution to knowledge. Moreover, patentable items created under university auspices are subject to the Regents patent policy.

If consistent with departmental policy, the format of theses and dissertations may be in a style suitable for submission to a professional journal. In such cases, additional introductory material, bibliographies, and other supplementary information not to be submitted with the journal manuscript should be included as appendices.

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, students must deposit with their dissertation copies a money order made payable to the Kansas State University Libraries. Each dissertation is microfilmed and an abstract is published in *Dissertation Abstracts*. The current fee $45.

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. The written approval of the major professor should be filed in the Graduate School office in the case of any student seeking to copyright a dissertation.

### Doctor of education

The Ed.D. is offered through the College of Education. While many of the requirements are the same as those for the Ph.D. and are noted in another section of this catalog, the Ed.D. has some that are unique. Residence for the Ed.D. may be accomplished by one of the following patterns: four summers within a five-year period in which 27 hours of course work are completed; three summers within a four-year period in which 24 hours of course work are completed, with a minimum of 6 hours of course work completed in one intervening semester; 24 hours of course work within 12 calendar months.

A total of 94 semester hours must be completed. Up to 30 hours for a master's degree and at least 16 hours of dissertation research may be included as part of the total. See the College of Education section of this catalog for additional specific requirements for the Ed.D.

### Doctor of philosophy

Students admitted to Ph.D. programs must complete a year of full-time study in residence at Kansas State University during which they must complete at least 24 hours of regular degree credit requirements. Furthermore, a minimum registration of 30 hours in research is required, not including work done toward a master's degree. Programs must include at least 90 semester hours.

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 sciences, economics, education, food science, foods and nutrition, genetics, grain science, human ecology, horticulture, pathology, plant pathology, psychology, and sociology. 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 would have a significant body of literature relevant to the field. Required foreign language examinations are administered by the Department of Modern Languages. The language requirement must be satisfied before the student is admitted to candidacy.

## Student Responsibility

Graduate students are held responsible for knowing all published academic policies and degree requirements. They are likewise held responsible for knowing the regulations concerning the degree they plan to take and any special requirements within the department or academic unit. In addition, it is the student's responsibility to be informed of the university's policies regarding the standard of work required for continued enrollment in the Graduate School. The Graduate School office should be consulted if additional information is needed.

Although it is customary for many graduate students to work continuously throughout the year, especially on thesis and dissertation research, the major advisor or certain supervisory committee members may not be available during the summer months. This is especially the case for faculty members on nine-month appointments who may be pursuing other activities off campus during that time. Students should take such possibilities into account in scheduling various examinations and thesis or dissertation reviews.

## Graduate Credit and Grades

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.

### 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 have a 3.0 grade point average and make a grade of B or better in three-fourths of the credit hours attempted at K-State (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. Retaken courses remain on the transcript and are considered as part of the record. A graduate student's record will be reviewed after the completion of each session.

The grade of Incomplete normally is given in regular courses (other than independent studies, research, and problems) only for verifiable personal emergencies. The faculty member has the responsibility to provide written notification to the student of the incomplete work. The student has the responsibility to take the initiative in completing the work, and is expected to make up the incomplete during the first semester in residence at the university after receiving the grade of I. If the student does not make up the incomplete during the first semester in residence at the university after receiving it, a grade may be given by the faculty member without further consultation with the student.

If after the end of the first semester the I remains on the record it will be designated as IX for record-keeping purposes and will be computed in the student's GPA, weighted at 0 points per credit. The designation of NR will be treated in a like manner.

### Nongraded work

At the discretion of the graduate faculty of the department concerned, seminars or colloquia in which letter grading conflicts with the objectives intended may be offered on a Credit/No Credit or Pass/Fail basis rather than for a letter grade. The seminars and colloquia which are to be offered for Credit/No Credit or Pass/Fail shall be listed with the dean of the Graduate School. All courses on the program of study except research (report, thesis, or dissertation) and seminars or colloquia which have been approved for Credit/No Credit or Pass/Fail must be taken for letter grades. All research credit hours must be graded as Credit/No Credit. Independently of the program of study, additional courses may be taken on a Credit/No Credit or Pass/Fail basis with the approval of the major professor and the professor offering the course. These courses may not be applied toward a degree. No more than 3 hours of Credit/No Credit or Pass/Fail courses may appear on the program of study for the master's degree nor more than 6 for the Ph.D.

# Academic Probation and Dismissal

Admission to and continuation in the Graduate School depend upon a high level of achievement. Students who do not maintain satisfactory progress in their studies are subject to being placed on probation or denied the privilege of continued enrollment in the university or in a specific graduate curriculum. In either case, they will be so notified by the dean of the Graduate School. No student on probation may receive a graduate degree.

A graduate student may be denied continued enrollment in the university or in the graduate curriculum in the case of: (a) failure to satisfy conditions necessary for removal from probationary status; (b) the accumulation of 6 or more semester hours of work with grades of less than B, and/or a grade point average less than 3.0, exclusive of research; (c) failure to meet published departmental requirements or failure in qualifying examinations, preliminary examinations, or final degree examinations; (d) demonstrable lack of diligence in removal of assigned deficiency courses, in meeting published degree requirements, or in maintaining normal progress toward a graduate degree; and (e) failure to acquire mastery of the methodology and content of one's field sufficient to complete a successful thesis or dissertation. A student denied the privilege of continued enrollment may petition the graduate dean for reinstatement to the same curriculum or for admission to a different curriculum.

# Financial Assistance

In order to support research, scholarship, and the acquisition of advanced degrees, the university offers several kinds of financial aid for graduate students. These include fellowships, traineeships, teaching assistantships, and research assistantships. In addition, a variety of loan programs are available to graduate students.

## University Graduate Fellowship Program

University fellowships provide a base stipend and a tuition scholarship. The stipend may be supplemented by the student's department. The fellowships are nominally for one year; departments provide support for additional years. Nominees must intend to pursue a doctoral degree at K-State, be a U.S. citizen or permanent resident, and not be enrolled at K-State when they apply. Nominations for fellowships are made by the department to the dean of the Graduate School by February 1.

## Teaching and Research Assistantships

Individual departments and graduate programs administer graduate student financial assistance primarily in the form of teaching and research assistantships. Award of assistantships is based on the student's ability and promise and is usually made for either nine or twelve months. The maximum appointment is for half time, but appointments for lesser fractions also may be made. Students are eligible for staff fees during each term in which they hold an appointment for at least 0.4 time. In addition, students who have been on appointments for at least 0.4 time during the spring term are eligible for staff 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 0.4 time appointments; the minimum is 6 hours in the regular terms and 3 in the summer. The corresponding maximums for a summer term are 5 and 6 hours respectively. Students desiring such appointments may obtain application blanks from the head of the department concerned.

All prospective graduate teaching assistants who are non-native speakers of English shall be required to achieve a minimum score of 240 on the TSE (Test of Spoken English) to be eligible for employment. All prospective teaching assistants shall have their spoken English competency assessed prior to any teaching assignment through an interview with not fewer than three institutional personnel. Any graduate teaching assistant having classroom or laboratory instructional responsibility and/or direct tutorial responsibilities, other than for courses or sessions conducted primarily in a foreign language, found to be potentially deficient shall be required to achieve a minimum score of 240 on the TSE even if such student has previously achieved such a score prior to appointment.

## Traineeships

The university has a number of traineeships available. Several departments also have federally supported traineeships available under the programs of the National Institutes of Health and other agencies.

## Loans

Kansas State University has five kinds of student loans available to graduate students: the Perkins Loan, the Stafford Loan, the Health Professions Student Loan (HPSL), Alumni/Foundation Loans, and the Supplemental Loan for Students (SLS).

The Perkins Loan is a five percent interest loan. The Stafford Loan is an eight percent interest loan that is funded by participating lending agencies. HPSL carries a five percent interest rate. No interest is charged while a student is attending school. At the time the borrower begins repaying these loans, the interest begins accruing on the unpaid balance. The repayment period may be up to 10 years.

The Alumni Loan/Foundation Loan charges six percent interest payable annually from the date of the loan, with $50 monthly payments beginning six months after the borrower leaves school.

The SLS loan had a 9.34 percent interest for 1991–1992. It begins accruing interest 60 days after the borrower receives the money. Independent students may defer payments, but not interest.

Qualified students also may borrow through emergency, alumni, and endowment funds to meet specific needs. Interested students should contact the Office of Student Financial Assistance.

# Satisfactory Academic Progress

Federal regulations require that financial aid recipients make satisfactory academic progress in order to be eligible for federal financial aid programs. Included are students who receive aid from any of these programs: State of Kansas Scholarship, Perkins Loan, Guaranteed Student Loan, Supplemental Loan for Students, Health Professions Loan, and College Work-Study.

K-State has established a framework for evaluating a student's efforts to earn a degree within a given period of time. This includes a quantitative measure (number of hours earned each semester and a maximum number of allowed credit hours) and a qualitative measure (grade points earned for hours completed each semester).

All recipients of student financial assistance will be required to meet the standards of satisfactory academic progress. The only programs not covered by this policy are athletic grants-in-aid and non-federally funded scholarships.

### Definition of satisfactory progress

Federal guidelines for awarding financial aid are based on specific minimum federal standards. Satisfactory academic progress is determined by the formula:

Hours for which federal financial aid is awarded

– Hours completed

= Credit or deficiency

Students begin satisfactory academic progress measurement during the first term federal aid is received. Credits or deficiencies apply only to satisfactory academic progress measurement.

Minimum hours required for these programs are:

| | Hours per semester | Hours per summer* |
|---|---|---|
| Perkins, Stafford, SLS and HPSL | 5 | 3 |

*Or term less than 15 weeks.

A course cannot be counted twice for financial aid purposes. Example: A student has received a D in a 3-credit-hour course and takes that course again to get a higher grade. The credit hours have already been counted as financial aid hours and cannot be counted again, even though the GPA is improved.

Courses in which a grade of F or incomplete (I), (IX), withdrawn (WD), NR, or NC is recorded are not counted in the satisfactory progress measurement. Graduate students will receive credit for incompletes in research that follows the published degree requirements as elective or required courses, or courses taken as a part of developmental studies.

Hours completed in excess of the required minimum standards will be credited to a student's overall academic achievement.

Course hours earned by a student while at another institution will be credited only after a transcript from the other institution is received by the Registrar's Office at Kansas State University and the credit is accepted. The course or courses will count for the academic year in which K-State accepted the credit. Cumulative grade point average is determined by the Registrar's Office.

The scholastic deficiencies chart is printed in the Grades section of this catalog. Qualitative measurements for financial aid recipients will be based on this chart.

# Funding Opportunities for Graduate Students of Color

In order to increase the number of students of color in its graduate programs, the university has funds to provide stipends and fellowships for African American, Native American, Hispanic American, and Asian American students who are U.S. citizens or permanent residents. In addition, the university can help students of color to identify sources of external funding offered by government and private organizations to support graduate education.

# Admission

Correspondence regarding admission to the Graduate School should be addressed to the appropriate department, which will supply application blanks and supplementary information.

Admission to graduate study is granted by the dean of the Graduate School only upon the recommendation of the faculty in a graduate program. Applicants should see that each undergraduate or graduate institution previously attended sends official transcripts. The transcripts should be received by the departments at least three months before the time the student expects to enroll.

Applicants who wish to be considered for fellowships or graduate assistantships should normally have all materials on file by February 1 for highest priority consideration, although some departments have later deadlines. All transcripts become part of the student's official file and may not be returned.

All new graduate students are required to fill out a medical history form for Lafene Health Center.

## Entrance Requirements

An application for 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:

A bachelor's degree from an institution accredited by one of the regional accrediting associations.

Adequate undergraduate preparation in the proposed major field or equivalent evidence of an appropriate background for undertaking an advanced degree program.

An undergraduate average of B or better in the junior and senior years.

Applicants to the Graduate School at K-State must have a bachelor's degree substantially the same as the ones granted by K-State. These degrees regularly contain a broad range of courses representing the basic academic disciplines. In addition, a major portion of the courses included should be graded by a multilevel system, usually A, B, C, D, F.

Applicants holding degrees not meeting these standards may be denied admission to graduate degree programs at K-State. Admission will be denied to applicants possessing bachelor's degrees with a significant amount of credit awarded for work experience that was not supervised by a faculty member of an accredited university nor evaluated in units which identify the academic content. On the other hand, a limited amount of credit for experience, when awarded as an acceptable part of a bachelor's degree for internships, field experience, or the like, will not be cause for denial of admission, but it must be clearly delineated as graded work.

For those whose grades do not meet the above standards, probationary admission may be granted, 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 other conditions to be met to attain full standing. Full standing is attained automatically upon completion of at least 9 hours of course 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 the admission. Students admitted on probation may be denied continued enrollment if they do not achieve full standing or if they receive any grade less than a B.

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 together with a copy of the official transcript from the institution which granted the undergraduate degree. A special student who later wishes to enter a degree program must undergo the full review process. No more than 9 semester hours earned as a special student may be transferred into a regular degree program.

## International Students

International applicants for admission to Kansas State University must, in most cases, meet the same academic standards for admission as those required of native students. In addition, international applicants holding nonimmigrant visas are required by U.S. immigration regulations to be enrolled in a full course of study. University regulations require that international students and their dependents (if they are with the student) purchase or be in possession of a medical insurance policy or equivalent coverage. Medical insurance can be purchased on the campus or from other independent agencies.

The Graduate School requires each foreign applicant whose native language is not English to demonstrate facility in the English language by making a satisfactory score on the Test of English as a Foreign Language. This test is required in the interest of ensuring that the student's progress toward a degree is not jeopardized by language difficulties. A score of 550 is required for admission by the Graduate School and some units require higher scores. 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 School 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 the Graduate School will be required to demonstrate proficiency in written and oral English at the time of enrollment. Students who fail to meet this requirement must enroll in and satisfactorily complete ENGL 075, SPCH 065, or both, as appropriate. Those who are determined to need substantial extra work in English will be strongly advised to participate in the English Language Program.

A special orientation and advising program is conducted for new international students one week before the date of enrollment.

# Enrollment

Donald E. Foster, University Registrar
118 Anderson Hall
532-6254

Enrollments for fall and spring semesters, for summer term, and January and May intersessions occur at specified times during the academic year. The specific times are outlined in the *Class Schedule*, a booklet published by the Registrar's Office, or in a similar pamphlet published by the Division of Continuing Education.

## Assignment to Classes

Students are responsible for fulfilling all requirements of the curriculum in which they are enrolled. They should consult with their advisors and be familiar with the *K-State Graduate Catalog*.

A catalog is given to each new student and copies are maintained for student use in the Graduate School, all deans' offices, Farrell Library, and all departmental offices. Catalogs may also be purchased at the K-State Union Bookstore.

No student is officially enrolled in courses or for private lessons in music or other subjects until a formal class assignment is completed. *No assignment is complete until all fees and charges are paid.*

A student may not enroll later than 10 class days after the beginning of a semester (five days for summer term) except by permission of the dean. Students should enroll during regularly scheduled registration periods in order to avoid late fees.

Not more than 16 hours, including those obtained in research, may be assigned in a single semester, nor more than 9 hours during a summer term. If a part of the assignment is for undergraduate credit, a student may be assigned to 17 hours during a semester or 10 hours during a summer term. Full-time staff members of the university may not be assigned to more than 6 hours in one semester, nor more than 3 hours in a summer term, and may enroll only with the permission of their supervisors. (See section on assistantships and fellowships for limitations applying to students holding assistantships.) These limitations apply to courses audited as well as courses for which credit is earned.

Any change in a student's enrollment should be carried out through the regular procedures and must be accompanied by the approval of the student's advisor 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 or term in which the requirements for a degree are completed.

A student working for the Ph.D. must enroll during the session in which the preliminary examination is taken and subsequently in each semester (summer terms excepted) 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 or her 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 the major professor) may petition for leave of absence for up to one year which subsequently may be renewed. Renewals for those who are meeting a 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, chair of the department or graduate group, and the dean of the Graduate School.

Candidates who have passed prelims and do not live in the vicinity of Manhattan, within 30 miles from campus, may make arrangements to enroll by mail but should request permission for doing so by writing the Graduate School office prior to the enrollment period.

## Faculty and Employees

Full-time faculty members and regular employees, with approval of the department heads or deans, may enroll in graduate or undergraduate work not to exceed 6 credit hours in fall and spring semesters or 3 credit hours during the summer term.

## Late Enrollment

A student who seeks to enter the university later than 10 calendar days after the start of the semester is admitted only by special permission of the student's dean. Those who enroll after the regular registration period and up through the 20th day (10th for summer term eight-week course) of class pay a late fee of $15. However, anyone enrolling after the 20th day (10th for summer term eight-course) of class must pay a $35 late fee.

## Withdrawal from the University

A student who withdraws from the university must have an official withdrawal permit from the appropriate dean.

If a student withdraws during the first 25 days of the semester, no mark will recorded on the student's transcript; thereafter, a mark of W is recorded. The deadline for withdrawing is the end of the 10th week of the semester.

If a student finds it necessary to withdraw from the university for verifiable nonacademic reasons after the 10th week, he or she should consult the appropriate dean's office.

## Auditing Courses

Auditing is attending a class regularly, without participating in course work or receiving credit, and is permitted on a space-available basis. Permission to audit a course is granted by the instructor, with the approval of the dean of the college in which the course is offered. Laboratory, continuing education, and activity courses may not be audited. A nonrefundable fee is charged each auditor except full-time university faculty members, employees, and full-time students. No record is made on the academic transcript. Students process the audit permission through the Enrollment Services. Students 60 years or older may audit on a space-available, no-fee basis.

# Final Examinations

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

Except for honors, problems, seminars, and language and fine arts performance courses, the last examination (last unit test or comprehensive test) in a course must be given during the examination period specified by the University Admissions and Enrollment Committee and is published in the *Class Schedule*. Classes may have take-home examinations, projects, papers (excluding term papers), or other media, in lieu of written final examinations as the last evaluation instrument in the course. In such instances, a deadline for submittal of the medium may not be earlier than the time of the end of the course's scheduled examination period as published in the *Class Schedule*.

# Fees

Keith L. Ratzloff, Controller

### Fees subject to change

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

Students enrolled on a per-credit-hour basis or changing from 6 or fewer to 7 or more credit hours will be assessed for all hours in which they are enrolled, including those for which the grade of W is recorded. Students withdrawing from courses are eligible for refunds in accordance with the refund policy.

Students receiving scholarships or grants not processed through the K-State Office of Student Financial Assistance before registration will be required to pay the full amount of their fees from personal resources on the day they register.

### Payment of fees

Unless a deferment is granted, students must pay the total amount of their semester or summer term fees on the day they register and should use a check for exact amount of fees, MasterCard, or VISA. For students' safety, cash and checks requiring change are discouraged. Late fees are assessed for students who register or pay their fees after the regular registration period.

### Deferments

If the student's eligibility to receive financial aid is verifiable prior to the student's fee payment date, the director of student financial assistance may authorize the deferment of payment of tuition and fees in accordance with the Board of Regents Policy and Procedures Manual (Chapter 2, Section E) The student's obligation to pay regularly assessed tuition and fees is not reduced by an approval to defer payment. A deferment may be authorized for:

1. Those students who have fulfilled the application requirements and whose awards have been made by the June packaging date, but whose checks are not in. Deferments may be granted only to the approved level of financial aid eligibility or the amount of tuition and fees assessed, whichever is less. Any amount of tuition and fees over and above the anticipated financial aid award must be paid by the student at the time of fee payment. No late fee will be accessed.

2. Those students who have applied for financial aid, but have not met the scheduled application deadlines. Deferments will be limited only to the amount of anticipated aid eligibility. A payment of one-third down or an amount equal to the aid that has been received, whichever is greater. will be required.

3. Veterans receiving benefits. Full tuition deferment only. Will be required to pay campus privilege fees. Late fee assessed.

4. International students. Full tuition deferment only. Will be required to pay campus privilege fees. Late fee assessed.

### Returned checks

Fee payment checks that are returned uncollectible by financial institutions will be subject to a $15 charge, in addition to all other fees.

### Withholding student records

The university withholds students' academic records for nonpayment of fees, loans, and other appropriate charges and for nonreturn of university property.

### Tuition

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

### Educational Opportunity Fund

This fee aids the academic achievement and progress of underrepresented K-State students.

### Student services support

This fee finances adaption and equipping of Holton Hall for improved delivery of student services programs.

### Student health

For a description of the services provided by this fee, see the section on Lafene Health Center in this catalog.

### K-State Union repair and replacement

This fee is used for repairs and replacements at the K-State Union.

### Student fee revenue bonds

This fee is used to retire the refunding bonds, Series 1985 and the Bramlage Coliseum revenue bonds. The refunding bonds advance refunded the outstanding balance of the Student Union Annex I bonds, Student Union Annex II bonds, stadium revenue bonds, and the student recreational building bond.

### Activity

This fee is used for a range of student interests and activities. Students enrolling in 6 or fewer credit hours do not pay a full activities fee and are not entitled to student ticket rates for certain activities.

### K-State Union

This fee is used for the administration, support, and operation of the student K-State Union.

**Student publications**
This fee supports the *Collegian* and *Royal Purple*.

**Recreational Services**
This fee supports the Chester E. Peters Recreation Complex (equipment, interior upkeep, supplies, etc.)

**KSDB-FM**
This fee supports the student radio station (equipment, means of service to operate the station, recent upgrade of power wattage, etc.).

**Athletics**
This fee supports intercollegiate athletics.

**Fine Arts**
This fee supports fine arts programming (theater, dance, music, art, etc.).

**Student publications equipment**
This is a temporary fee to provide new equipment for student publications (*Collegian* and *Royal Purple*).

# Schedule of Fees

The following schedule of fees was in effect when this catalog was prepared.

**Contracts and compensatory charge**
This schedule does not limit the charges that may be collected under arrangements with other governmental or private agencies, except that such arrangements may not provide for lesser charges. Compensatory or other charges to more nearly cover the actual cost of instruction are specifically authorized.

## Students enrolled in 7 or more semester credit hours:

| | Resident | Non-resident |
|---|---|---|
| **Tuition** (based on student classification) | | |
| Graduate | $ 917.00 | $3,027.00 |
| Veterinary medicine | $1,793.00 | $5,858.00 |
| **Campus privilege fees** | | |
| Educational Opportunity Fund | 6.00 | 6.00 |
| Student services support | 3.00 | 3.00 |
| Student health | 80.00a | 80.00a |
| K-State Union repair and replacement | 3.00b | 3.00b |
| Student fee revenue bonds: | | |
| Refunding bonds (stadium, Union, recreation bldg.) | 22.25 | 22.25 |
| Coliseum bonds | 8.25 | 8.25 |
| Activity fee | 8.00 | 8.00 |
| K-State Union | 27.00b | 27.00b |
| Student Publications | 4.80 | 4.80 |
| Recreational Services | 8.00b | 8.00b |
| KSDB-FM | .85 | .85 |
| Athletics | 10.00 | 10.00 |
| Fine Arts | 7.40 | 7.40 |
| Student Publications equipment | 3.90 | 3.90 |
| Total graduate | $1,109.45 | $3,219.45 |
| Total veterinary medicine | $1,985.45 | $6,050.45 |

## Students enrolled in 6 or fewer semester credit hours:

| | | Resident | Non-resident |
|---|---|---|---|
| **Tuition** (based on student classification) | | | |
| Graduate | per credit hour | $ 61.00d | $202.00 |
| Veterinary medicine | per credit hour | $120.00f | $391.00f |
| **Campus privilege fees** | | | |
| Educational Opportunity Fund | total fee | 3.00 | 3.00 |
| Student services support | total fee | 1.00 | 1.00 |
| Student health | total fee | 25.00a | 25.00a |
| K-State Union repair and replacement | total fee | 1.50 | 1.50 |
| Student fee revenue bonds: | | | |
| Refunding bonds (stadium, Union, recreation bldg.) | total fee | 12.50 | 12.50 |
| Coliseum bonds | total fee | 3.75 | 3.75 |
| Activity fee | total fee | 4.00c | 4.00c |
| K-State Union | total fee | 13.50 | 13.50 |
| Student Publications | total fee | 2.40 | 2.40 |
| Recreational Services | total fee | 3.50 | 3.50 |
| KSDB-FM | total fee | .50 | .50 |
| Athletics | total fee | 5.00 | 5.00 |
| Fine Arts | total fee | 3.25 | 3.25 |
| Student Publications equipment | total fee | 1.95 | 1.95 |

## Fees per summer term (based on student classification)

| | | Resident | Non-resident |
|---|---|---|---|
| **Tuition** | | | |
| Graduate | per credit hour | $ 61.00d | $202.00 |
| Veterinary medicine | per credit hour | $120.00f | $391.00f |
| **Campus privilege fees** | per credit hour | 13.45e | 13.45e |

## Auditing

Auditing, permitted on a space-available basis, allows class attendance without participation or credit upon recommendation of the instructor and approval of the dean. This privilege is not applicable to laboratory and Division of Continuing Education courses. Any person 60 years or older may audit classes at no cost but still must obtain approval from the instructor and dean.

| | | | |
|---|---|---|---|
| Graduate | per credit hour | $ 56.00d | $179.00 |
| Veterinary medicine | per credit hour | 120.00f | 391.00f |

[a]Students enrolled in a spring semester but not attending summer school may use Lafene Health Center services during the summer by paying a $20 fee prior to the first day of summer school classes. After the start of classes the fee for such students will be $30, payable during the first visit to the health center. Students who have paid their health fees may elect to have their spouses covered if they pay, within 10 days of their own health fee payment, a spouse fee of $80 for a semester, or $30 for a summer term. Full-time K-State employees will not be assessed a student health fee, but they may choose to pay the fee and therefore be eligible for Lafene Health Center services.

[b]Students who will be attending classes at off-campus locations during an entire semester and who will reside outside of a 30-mile radius of K-State's Manhattan campus during that semester may elect to be exempted from all campus privilege fees.

[c]Not a full activity fee and does not entitle students to student ticket rates for certain activities, such as athletic events.

[d]Employees (as defined in the Eligibility for Resident Fees section) are assessed the resident tuition at the hourly rate.

[e]Summer-term campus privilege fees are assessed only on the first 6 credit hours for each summer term and are not applicable to students enrolled in formally organized classes actually conducted at off-campus locations.

[f]The veterinary medicine senior class will be assessed three equal tuition payments based on 6 credit hours for the summer term and full-time tuition for the following fall and spring semesters. The tuition assessments will be equal, but the campus privilege fees assessments will be based on the applicable amounts for each enrollment period.

## Application for admission processing fees (not subject to refund)

| | |
|---|---|
| For post-baccalaureate programs in the Department of Architecture, Landscape Architecture, and Regional and Community Planning (not applicable to other fees) | $15.00 |
| For post-baccalaureate programs in College of Business Administration | |
| Domestic | $25.00 |
| International | $30.00 |
| For international students to post-baccalaureate programs except Business Administration | $25.00 |

## Off-campus courses# (Based on course level)

| | |
|---|---|
| Graduate credit | $87.00 per semester hour |
| No credit | Lowest advertised tuition rate per semester hour |
| Non-credit courses | Vary to correspond with total direct costs |

**Regents Center construction fee**
Students enrolled in K-State courses offered in the KU Regents Center in Kansas City will be assessed a $10-per-credit-hour charge to defray costs of construction of this new facility.

**Media fees**

| | |
|---|---|
| Videotape electronic media fee | $25 per credit hour |
| Audiotape electronic media fee | $40 per credit hour |
| Real-time/interactive electronic media fee | $20 per clock hour |

**TELENET media fee**
(For courses delivered via Kansas Regents Network)

| | |
|---|---|
| 1-credit-hour course | $17 |
| 2-credit-hour course | $22 |
| 3-credit-hour course | $27 |

#As approved by the Board of Regents, off-campus courses may be offered for either resident or extension credit. Resident credit will be awarded only with the approval of the appropriate campus faculty council. (For off-campus courses, the established off-campus fees per credit hour for graduate courses are to be collected and an amount equal to the on-campus incidental fee per credit hour deposited to the general fee fund.)

## On-campus fees administered through the Division of Continuing Education

| Credit | | Resident | Non-resident |
|---|---|---|---|
| **Tuition** | | | |
| Graduate | per credit hour | $ 61.00 | $202.00 |
| Veterinary Medicine | per credit hour | 120.00 | 391.00 |
| Coordination fee | per credit hour | 10.00 | 10.00 |
| **Non-credit** | | | |
| Tuition | | Vary to correspond with total direct costs | |
| **Coordination fee** | | Vary to correspond with total direct costs | |
| **Student fees (both credit and applicable non-credit courses)** | | | |
| Activity fees | per day | $2.65* | $2.65* |
| Health fees | per day | $1.20* | $1.20* |

*To a maximum of the part-time activity fee of $55.85 per semester

**To a maximum of $25 per semester

## Conferences, institutes, and seminars

| | |
|---|---|
| Non-credit | Vary to correspond with total direct costs |

# Student Records

## University Policy

Kansas State University maintains various student records to document academic progress and to record interactions with university staff and officials. To protect each student's rights to privacy and to conform with federal law, the university has an established policy for handling student records.

Interpretation of this policy is based on experience with educational records, and the policy itself may subsequently be modified in light of this experience. Notice of the policy and of a student's rights under federal law is given annually. Copies of this policy are available at the Registrar's Office, 118 Anderson Hall and stated below.

## Directory Information

Certain information concerning students is considered to be open to the public upon inquiry. This public information is called directory information and includes a student's name, local address and telephone number, permanent mailing address, college, curriculum, year in school, date and place of birth, dates of attendance at K-State, awards and academic honors, degrees and dates awarded, most recent educational institution attended, participation in officially recognized activities and sports, and height and weight of members of athletic teams.

Directory information as defined above will be released for individual students by the Registrar's Office to anyone upon inquiry, unless the student has requested after registering that directory information not be released. The student's request to have directory information withheld must be submitted for each semester the student is enrolled and should be made at the Registrar's Office, which will notify other appropriate university offices.

## Confidential Information

With the exception of the information noted above, student records are generally considered to be confidential. The following policies govern access to confidential student records:

1. *Each type of student record is the responsibility of a designated university official, and only that person or the dean, director, or vice president to whom that person reports has authority to release the record.* The responsible officials are:

a. Academic records: For graduate students, the Graduate School, Fairchild Hall.

b. Admissions records: For graduate students, the Graduate School, Fairchild Hall.

c. Financial aid records: director of Student Financial Assistance, Fairchild Hall.

d. Business records: Controller's Office, Anderson Hall.

e. Traffic and security records: head of the University Police Department, East Stadium.

f. Medical records: director of the Student Health Service, Lafene Health Center.

g. Counseling records: director of University Counseling Services, Lafene Health Center.

h. Actions of academic standards committees: college dean.

i. Academic disciplinary records: the Graduate School, Fairchild Hall.

j. Nonacademic disciplinary records: dean of student life, Holton Hall.

k. Housing records: director of housing and dining services, Pittman Building.

l. Placement records: director of Career Planning and Placement Center, Holtz Hall.

m. Evaluations for admission to graduate or professional programs: dean (of the Graduate School or the appropriate college) or department head.

n. Special academic programs: faculty member in charge of the program, and dean of the college.

o. Foreign student records: foreign student advisor, International Student Center.

p. Test scores for College Level Examination Program (CLEP), American College Testing Program (ACT), Miller Analogies Test (MAT), etc.: director, Academic Assistance Center, Holton Hall.

2. Confidential educational records and personally identifiable information from those records will not be released without the written consent of the student involved, except to other university personnel, or in connection with the student's application for financial aid, or in response to a judicial order or subpoena, or in a bona fide health or safety emergency; or, upon request, to other schools in which the student seeks or intends to enroll; or to the U.S. comptroller general, the secretary of H.E.W., the U.S. commissioner of education, the director of the National Institute of Education, the assistant secretary for education, state educational authorities, or state and local officials where required by state statute adopted before November 19, 1974.

3. The responsible official may release records to university personnel who have a legitimate need for the information in order to carry out their responsibilities.

4. All student records are reviewed periodically. Information concerning the frequency of review and expurgation of specific records is available in the Registrar's Office.

5. With certain exceptions, students may review records that pertain directly to them upon request and may obtain a copy of the record at cost, according to the following schedule:

a. Transcript of academic record: $3 per copy.

b. Housing department records: four cents per page.

c. Medical records (Lafene Health Center): no charge to patient for medical purposes. A charge of $10 to $25 to outside parties with patient release.

d. Other records: no charge.

The major exceptions to student review are medical and counseling records. These may be released, however, to other medical or psychological professionals at the written request of the student; and may be inspected by the patient at the discretion of the professional staff. Other exceptions are law enforcement records, private notes of staff members, and financial records of parents.

6. A student may waive the right to review a specific record by submitting in writing a statement to this effect to the official responsible for that record. Examples are recommendations for career placement or admission to graduate study.

7. *University personnel who have access to student educational records in the course of carrying out their university responsibilities shall not be permitted to release the record to persons outside the university*, unless authorized in writing by the student or as required by a court order. Only the official responsible for the records has the authority to release them.

8. All personal educational information about a student released to a third party will be transferred on condition that no one else shall have access to it except with the student's consent. A record is maintained showing who has had access to student records, and this record is open to inspection by the student.

# Release of Grades

Reports of a student's grades are routinely sent to the student. Parents of dependent students may obtain grades by writing to the Registrar's Office. Proof of dependency is required. The grades of other students will be sent to their parents only with written permission of the student.

### Withholding records

In the case of a student who is delinquent in an account to the university, including unpaid traffic or parking violations, or about whom official disciplinary action has been taken, the appropriate university official may request that the student's record not be released. The effect of this action is that transcripts are not released and registration forms are withheld. In order for the action to be rescinded, the Registrar's Office must receive authorization from the official who originally requested the action, indicating that the student has met the obligation. Further information concerning this policy can be obtained from the Registrar's Office, 118 Anderson Hall, 532-6254.

# Review and Challenge of Records

Upon request to the official listed above, a record covered by the act will be made available to the student within a reasonable time and no later than 45 days after the request. Copies are available at the student's expense and explanations and interpretations of the records may be requested from the official in charge. If the official believes that a particular record or file contains inaccurate or misleading information or is otherwise inappropriate the university will afford an opportunity for a hearing to challenge the record's content. Prior to any formal hearing, the official in charge of the record is authorized to attempt, through informal meetings and discussions with the student, to settle the dispute. if this is unsuccessful, the matter will be referred to the appropriate vice president.

If the student is still dissatisfied, a hearing may be requested. The hearing, conducted by a hearing officer appointed by the president, will be held within two weeks after the hearing. If the result does not satisfy the student, he or she may place a statement in the file.

### Complaints

A student who believes the university has not complied with federal law or regulations may send a written complaint to The Family Educational Rights and Privacy Act Office, 400 Maryland Avenue, S.W., Washington, D.C. 20202.

# Transcripts

A transcript is a certified, official copy a student's permanent academic record. Since it contains confidential information, it cannot be released to anyone but the student without a specific request signed by the student.

Each transcript costs $3; the required fee must be paid in advance. A transcript request must be made in person or in writing to the Registrar's Office, 118 Anderson Hall; it cannot be requested by telephone or fax.

A written request must be sent to Kansas State University Registrar's Office, 118 Anderson Hall. The request must include the following:

1. Student current name, plus any other name or names used while attending K-State.
2. Student I.D. number.
3. Student date of birth.
4. Student beginning and ending dates of enrollment at K-State.
5. The number of transcripts requested.
6. Where each transcript is to be sent.
7. $3 for each transcript requested.
8. Student "original" signature.
9. Student current home address and day-time telephone number.
10. Indicate if transcript(s) should be held until current semester grades are posted and/or until degree is posted.

Transcripts may be requested in person by coming into the Registrar's Office during work hours. Students must have a K-State student ID or current driver's license for identification purposes. No one else may pick up or have a student's transcript mailed without written permission from the student. Written permission must include the name of the person authorized to request or obtain transcript and student's "original" signature.

Transcript requests cannot be honored for a student with a delinquency to the university.

Transcripts picked up by or sent directly to the student are stamped "issued to student." Some institutions will not accept a transcript that is marked "issued to student."

Transcripts are sent through the mail and not faxed.

# All-University Regulations

Students, faculty, and administrators are members of a community dedicated to the growth and development of individuals.

Enrollment at K-State entails responsibilities as well as privileges. Acceptance of and adherence to the following policies is necessary for the protection of the rights of others and the protection and health of the community. Copies of the following policies are available in the Student Government Services Office in the K-State Union and the Dean of Student Life Office in Holton Hall, unless otherwise indicated.

## Graduate Student Rights and Responsibilities

1. Every graduate student has:

a. Freedom of inquiry, conscience, expression, and association and the right to petition for the redress of grievances.

b. The right to have any information about his or her opinions and associations unrelated to academic performance or assigned responsibilities that has been acquired by professors or administrators in the course of their work as instructors, advisors, or counselors held confidential at his or her request and not disclosed to others without his or her consent.

c. Freedom from unfair treatment by faculty or administration in the assignment and evaluation of academic work toward the completion of requirements for a particular course.

d. The right to due process in the conduct of proceedings pursuant to the provisions of this document or of any proceedings conducted under any other provisions of any other rule or regulation governing Kansas State University.

e. The right to immunity from reprisal in the form of university disciplinary action or proceedings for seeking redress pursuant to the provisions of this document.

2. Every graduate student is responsible for:

a. The exercise of applicable rights and freedoms, as enumerated above, in a manner that does not materially and substantially interfere with the requirements of appropriate discipline in the operation of the institution or infringe upon the rights of other students.

b. Completing the requirements and meeting the standards of any course in which he or she is enrolled.

### Graduate student grievance procedures

If a graduate student feels he or she has been unjustly treated in some aspect of academic work and has been unable to secure a remedy through consultation with the professor(s) involved, with the supervisory committee, and thereafter with the head of the department or chair of the program, it is the student's prerogative to take the matter to the dean of the Graduate School. If the dean is unable to arrive at a mutually acceptable solution with the persons concerned, at the student's request the dean will initiate the grievance procedures adopted by the Graduate Council and described in detail in the Graduate Handbook.

## Student Conduct

### Philosophy of student conduct

The purpose of discipline in the university setting is to protect the campus community and its members. To achieve this protection, students at K-State are expected to follow university rules and policies pertaining to nonacademic conduct. Persons who violate these policies, interfere with the rights of others, disrupt the educational process, or commit other unlawful acts will be held accountable for their actions.

The following principles govern the disciplinary process: every effort is made to bring about outcomes that are positive for all parties involved; students will be members of all Student Governing Association judicial bodies; formal hearing processes are fundamentally fair and respect the rights of the individuals involved; confidentiality will be maintained; records of proceedings will be released only on written authorization of the student involved. The procedures are outlined in the SGA Judicial Code, included in the by-laws to the SGA Constitution.

Descriptions of the judicial structure and process, as well as university policies, are free and are available in the SGS Office of the K-State Union.

### Prohibited conduct

Important definitions of terms describing prohibited conduct are stated in the Student Conduct Code, available in the Student Government Office in the K-State Union.

The following misconduct is subject to disciplinary action:

1. Intentionally or recklessly causing physical harm to any person on university premises or at university-sponsored activities, or intentionally or recklessly causing reasonable apprehension or fear of such harm.

2. Unauthorized use, possession, or storage of any weapon on university premises or at university-sponsored activities.

3. Intentionally initiating or causing to be initiated any false report, warning, or threat of fire, explosion, or other emergency on university premises or at university-sponsored activities.

4. Intentionally or recklessly interfering with university or university-sponsored activities, including, but not limited to, studying, teaching, research, university administration, or fire, police, or emergency services.

5. Knowingly violating the terms of any disciplinary sanction imposed in accordance with this code.

6. Unauthorized distribution, use, or possession of a controlled substance as described in Chapter 65, Article 41 of Kansas Statutes Annotated, including but not limited to marijuana, cocaine, and heroin, on university premises or at university-sponsored activities.

7. Violation of the university's published alcohol and cereal malt beverage policy.

8. Intentionally or recklessly misusing or damaging fire safety equipment on university premises or at university-sponsored activities.

9. Forgery, unauthorized alteration, or unauthorized use of any university document or instrument of identification.

10. Intentionally and substantially interfering with the freedom of expression of others on university premises or at university-sponsored activities.

11. Theft of property or of services on university premises or at university-sponsored activities; knowing possession of stolen property on university premises or at university-sponsored activities.

12. Intentionally or recklessly destroying or damaging the property of others on university premises or at university-sponsored activities.

13. Unauthorized presence in or use of university premises, facilities, or property.

14. Negligently, recklessly, or intentionally participating in the hazing of another. (Consent by the person hazed shall be no defense to hazing.)

15. Intentionally or recklessly engaging in conduct which clearly and directly impairs, interferes with, or obstructs the missions, processes, and functions of the university.

16. Telephone harassment, which shall include making calls containing lewd or obscene remarks; making calls intended to harass whether or not conversation ensues; making the telephone ring repeatedly with intent

to harass; and making repeated calls in which conversation ensues solely to harass.

Attempts to commit acts prohibited by this code shall be considered violations to the same extent as completed acts.

Sanctions may be imposed for prohibited conduct pursuant to the Student Governing Association Constitution and By-Laws.

# Academic Dishonesty

All academic relationships ought to be governed by a sense of honor, fair play, trust, and a readiness to give appropriate credit for the intellectual endeavors of others when credit is due. K-State's policy on academic dishonesty assures due process and provides guidelines for action in instances where the proper academic relationships and attitudes have broken down.

Any student enrolling at K-State implicitly accepts the university's stipulations concerning academic honesty and the procedures they entail.

Complete copies of the academic dishonesty policy are available from the SGS Office in the K-State Union. The policy outlines grievance procedures for all matters of academic dishonesty, grade appeals, or other academic grievances brought by students against faculty members or faculty members against students.

### Plagiarism

Plagiarism, taking someone else's intellectual work and presenting it as your own, covers unpublished and published sources. Borrowing another's term paper, handing in a paper purchased from an individual or agency, or submitting papers from living group, club, or organization files are all punishable as plagiarism.

The standard for attribution and acknowledgement of literary indebtedness is set by each discipline. Students should consult with their department or with recognized handbooks in their field if in doubt.

The guidelines apply to faculty and research assistants in their possible use of students' and colleagues' research and ideas, as well as to students' use of source materials and authorities, and student use of other students' ideas and work.

### Other forms of academic cheating

Other forms of academic dishonesty subject to penalties include, but are not limited to, consultation of books, library materials, or notes during a test; use of crib sheets or hidden notes during an examination or looking at another student's test; having a confederate supply questions or answers from an examination to be given or in progress; having another person stand in on an exam or other graded activity; deliberate falsification of lab results; submission of falsified data; procurement or alteration, without permission, of examinations or other academic exercises; collaborating on projects where collaboration is forbidden; and other forms of academic dishonesty and fraud.

### Adjudication and penalties

Guidelines for adjudicating charges of dishonesty are described in the policy. Further information is contained in the Faculty Senate Minutes, April 11, 1989, Student Grievance Procedures.

The minimum penalty for cheating on an examination or paper, if proved, is an F for the assignment; maximum penalty is dismissal from the university. Minimum penalty for cheating on a comprehensive final, if proved, is an F for the course; maximum penalty is dismissal from the university.

In a second proved instance of academic dishonesty, suspension from the university is automatic. Dismissal from the university is the maximum penalty.

# University Policies

Students, faculty, and administrators are members of a community dedicated to the growth and development of individuals.

Enrollment at K-State entails responsibilities as well as privileges. Acceptance of and adherence to the following policies is necessary for the protection of the rights of others and the protection and health of the community. Copies of the following policies are available in the Student Government Services Office in the K-State Union and the Dean of Student Life Office in Holton Hall, unless otherwise indicated.

### Advertising, sales, and solicitation

Facilities of Kansas State University are not available for unrestricted use by non-university groups. University property may not be used for commercial purposes except when sponsored by a university-affiliated organization or department. The regulations governing fund-raising and the posting and distribution of literature are available in the SGS Office only.

### AIDS, ARC, and AIDS virus guidelines

Under the direction of the Kansas Board of Regents, the university has developed guidelines to assist students, staff, and faculty members in the event that they have to deal with situations involving acquired immune deficiency syndrome (AIDS) or AIDS-related complex (ARC). Complete copies of the guidelines are also available in the Lafene Health Center.

### Alcohol and cereal malt beverage policy

The legal drinking age in Kansas for alcoholic beverages is 21. The Kansas Board of Regents policy permits the use and sale of cereal malt beverages (3.2 beer) under authorized and appropriately controlled conditions and regulations. By state law, the sale of alcoholic liquor is not permitted on state property. Included in the K-State policy is information on alcohol and cereal malt beverage consumption in residence halls, at athletic events, and for student organizations.

### Drug-free workplace policy

In 1988, Congress passed the Drug-Free Workplace Act. This act applies to all institutions holding and applying for federal grants and contracts. K-State adopted the policy that the unlawful manufacture, distribution, dispensing, possession, or use of controlled substances is prohibited in its workplace.

### Facilities usage

K-State facilities are available for use by authorized groups for activities that complement the teaching, research, and service programs of the university. Policies and procedures for use of K-State facilities (other than the K-State Union) are available in the Division of Facilities Management in Dykstra Hall.

Policies and procedures for use of the K-State Union are available in the Union Reservations Office on the second floor or in the Handbook for UAB Registered Organizations.

### Gender

The goal of this policy is to create an environment in which all students, faculty, and staff interact solely on the basis of individual strengths and characteristics without having those interactions shaped by generalizations, stereotypes, or valuations based on gender. Copies are also available in the Women's Resource Center in Holton Hall and Affirmative Action Office in Anderson Hall.

### Political activity guidelines

All members of the university community are encouraged to take advantage of opportunities to educate themselves regarding the candidates and issues relating to national, state, and local elections. Copies of the university guidelines related to political activities on campus are available in the SGS Office only.

### Prayer at university functions

Nonsectarian prayers, invocations, benedictions, or silent meditations are permitted at university functions to enhance mutual respect and awareness.

### Racial and/or ethnic harassment

Racial and/or ethnic harassment is prohibited by K-State and includes, but is not limited to, verbal, physical, or written behavior directed toward or relating to an individual or group on the basis of race, ethnicity, or racial affiliation.

It has the purpose or effect of creating an intimidating, hostile, or offensive work or educational environment; interfering with an individual's work, academic performance, living environment, personal security, or participation in any university-sponsored activities; and threatening an individual's employment or academic opportunities.

Racial and/or ethnic harassment should be reported to the university administrator responsible for the department or unit or to the Affirmative Action Office. For students with complaints of harassment by other students, the dean or associate dean of student life may be regarded as the appropriate administrator. Copies of the policy are also available from the Affirmative Action Office in Anderson Hall.

### Religious activities

In a pluralistic, multicultural, and interdenominational university environment, freedom of worship is supported. Religious programs and activities must comply with university policies as well as federal, state, and local laws. In keeping with its education mission, the university may specify the time, place, and manner of religious events, but may not regulate their content.

### Sexual harassment policy

K-State prohibits sexual harassment and has defined sexual harassment as any behavior that, through inappropriate sexual content or disparagement of members of one sex, interferes with an individual's work or learning environment. This policy applies to the working and learning relationships of all individuals within the university community—faculty, staff, and students.

Sexual harassment should be reported to the university administrator responsible for the department or unit or to the Affirmative Action Office. For students with complaints of harassment by other students, the vice president for institutional advancement may be regarded as the responsible administrator. Copies of the Policy Prohibiting Sexual Harassment are available from the SGS office, departmental offices, or the Affirmative Action Office in Anderson Hall.

### Sexual violence

No form of sexual violence will be tolerated or condoned at Kansas State University. This policy prohibits not only those acts commonly understood to constitute "sexual assault," but all attempts to coerce sexual activity as well. This university will investigate acts of sexual violence perpetrated by and/or against students and will respond with appropriate action, which may include suspension or dismissal. Copies are available also in the Women's Resource Center in Holton Hall.

# Services for Students

## Adult Student Services

Nancy Bolsen, Director
201 Holton Hall
532-6434

Adult Student Services assists undergraduate and graduate students who are married, have children, are re-entering the edu-cational system after several years, or are 25 years of age or older. Staff members assist students with admission and enrollment and provide information or referrals for housing, child care, refresher and study skills courses, tutoring, financial aid, insurance, public school enrollment, community family programs, emergency locator, and commuter information. Staff members work with university and student groups, such as the Non-Traditional Student Association, to make their experiences as adult students at K-State successful ones. The staff may be able to assist the returning K-State student in advising about remedying past academic deficiencies. Staff also help students with their everyday challenges and special concerns before, during, and after their admission to K-State.

## Alcohol and Other Drug Education Service

Bill Arck, Director
214 Lafene Health Center
532-6927

The Alcohol and Other Drug Education Service offers information about physical effects and social issues related to alcohol and other drug use or abuse. Campus services provided include media activities such as newspaper ads, posters, brochures, and radio public service announcements; coordination of and participation in awareness events, such as National Collegiate Alcohol Awareness Week and National Collegiate Drug Awareness Week; and presentations providing information on alcohol and drug-related topics.

This office can also make referrals to various resources for those with concerns about their own or another's possible alcohol and/or drug use or abuse.

## Career Planning and Placement Center

James N. Akin, Director
Holtz Hall
532-6506

The Career Planning and Placement Center is available to assist prospective students, degree candidates, and alumni in their career assessments. The staff is committed to fostering self-direction and personal responsibility in those seeking help with their career plans and placement goals. Strong academic programs, capable students, and a campus work ethic combine to give K-State students a distinct advantage over those from many institutions in planning and achieving vocational/professional and graduate study goals.

The office provides a centralized job search assistance for students of all colleges and departments. It brings together students, faculty members, and employer representatives seeking college-educated personnel. Services include career advising; campus workshops on resume building, job search strategies, and interview techniques; candidate referrals; a government job center; summer employment assistance; an extensive career library; on-campus interviews; and career fairs.

## Dean of Student Life Office

Pat J. Bosco, Associate Vice President for Institutional Advancement and Dean of Student Life
122 Anderson Hall
532-6237

Susan M. Scott, Associate Dean
E. Bernard Franklin, Assistant Dean
102 Holton Hall
532-6432

Student life services, including Admissions, Financial Assistance, Greek Affairs, Housing, K-State Union, New Student Services, Recreational Services, Registrar, and the Associate Dean of Student Life Office, are coordinated and directed by the associate vice president and dean. These units meet the needs of prospective and enrolled students.

The office is responsible for the Student Governing Association, student activities, leadership development, the administration of the judicial program for nonacademic misconduct, and off-campus housing. Student activities, FENIX, Religious Affairs, and the

International Student Center are supervised and supported by this office. Staff members coordinate assistance to students and families in times of personal crisis and are available to students for general advice, counsel, and assistance with personal problems.

# English Language Program

Enid Cocke, Director
205 Fairchild
532-7324

The English Language Program offers intensive English courses primarily for international students who plan to enter degree programs at K-State. However, it also accepts students who wish to come for English instruction only.

The program offers five levels of full-time intensive English. It also offers an advanced part-time course specifically for graduate students. This course provides continued instruction and support in English while students take up to six hours in their degree field.

Many graduate departments offer conditional admission to students who are academically qualified but do not yet have the necessary English proficiency. These students apply to the English Language Program and receive an I-20 form to cover both their English study and the time that they spend earning their degree. They study in the English Language Program until they receive the necessary TOEFL score or earn the recommendation of the Program.

The program also screens the English proficiency of incoming non-native speakers of English. Students with a TOEFL between 550 and 600 are tested, and some are placed in ENGL 075, a support course in Written English for International Students. In addition, the English Language Program administers the oral proficiency test for students who wish to qualify to be graduate teaching assistants.

For other information and a brochure, write the English Language Program at the address above.

# Housing and Dining Services

Charles Werring, Director
Pittman Building
532-6453

Kansas State University provides residence hall living for approximately 4,000 students and 576 apartments for students and their families.

### Residence halls

The Department of Housing and Dining Services has designated Edwards Hall as an upperclass/graduate living area. All graduate students are assigned to Edwards unless another residence hall has been requested. In addition to Edwards Hall, intensive study floors exist in all of the remaining halls, with Putnam Hall being designated as an intensive study hall. Though Edwards Hall is designated as a graduate hall, there is no requirement that graduate students choose it as their first preference.

K-State residence halls have professionally trained, full-time, live-in staff. In addition, juniors, seniors, and graduate students serve as resident assistants in each residence hall.

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

When the application and fee are received by housing and dining services, an academic-year housing and dining services contract is forwarded to the student. The cost of the contract is set on an annual basis, and is one of the lowest room and board rates in the Big Eight.

Students pay for their contract by semester and may select either the full payment or installment plan.

### Family housing

Student families and a limited number of single graduate students have access to one- and two-bedroom apartments at Jardine Terrace, both furnished and unfurnished. These low-cost apartments are close to the campus. Coin-operated laundry facilities are available.

The rental includes gas, water, and trash. A deposit is required. Assignments are made on a first-come, first-served basis, and early application is recommended. Those residing in Jardine Apartments use the mayor-council form of government to regulate community life.

Apartments are partially accessible for people with physical limitations. The department of housing and dining services is pleased to work with students and family members to accommodate special needs.

# International Student Center

Donna Davis, Director
532-6448

The International Student Center provides a comfortable atmosphere where people wanting to increase their international perspective can find new friends. Made possible by a private gift, the center includes a multipurpose meeting room, dining room, kitchen, and reading lounge. Students from everywhere pass through the center each day, sharing cultures, traditions, recipes, language lessons, and their common concern for what is happening in today's world. Everyone is welcome to join in the programs and activities of the International Student Center and the various international student organizations.

### Foreign Student Office

Adjacent to the International Student Center is the Foreign Student Office. This office provides administrative services required for international students and scholars by their home countries and the United States Immigration and Naturalization Service. The office also acts as the university's primary resource for international student programs.

# K-State Union

Jack Sills, Director
532-6591

The K-State Union is the campus center for social, recreational, educational, and cultural activities. It opened in March 1956 and is supported only by generated revenue and student fees.

The K-State Union was built entirely by student fees. It features a full-service bookstore; a food service operation; a recreation area complete with bowling, billiards, video games, snack bar, and pro shop; Union Station; an art gallery; information counter; check cashing service; automatic bank teller machines; lounges; copy center; two auditoriums; campus vending service; and much more.

Union Program Council is the student volunteer arm of the K-State Union. UPC provides more than 450 programs each year for the social, cultural, educational, and personal growth of students. Student Governing Association offices are located on the ground floor.

The Union Governing Board is the body that establishes policy under which the K-State Union director and staff operate.

# Lafene Health Center

Lannie W. Zweimiller, Director
532-6544

The Lafene Health Center is a modern ambulatory healthcare facility designed to provide for most student outpatient health needs. The health center is fully accredited by the Joint Commission on Accreditation of Healthcare Organizations. Students who have paid the health fee as a part of their tuition are eligible for care. Non-student spouses, university con-

ference participants, and other campus visitors may receive care upon payment of a special fee.

Lafene Health Center provides, through a full complement of medical and other professional personnel, a range of services that include special clinics for sports-related injuries, women, and allergies and immunizations, as well as a clinic for general care. Also included are services in health education, nutrition, and physical therapy. The services of a pharmacy, laboratory, and x-ray are available at reduced rates.

The center is staffed by full-time physicians with medical support personnel. When necessary, the student is referred to specialists for treatment at the student's expense.

After regular clinic hours, a student who is ill or injured may receive medical care until midnight through the after-hours clinic of the Lafene Health Center. Home visits are not made. The local ambulance service is available, when needed, to transport patients to the appropriate health care facility.

It is strongly recommended that all students at K-State carry medical insurance, either through the parents' plan at home or through the university-sponsored student health insurance plan available at special rates. This latter plan covers most services provided at Lafene Health Center and allowed claims for medical expenses if the student requires care away from the campus.

K-State requires a complete medical history, including a current immunization record, on all new students or transfer students. This history must be completed on the Kansas State University medical history form and is required prior to provision of non-emergency treatment at the health center. A physical examination is not required, but encouraged, and a copy of this examination assists the staff in evaluating illnesses. If a student has a continuing medical problem, a summary from the attending physician is helpful should treatment at the center be needed. Students receiving allergy injections must furnish instructions from their allergists before injections can be administered at the health center.

# Multicultural Student Organizations

Diana Caldwell, Coordinator
201 Holton Hall
532-6436

Emphasis is placed on building strong cultural groups that help foster the development of leadership skills and roles for multicultural students on campus; supporting multicultural student organizations, including Asian-American Students for Intercultural Awareness (ASIA), Black Student Union (BSU), the Hispanic American Leadership Organization (HALO), Native American Student Body (NASB), and other special interest organizations; assisting student organizations in sponsoring programs and activities that bring multicultural leaders and role models to K-State; and heightening multicultural awareness within the community.

# Recreational Services

Raydon H. Robel, Director
532-6980

Recreational Services is responsible for the intramural, recreational sports, and fitness programs for the campus.

Intramural sports are the scheduled competitive activities of the recreation program. Teams are organized by fraternities, sororities, residence hall floors, and off-campus, co-rec, and faculty/staff groups. More than 30 different intramural activities are offered for competition.

The natatorium at the Ahearn Sports Complex has two 25-yard swimming pools, one diving pool with two one-meter and two three-meter boards, and a sun deck.

The Chester E. Peters Recreation Complex houses 16 handball/racquetball courts; two gyms (convertible to six basketball, nine volleyball, six tennis, and 18 badminton courts); two weight and exercise areas; combatives area; a running track; locker rooms; and a central supervisory and check-out area.

Outdoor facilities include lighted tennis and handball/racquetball courts, multi-purpose playfields, a fitness cluster, and running trails. Outdoor recreational equipment and camping equipment can be rented at the Outdoor Rental Center.

The department provides employment as lifeguards, sports officials, building managers, and office assistants.

# Religious Affairs

Don Fallon, Coordinator
102 Holton Hall
532-6432

The coordinator of religious activities in Holton Hall provides information regarding religious activities and organizations on campus and in the community. Pastoral care and counseling are available through this office and by referral. Students may seek counseling regarding relationships, sexuality, death and loss, or other personal and spiritual concerns.

Two memorial chapels on campus, Danforth and All Faiths, are available for student worship, weddings, and private meditation.

# Services for Disabled Students

Gretchen Holden, Director
Holton Hall
532-6441

Services for Disabled Students works to meet the needs of students with physical limitations and documented learning disabilities by providing academic, financial, and vocational counseling. Staff will work as a liaison with students' instructors. Reading and study skills instruction may be of special interest to learning disabled students.

Other supportive services include tutorial assistance, readers, notetakers, typing, and an errand service. Assistance is provided in obtaining taped texts. Test taking accommodations, including extended time for test taking, oral examinations, and scribes, can be arranged through this office. Classes scheduled in inaccessible locations will be relocated for students with mobility impairments. Individualized help with enrollment is available. Efforts will be made to provide interpreters for hearing impaired students when requested.

Special equipment available to students includes a talking calculator, Kurzweil Reading Machine, variable-speed tape recorders, and a TTY (telephone for the hearing impaired). A shuttle van, equipped with a hydraulic lift, operates on campus between all buildings and is available to students with either temporary or permanent physical limitations. Accessible housing is available.

# Student Activities

Carolyn Coon, Interim Coordinator
K-State Union, SGS Office
532-6541

The coordinator of student activities helps students identify activities and avenues of campus involvement. The coordinator also advises the Student Governing Association and student judicial system, administers the student activity fee, and assists individuals and groups who wish to organize and register their activities on the K-State campus. Leadership workshops are organized annually, and consultation is available for leadership development to interested campus leaders and organizations.

# Student Government

Carolyn Coon, Interim Coordinator of Student Activities
K-State Union, SGS Office
532-6541

The purpose of the Student Governing Association is to help students voice any concerns, suggestions, or grievances they may have. Every student is automatically a member of the Student Governing Association and is represented by a college council (elected by the students in each respective college), by one student senator for each 300 students enrolled in the colleges, and by the student body president. The student senators and the student body president are elected by the K-State student body.

SGA is divided into three branches: legislative, judicial, and executive. The legislative branch—student senate—is composed of six standing committees: academic affairs and university relations, communications, finance, senate operations, student affairs and social services, and legislative affairs. A major function of student senate is the allocation of the student activity fee and the Educational Opportunity Fund, which are collected as part of the tuition payment. These funds are used to assist student and university organizations in providing programming and services for the K-State community.

The judicial branch is composed of judicial council, student review board, tribunal, parking citation appeals board, and the living group judicial boards.

The student body president and cabinet make up the executive branch. The president has the responsibility to promote the general welfare of the students and acts as the official voice of the student body to the faculty, administration, and public.

Another form of representation is the Associated Students of Kansas. ASK is a student lobby group that takes the concerns of students in each of the state schools to the Kansas legislature.

### Graduate Student Council

This body of elected representatives is composed of graduate students from each of the academic colleges. Under the leadership of its elected president, the council works with the graduate dean in advancing matters of campuswide impact on graduate students.

### Student organizations

More than 325 organizations are available to students, faculty members, staff, and community members.

Any organization desiring to become a registered organization must adhere to University Activities Board guidelines.

Registered groups may schedule rooms and tables in the K-State Union, use most campus facilities, and post notices on campus bulletin boards.

# U-LearN

16 Holton Hall
532-6442

University Learning Enhancement Resource Network (U-LearN) is a walk-in and phone-in resource center that answers questions regarding academic, campus, and community activities and general information.

U-LearN programs include the Work Opportunity Resource job board; listing tutoring, typing, babysitting, and odd jobs for students who want to utilize their special skills or are looking for assistance in these areas. The Volunteer Income Tax Assistance program assists students, faculty, and staff in filing their income tax forms.

# University Counseling Services

Fred Newton, Director
Second Floor, Lafene Health Center
532-6927

The Counseling Service is open 8 a.m. to 5 p.m. weekdays. Emergencies from 5 p.m. to midnight on weekdays and 8 a.m. to midnight on weekends are handled through the Lafene Health Center After-Hours Service (532-6544). Professional counselors, psychologists, and a psychiatrist are available to assist K-State students.

Individual, couple, and/or group counseling is offered for people wishing to discuss academic, career, or personal concerns. A policy of confidentiality is followed. No information is released without written authorization of the student. Psychological testing may be used as an adjunct to career or personal counseling.

In addition, programs using a workshop or seminar format are offered to enhance personal growth and skill development. These include stress management, biofeedback, career life planning, assertiveness training, relationship enhancement, responsible drinking, and ACOA support. Career Life Planning (EDCEP 511) is offered for academic credit.

Consultation by center staff members is offered to individual students, staff, or faculty members concerning their work and living environments. Additionally, the staff is available for class or group presentations and workshops upon request.

# Women's Resource Center

Judith Davis, Director
206 Holton Hall
532-6444

The Women's Resource Center serves to promote the academic and personal well-being of K-State students. Center services include support, advocacy, and referral services to individual students experiencing difficulties; study and support groups; educational programs on a variety of gender-related topics to classes and to student, faculty, and community groups; and a browsing/lending library.

# Auxiliary Services and Facilities

## Administrative Services

John Streeter, Director
21 Anderson Hall
532-6281

The administrative computing community of the university is supported by the Office of Administrative Systems. Services consist of software development, systems project management, systems analysis, applications programming, and production data processing.

Major application systems include admissions, financial assistance, registration, and student, employment, financial, property, and alumni records. Most administrative application systems are operated on the university's central mainframe computer system in the IBM MVS/XA CA-IDMS-DC environment.

COBOL and CA-ADS/O are the principal programming languages. Database services are provided by CA-IDMS-DB. A fourth-generation language, FOCUS, is available for end user report preparation on the IBM VM/XA system.

## Affirmative Action Office

Jane Rowlett, Director
214 Anderson Hall
532-6220

The Affirmative Action Office is available to students on matters of equal opportunity in all areas including admissions, access to programs and activities, and employment. The university is committed to a policy of equal educational opportunity regardless of race, sex, national origin, handicap, religion, age, or sexual orientation. Any barriers that students encounter for these reasons should be discussed with this office so that we may aid in their removal.

## Alumni Association

Fred Thibodeau, Executive Director
KSU Foundation Center
2323 Anderson, Suite 400
532-6260

The Kansas State University Alumni Association is a 30,000-member organization. It is an independent group of alumni and friends devoted to the university.

The nonprofit organization supports K-State through student recruitment programs, maintenance of records on more than 110,000 alumni and friends, publication of the *K-Stater*, and sponsorship of local alumni gatherings and class reunions.

## Child Care

### KSU Child Development Center

Jana Adams, Director
Jardine Terrace, Building L
539-1806

The KSU Child Development Center is a nonprofit corporation serving the child care needs of K-State students, faculty, and staff. It is fully licensed by Kansas and is professionally staffed. Its facilities are in building "L" of Jardine Terrace.

The center offers full-day programs for toddlers (ages 12 months and walking through 2½), preschoolers (ages 2½ through 5), and school-age children (ages 5–12). Limited part-time program spaces are offered to families of toddler and preschool children who need regular flexible care.

### Department of Human Development and Family Studies

Mary DeLuccie, Director
Justin Hall
532-5510

This department operates two child care facilities. Both are licensed by the Kansas State Department of Health and Environment and accredited by the National Academy of Early Childhood Programs. Enrollment in these programs is open to members of the K-State and Manhattan communities.

The Hoeflin Stone House Child Care Center is on the northeast edge of campus. The center provides full day care for 30 children ranging in age from 18 months to 5 years. Priority is given to children of working parents. The program focuses on the children's developmental needs and interests.

The Early Childhood Laboratory on the east edge of campus hosts an interagency program with USD 383. The facility integrates children who have disabilities with nonhandicapped children, and accommodates an age range from 2½ to 5 years in a part-day program.

The activities and environment at both facilities are designed to foster children's cognitive, language, social, emotional, and physical growth and development.

## Family Center

Stephan R. Bollman, Director
Campus Creek Road
532-6984

The Family Center provides applied educational experiences to students while offering family-related educational outreach, counseling, and consultation services to the Manhattan community and the state. The Family Center provides an interdisciplinary focus with faculty participation from departments within the college.

Students, under faculty supervision, offer services involving marriage and family therapy and family life education. Affiliated programs include the Friendship Tutoring Program for school-age children and programs sponsored by grants. Special workshops address particular family topics, including working parents, parent education, and family life. The annual National Rural Families Conference features the Ruth Hoeflin Forum on Family Issues.

Services are available to students and the general public. A fee is assessed for some services based on a sliding scale.

## Foundation

Arthur F. Loub, President
KSU Foundation Center
2323 Anderson, Suite 500
532-6266, 532-7500

The Kansas State University Foundation, the official fund-raising arm of the university, is a nonprofit organization certified under Section 501 (C) (3) of the IRS Code of 1954. The foundation acts as the custodian for gifts to the university and is encouraged to receive and hold in trust any real and personal property given for the use of Kansas State University, and to administer and control all the gifts to provide services that are not or cannot be provided through appropriated funds.

Although the foundation is not a bank it offers many of the same services and is responsible for the administration of more than 2,000 scholarships and the processing of 43,000 gifts annually, while administering total assets of $100 million. Policy is formulated by a 175-member board of trustees and an executive committee of 15 members to which the staff, directed by the president, is responsible.

# Institutional Advancement

Robert S. Krause, Vice President
122 Anderson Hall
532-5942

The vice president for institutional advancement is responsible for the external relations of the university and is the chief student affairs officer. Additionally, the vice president coordinates ongoing activities with the KSU Foundation, KSU Alumni Association, and Department of Intercollegiate Athletics, and external relations with governmental agencies, the Board of Regents, and other university constituents. The vice president for institutional advancement reports directly to the president and serves as chief spokesperson for the university.

# Police Department

701 N. 17th
Southeast corner, Memorial Stadium
532-6412 business
532-6400 emergency

The University Police Department is responsible for the protection of all properties owned and operated by the state educational institution or its affiliates. This authority is granted under state law. While service to the K-State community is of great concern to the department, the prevention of crime and investigation of all reported crimes is also of prime importance.

The department assists with parking control and regulates traffic control. Traffic and parking regulations are established by a student-faculty/staff Traffic and Parking Council, by authority of K.S.A.-74:3211.

The department is responsible for providing physical security on campus property. This includes opening and closing buildings, monitoring security cameras, and maintaining 16 emergency telephones strategically located throughout the university.

The University Police Department is open 24 hours a day. It provides a contact for emergency repairs and acts as the university operator outside normal business hours. The department has sworn police officers on duty 24 hours a day.

# Postal Service

113 Dykstra Hall
532-6306

All mail for students must be addressed to their Manhattan residences, not the university.

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 Central Mail Service sells stamps, money orders, and other postal supplies; weighs, insures, and registers mail; and receives outgoing U.S. mail. A self-service postal unit is in the K-State Union.

# Speech and Hearing Center

Caroline Salva, Director
107 Leasure Hall
532-6879, 532-6873

The Speech and Hearing Center provides evaluation, management, and consultation services to university students with articulation, fluency, voice, language, or hearing impairments. These clinical services are also available to children and adults of the surrounding communities. The center provides educational and clinical experiences for students preparing for careers in speech-language pathology and audiology.

# Student Publications

Ron Johnson, Director
103 Kedzie Hall
532-6555

Student Publications Inc. is a nonprofit student publishing corporation that publishes the daily student newspaper, the *Kansas State Collegian*; the student yearbook, the *Royal Purple*; and the *Campus Directory*. Student Publications is governed by the Board of Student Publications, composed of four students elected by the student body annually and three faculty members appointed by the university president.

The Board of Student Publications names an editor in chief and advertising manager of the *Collegian* three times each year. The *Royal Purple* editor is chosen in the spring for the following year. The editors and advertising managers hire students for staff positions.

The *Collegian* and *Royal Purple* each have faculty advisors, but their content is determined and controlled solely by the editors and student staffs.

# Telecommunications Services

Fred Damkroger, Director
109 East Stadium
532-7001

Telecommunications provides the voice, data, and video transmission capabilities for the university. The entire campus has been rewired since 1987. Fiber optic cables are also run to all the academic buildings and residence halls.

Long-distance service is provided using the state's intercity KANS-A-N network along with facilities provided by Southwestern Bell and AT&T. The DEFINITY G2 automatically controls the routing of calls. Long-distance service for the residence halls is provided using these facilities as well. Each student in the residence halls has an opportunity to obtain an authorization code to facilitate the identification of calls and proper billing. Authorization codes for other campus users are available if circumstances warrant their use.

# University Relations

John Fairman, Assistant Vice President for University Relations
122 Anderson Hall
532-6269

Public information for K-State activities and events is coordinated through University Relations and its four units: News Services, Photographic Services, Printing Services, and University Publications.

News Services is the official outlet for print and broadcast news materials relating to K-State policies and administration. News Services also publishes *In-View*, the official faculty–staff newsletter.

Photographic Services offers photoprocessing, location and studio photography, and slide reproduction.

Printing Services prints books, brochures, business cards, envelopes, letterheads, posters, and other printed matter. Second- and third-class mailing services are available to all departments and affiliated organizations.

University Publications provides editing, design, and production coordination of enrollment management, recruitment, and informational publications.

# International Programs

William L. Richter, Interim Assistant Provost for International Programs
Carolee Fairbanks, Office Specialist
304 Fairchild Hall
532-5990

Building upon several decades of international involvement, K-State provides a range of programs that link the campus with other parts of the world. Many of these are coordinated through individual departments or colleges; others serve the whole university.

The Office of International Programs is responsible for coordinating international programs. The office houses the assistant provost for international programs, study abroad programs, and the various international and area studies programs. Coordination is assisted by an International Activities Council that is broadly representative of the university.

## International and Area Studies Programs

International and Area Studies Programs
304 Fairchild
532-5990

International Trade Studies
Dr. Mark Parillo, 532-5990 or 532-6730

Students interested in world affairs may take advantage of several interdisciplinary opportunities. The South Asia Center and the Latin American studies and international studies programs offer secondary majors to undergraduates.

Several other international programs that do not offer degrees provide advice and opportunities to interested students and faculty. These include international trade studies, Canadian studies, and groups of scholars with interests in the Middle East, Western Europe, Eastern and Central Europe, and Africa. For more information, contact the Office of International Programs or the following:

Latin American studies
Marcial Antonio Riquelme, 532-5990

South Asian studies
Lelah Dushkin, 532-5990 or 532-6865

Canadian studies
Judith Zivanovic, 532-6900

Russian studies
Walter Kolonosky, 532-6760

Middle East studies
Michael Suleiman, 532-6842

African studies
Donald Adamchek, 532-6865

## Study Abroad Programs

Study Abroad Programs
304 Fairchild

International Student Exchange Program
Walter Kolonosky, 532-5990 or 532-6760

Exchange Agreement Programs
304 Fairchild
Carolee Fairbanks, 532-5990

The Office of Study Abroad provides information for students who wish to study in another country. K-State has bilateral exchange agreements with more than two dozen universities abroad. In addition, the university participates in the International Student Exchange Program (ISEP), through which many other exchanges are possible.

Qualified students are encouraged to apply for Rhodes, Marshall, Fulbright, Rotary, and other international scholarships.

### Programs

**Austria**
Leopold Franzens University

**China (People's Republic of)**
Luoyang Institute of Technology and Henan Agricultural University

**Central America (Regional)**
Higher Council of Central American Universities

**Costa Rica**
University of Costa Rica

**Czechoslovakia**
Charles University

**Denmark**
Aarhus School of Architecture

**England**
Nottingham University

**France**
Aix-Marseille University; Ecole Superieure d'Agriculture de Purpan
Institute of National Polytechnique de Lorraine
Univesity of Reims

**Germany**
Justus Liebig Universitat, Giessen; Ludwig Maximilian Universitat, Munich; Technical University, Trier

**Honduras**
Escuela Agricola Panamericana, Tegucigalpa; Ministerio de Recursos Naturales de Honduras, Tegucigalpa

**Korea (Republic of)**
Korea University

**Mexico**
Instituto Technologico y de Estudios de Monterey

**Netherlands**
Agricultural University of Wageningen

**New Zealand**
University of Otago, Dunedin

**Paraguay**
National University, Asuncion; Catholic University, Asuncion

**Switzerland**
Eidgenossische Technische Hochschule, Zurich

**Italian Semester Program**
Susanne Siepl–Coates, 532-5953

**Mexican Summer Program**
Maureen Thrie, 532-6760

**Summer Abroad in English Education**
Ray Kurtz, 532-5391

### Scholarship programs for foreign study

**Fulbright, Pearson**
Walter Kolonosky, 532-5990 or 532-6760

**Marshall, Rhodes**
Nancy Twiss, 532-6900

**Partnership Exchange (Germany, Switzerland)**
Carolee Fairbanks, 532-5990
Carol Miller, 532-6760

**Rotary International**
Jerry Weis, 532-6615

**Yamani (Middle East)**
Michael Suleiman, 532-6842

### International students

See the International Student Center and English Language Program sections of this catalog.

# International Development Programs

The Office of International Agricultural Programs, the Food and Feed Grains Institute, the International Grains Program, the International Meat and Livestock Program, the Human Ecology Paraguay Project, and other units maintain projects abroad, provide short-term consultants, and provide short-course training for foreign visitors. The International Trade Institute, in addition to its training programs, provides advice and assistance to Kansas manufacturers seeking overseas export markets.

K-State is a member of the MidAmerica International Agricultural Consortium and the Association of Big Eight Universities, through which collaborative development projects are pursued.

International Agricultural Programs
William J. Jorns, Acting Director, 532-5714

International Trade Institute
Wayne Norvell, Director, 532-6799
Neelima Gogumalla, Assistant Director, 532-6799

International Community Service Program
Carol A. Peak, Director, 532-5701

Food and Feed Grains Institute
Charles Deyoe, Director, 532-6161
Roe Borsdorf, Associate Director, 532-6161

International Grains Program
Charles Deyoe, Director, 532-6161
Roger Johnson, Associate Director, 532-6161

International Sorghum and Millet Program
Richard Vanderlip, 532-7249

Paraguay Project
Barbara Stowe, 532-5500

Resources on Developing Countries
Nancy Donoghue, 532-7451

Wheat Genetics Resource Center
Bikram Gill, 532-5692

International Meat and Livestock Program
Jack Riley, Director, 532-6533

MidAmerica International Agricultural Consortium
William J. Jorns, 532-5714

Association of Big Eight Universities, International Committee
William L. Richter, 532-5990

# 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 chair of the appropriate program in care of the Graduate School.

## Biochemistry

C. Hedgcoth, Chair

Professors L. Davis, Denell, Hedgcoth, Iandolo, K. Kramer, Muthukrishnan, Oehme, Reeck, Roche, Roufa, Seib, and L. Takemoto; Associate Professors Marchin, Mueller, D. Rintoul, D. Takemoto and Tomich; Assistant Professors Andersson, Kanost, Krishnamoorthi, Ulug, X. Wang, and Welti.

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 faculty 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 biochemistry, grain science and industry, pathology, surgery and medicine, and the Division of Biology.

Entering graduate students must meet the entrance requirements of the Graduate School and must have completed one year of organic chemistry; differential and integral calculus; one semester of analytical chemistry; and a course of biology, including a laboratory. It is preferred that students entering the program have a year of physical chemistry but this requirement may be satisfied by including the year of physical chemistry as a part of the graduate program.

## Engineering

Harry Manges, Chair

Professors Akins, Appl, Azadivar, Azer, Bissey, Burton, Carpenter, Chung, Clark, Cogley, Cooper, Dillman, Donnert, S. A. Dyer, Eckhoff, Erickson, Fan, Faw, Gallagher, Glasgow, Gorton, Gowdy, Harnett, Hu, C. L. Huang, Hummels, Hwang, Johnson, Jones, Koelliker, Konz, Kuhlman, Kyle, Lee, Lenhert, Lucas, Manges, Mathews, Matthews, Merklin, Miller, Rathbone, Russell, Schrock, Shultis, Simons, Snell, Soldan, Spillman, Steichen, Swartz, Thompson, Tillman, Turnquist, Walawender, and Walker; Associate Professors Beck, Chandra, Chang, Devore, R. A. Dyer, Fenton, Fowler, Harms, Harner, Hayter, Heber, Knostman, Kramer, Krishnaswami, Morcos, Pacey, Pahwa, D. Rogers, A. Rys, Schlup, Slocombe, Stokes, Swenson and White; Assistant Professors Banks, Ben-Arieh, S. Chang, Chapman, Edgar, Flores, Fox, Gordon, Hosni, Hossain, C. T. Huang, Y. Huang, McCright, Melhel, M. Rys, Tracy, Triantaphyllou, and N. Zhang.

The graduate committee of the College of Engineering coordinates the graduate program leading to the Ph.D. in engineering. The committee consists of a representative from each academic department of the college. The primary function of the committee is to administer the graduate program policies established by the College of Engineering graduate faculty and the Graduate School.

Within the doctoral program leading to the Ph.D. in engineering, the traditional areas of engineering are represented by the Departments of Agricultural Engineering, Chemical Engineering, Civil Engineering, Electrical and Computer Engineering, Industrial Engineering, Mechanical Engineering, and Nuclear Engineering, with emphasis in systems engineering, materials science, energy processes, bioenvironmental engineering, and information processing.

The master's degree is offered in architectural engineering with emphasis in building systems study.

Entering graduate students must meet the entrance requirements of the Graduate School and must have completed the B.S. degree in a field of engineering or a closely related area of science.

## Food Science

Leniel H. Harbers, Chair

Professors Bowers, Chung, Deyoe, Dikeman, Erickson, Fan, Fung, Harbers, Hoseney, Hunt, Kastner, Kropf, Miller, Minocha, Mugler, Paulsen, Pederson, Ponte, Reeck, Seib, Setser, Shanklin, Walker, and Zayas; Associate Professors Chambers, Faubion, Harbers, Jeon, Klopfenstein, and Penner; Assistant Professors Aramouni, Flores, Gast, Herald, Lamont, Phebus, and Smith.

The food science graduate program involves the interrelationships among 35 professionals from 10 departments. Faculty from five colleges (agriculture, arts and sciences, engineering, human ecology and veterinary medicine) have participated in the interdisciplinary food science master's and doctoral programs since 1965. Graduate faculty are located in the Departments of Animal Sciences, Grain Science, Foods and Nutrition, Hotel, Restaurant, Institution Management and Dietetics, Chemical

Engineering, Horticulture, Forestry and Recreation Resources, Agricultural Engineering, Agronomy, Biochemistry, and Laboratory Medicine.

Graduate students conduct their research in one of the participating departments. The food science faculty are involved in research on the chemical, sensory, and nutritional aspects, functional characteristics, and processing of foods. Faculty with expertise in chemical analysis, instrumental analysis, sensory analysis, systems analysis, biochemistry, dietetics, statistics, microbiology, thermodynamics, rheology, biochemical engineering, and food engineering participate in the food science program.

Research facilities for cereals include a complete pilot plant for milling grain into flour, complete baking research facilities, equipment for extrusion research, well-equipped laboratories for cereal chemistry, a specialized cereal science library, and other supporting facilities. Research facilities related to animal products include complete dairy and red-meat processing facilities, well-equipped research laboratories for red meat, poultry and dairy research, food chemistry, and food microbiology research laboratories. Flavor and sensory evaluation laboratories and instrumentation for physical, histological, and biochemical analysis of food products are also available. Laboratory facilities for food engineering research include ultrafiltration cells, instrumental fermentors, gas and liquid chromatography, an elemental analyzer, and an environmental chamber with temperature and humidity control. New facilities and instrumentation for food safety studies have recently been obtained.

Graduate study in food science will provide training for a number of varied academic and technical careers. Food processing is a top industry in the United States so the need for food technologists is growing.

Application should be made at the beginning of the previous semester, and preferably earlier to ensure availability of a major professor. An optimal number of graduate students of 50 is usually maintained, therefore admission is highly competitive. All inquiries and requests for admission materials should be addressed to Dr. L.H. Harbers, Food Science Graduate Program, Call Hall, Kansas State University, Manhattan, KS 66506, Phone: (913) 532-5654; FAX: (913) 532-5681. All prospective students must complete a graduate school application and submit a statement of objectives, official transcripts, and three letters of recommendation. Seniors and master's students may submit a current transcript and, if admitted, will receive provisional acceptance pending submission of an official transcript showing completion of a bachelor's degree, or M.S. degree for doctoral applicants. It is imperative that the letter of objectives contain a specific area of study within food science, i.e., food chemistry, food microbiology, cereals, red meat, or sensory analysis, so that the application may be directed to the appropriate faculty. Terms such as food processing and food technology are too general and may result in rejection because of lack of specificity. Submission of GRE examinations is strongly recommended.

Foreign students must submit a TOEFL score of at least 550 or have received a previous degree from a U.S. university. In addition, a financial form must be completed and signed by a sponsor with evidence of support for the entire program of study.

All applications will be reviewed by three appropriate members of the food science graduate faculty. A faculty member must be willing to act as a major advisor prior to submission of credentials to the graduate school.

Research and teaching assistantships administered by the individual departments are available on a limited basis. Those receiving assistantships pay in-state fees. Members of the food science program obtain funds from the Agricultural and Engineering Experiment Stations and outside research funds that help sponsor some graduate research assistants. Currently, research stipends are competitive but may vary by department.

General requirements for entering graduate study in food science are: (1) mathematics, including college algebra and statistics; (2) biochemistry and organic chemistry; (3) a course in physics; (4) an introductory course in microbiology; and (5) a course in botany, zoology, or biology. Certain programs within Food Science may require additional courses.

When the student's committee believes it necessary, the student will be required to take additional undergraduate courses to prepare more completely for the individual program.

Candidates for degrees are expected to select courses that provide adequate coverage in several food areas, with primary emphasis in one or more areas.

The M.S./Ph.D. program of study shall be expected to include courses in biochemistry, statistics, food microbiology, food chemistry, and food processing/food engineering. No more than 6 credit hours at the 500 level will be accepted. One credit of FN 981 Food Science Colloquium for the M.S. degree and 2 credits of Food Science Colloquium for the Ph.D. degree shall be included. There is no foreign language requirement.

Course requirements will be evaluated by the student's supervisory committee. The chairman of the food science graduate program must approve members of the student's advisory committee and the program of study.

Below is a partial list of courses that may be selected for the major. See your advisor for details.

**Agricultural engineering**

| | |
|---|---|
| AGE 575 | Fundamentals of Agricultural Process Engineering |
| AGE 625 | Thermal Processing Operations in Food Engineering |
| AGE 630 | Food Process Engineering Laboratory |
| AGE 635 | Food Plant Design |
| AGE 700 | Agricultural Process Engineering |

**Animal sciences and industry**

| | |
|---|---|
| ASI 502 | Principles of Dairy Foods Processing |
| ASI 605 | Fresh Meat Operations |
| ASI 606 | Instrumental Analysis of Food and Agricultural Products |
| ASI 607 | Food Microbiology |
| ASI 610 | Processed Meat Operations |
| ASI 671 | Meat Selection and Utilization |
| ASI 694 | Food Plant Management |
| ASI 695 | Quality Assurance of Food Products |
| ASI 713 | Rapid Methods and Automation in Microbiology |
| ASI 715 | Chemistry of Foods |
| ASI 725 | Food Analysis |
| ASI 777 | Meat Technology |
| ASI 806 | Topics in Meat Science and Muscle Biology |
| ASI 811 | Food Fermentation |
| ASI 818 | Fundamentals of Meat Processing and Preparation |
| ASI 915 | Food Toxicology |
| ASI 930 | Advanced Meat Science |

**Biochemistry**

| | |
|---|---|
| BIOCH 521 | General Biochemistry |
| BIOCH 755 | Biochemistry I |
| BIOCH 756 | Biochemistry I Laboratory |
| BIOCH 790 | Physical Biochemistry |
| BIOCH 840 | Intermediary Metabolism |
| BIOCH 910 | Lipids |
| BIOCH 930 | Proteins |
| BIOCH 940 | Chemistry of Carbohydrates |
| BIOCH 950 | Enzyme Chemistry |

**Biology**

| | |
|---|---|
| BIOL 670 | Immunology |
| BIOL 675 | Genetics of Microorganisms |
| BIOL 690 | Microbial Physiology and Metabolism |
| BIOL 730 | General Virology |
| BIOL 805 | Advanced Mycology |
| BIOL 830 | Advanced Virology |
| BIOL 888 | Electron Microscopy Technique |

**Chemistry**

| | |
|---|---|
| CHM 545 | Chemical Separations |
| CHM 921 | Advanced Separations |
| CHM 942 | Advanced Analytical Chemistry |

**Chemical engineering**

| | |
|---|---|
| CHE 530 | Transport Phenomena 1 |
| CHE 531 | Transport Phenomena 2 |
| CHE 550 | Chemical Reaction Engineering |
| CHE 715 | Biochemical Engineering |
| CHE 805 | Selected Topics in Biochemical Engineering |

**Foods and nutrition**

| | |
|---|---|
| FN 501 | Food Science |
| FN 502 | Principles of Nutrition |
| FN 612 | Principles of Food Product Development and Control |
| FN 660 | Nutrition and Food Behavior |
| FN 710 | Bionutrition |
| FN 720 | Food Systems |
| FN 721 | Sensory Analysis of Foods |
| FN 731 | Descriptive Sensory Analysis |
| FN 741 | Consumer Response Measurement |
| FN 790 | Food Research Techniques |
| FN 821 | Practicum in Sensory Analysis |
| FN 844 | Nutritional Epidemiology |
| FN 905 | Lipids in Food Systems |
| FN 906 | Proteins in Food Systems |
| FN 907 | Food Dispersions |
| FN 908 | Carbohydrates in Food Systems |
| FN 981 | Food Science Colloquium |

**Grain science and industry**

| | |
|---|---|
| GRSC 500 | Milling Technology I |
| GRSC 602 | Cereal Science |
| GRSC 625 | Flour and Dough Testing |

| | |
|---|---|
| GRSC 635 | Baking Science I |
| GRSC 651 | Food and Feed Plant Sanitation |
| GRSC 661 | Qualities of Feed and Food Ingredients |
| GRSC 710 | Fundamentals of Grain Storage |
| GRSC 730 | Milling Technology II |
| GRSC 737 | Baking Science II |
| GRSC 805 | Nutritional Properties of Cereals and Legumes |
| GRSC 811 | Principals of Food Analysis |
| GRSC 815 | Fundamentals of Processing Grains for Food |
| GRSC 901 | Starch Chemistry and Technology |
| GRSC 905 | Enzyme Applications |
| GRSC 915 | Advanced Cereal Chemistry |

**Horticulture, forestry, and recreation resources**

| | |
|---|---|
| HORT 700 | Vegetable Crop Physiology |
| HORT 792 | Handling and Processing Fruits and Vegetables |

**Hotel, restaurant, institution management and dietetics**

| | |
|---|---|
| HRIMD 650 | Fundamentals of Public Health and Food Safety |
| HRIMD 805 | Food Production Management |
| HRiMD 880 | Resource Procurement for Foodservice Systems |
| HRIMD 890 | Foodservice Administration |
| HRIMD 895 | Cost Controls in Foodservice Systems |

**Statistics**

| | |
|---|---|
| STAT 703 | Statistical Methods for Natural Scientists |
| STAT 704 | Analysis of Variance and Covariance |
| STAT 705 | Regression and Correlation Analyses |
| STAT 720 | Design of Experiments |
| STAT 730 | Multivariate Statistical Methods |

# Genetics

Chairman: George H. Liang

Professors Clayberg, Cox, Davis, Denell, Gill, Hatchett, Hedgcoth, Manney, Muthukrishnan, Nassar, Reeck, Schalles, Schapaugh, Sears, Stuteville, and Williams; Associate Professors Leslie, Tomb, and White; Assistant Professors Eversmeyer, Heaton, Hulbert, Kanost, Montelone, Skinner, and Wang.

The genetics curriculum is sponsored by several departments to offer specialized education in genetics to students in a variety of disciplines. Graduate work leading to M.S. and Ph.D. degrees in genetics is administered by the faculty of participating departments. These departments are agronomy, animal sciences and industry, biochemistry, entomology, horticulture, forestry and recreation resources, physics, plant pathology, statistics, and the Division of Biology. The genetics program consists of 26 full-time graduate faculty members and about 20 graduate students, several visiting scientists, and postdoctoral fellows. All faculty members direct active research projects, and there is a high degree of interaction and cooperation among researchers in various areas of genetics.

Graduate students are expected to start research in their first year and will receive individual attention and help. The objective is to produce graduates of the highest standard of quality. The curriculum is broad, including animal, physiological, molecular, microbial, fungal, yeast, population, quantitative, and behavioral genetics, as well as cytogenetics, genetic engineering, tissue culture, etc. Flexibility is maintained to build a framework of fundamental information by which new findings and concepts can be assimilated as they arise in the rapidly changing field of genetics.

The genetics program is well equipped. Major research instruments include ultracentrifuges; high-speed and desktop centrifuges;, HPLC, research-grade microscopes; electrophoretic apparatus; spectrophotometers; PCR and gene cloning instruments; tissue culture facilities, such as laminar flow hoods, incubation and growth chambers, darkroom facilities and computers; excellent greenhouse equipment with adequate space; and seed storage and field research related facilities.

Original research is of basic importance for graduate study. The small size of the research labs, averaging three to four students per lab, makes for close interaction within the group. Students are encouraged to attend and participate in seminars offered by participating departments.

Application forms for admission can be obtained from the Program Chairman at Throckmorton Hall, Kansas State University, Manhattan, KS 66506-5501. Applicants will be carefully considered by faculty familiar with the academic and research achievements of the candidates. Out-of-state tuition is waived for students who are awarded graduate research or teaching assistantships. There is no language requirement besides English. Foreign students are expected to have a TOEFL score of 550 or better; the GRE is desired but not required.

Students who consider pursuing graduate careers at Kansas State University are encouraged to visit the university in order to meet with members of faculty and with other students and to form their own impression of the general atmosphere and of the many research possibilities.

## Degree options and requirements

### Master of science

A minimum of 30 credits is required with 6 to 8 research hours. Core courses include:

A statistics course (700 level).
A course in molecular biology, molecular genetics.
A course in biochemistry (500 level or higher).
Two additional genetics or breeding courses (plant or animal).
A minimum of 1 credit of graduate level seminar.
Scientific writing (1 cr.) is encouraged for foreign students.

### Doctor of philosophy

A minimum of 90 credits is required, with typical course programs of 30 to 40 credit hours:

A statistics course (700 level or higher).
A course in molecular biology, molecular genetics, or nucleic acids.
A biochemistry course (500 level or higher).
Four additional genetics and/or breeding courses (plant or animal).
A minimum of 3 credits of graduate-level seminars may include seminars offered by participating departments; one of the seminar credits may be substituted by Scientific Writing, or by teaching a semester-long laboratory course; one of the three seminars must be an oral seminar presenting the candidate's research.

### Core courses options

**Agronomy**

| | |
|---|---|
| AGRON 770 | Plant Genetics |
| AGRON 830 | Quantitative Genetics in Relation to Plant Breeding |
| AGRON 860 | Applied Plant Breeding |
| AGRON 910 | Topics in Plant Breeding |
| AGRON 930 | Topics in Plant Genetics |
| AGRON 940 | Genetic Manipulation of Crop Plants |
| AGRON 970 | Advanced Plant Breeding |

**Animal science and industry**

| | |
|---|---|
| ASI 655 | Behavior of Domestic Animals |
| ASI 749 | Advanced Animal Breeding |

**Biochemistry**

| | |
|---|---|
| BIOCH 521 | General Biochemistry |
| BIOCH 522 | General Biochemistry Lab |
| BIOCH 700 | Advanced Topics in Plant Biochemistry |
| BIOCH 755 | Biochemistry I |
| BIOCH 756 | Biochemistry I Lab |
| BIOCH 765 | Biochemistry II |
| BIOCH 766 | Biochemistry II Lab |
| BIOCH 920 | Nucleic Acids |

**Biology**

| | |
|---|---|
| BIOL 540 | Molecular Biology |
| BIOL 551 | Taxonomy of Flowering Plants |
| BIOL 615 | Cytogenetics |
| BIOL 620 | Evolution |
| BIOL 655 | Genetics Laboratory |
| BIOL 675 | Genetics of Microorganisms |
| BIOL 691 | Microbial Genetics Laboratory |
| BIOL 760 | Genetic Engineering |
| BIOL 805 | Advanced Mycology |
| BIOL 815 | Plasmid Biology |
| BIOL 860 | Molecular and Cellular Biology |

**Entomology**

| | |
|---|---|
| ENTOM 799 | Problems in Entomology (Evolutionary Genetics) |
| ENTOM 845 | Insect Host Plant Resistance |
| ENTOM 910 | Insect Genetics |

**Horticulture, forestry, and recreational resources**

| | |
|---|---|
| HORT 740 | Horticultural Plant Breeding |
| HORT 780 | Topics/Plant Micropropagation |
| HORT 846 | Plant Research Methods |
| HORT 910 | Topics in Plant Breeding |
| HORT 940 | Plant Regulators in Horticulture |

**Plant pathology**

| | |
|---|---|
| PLPTH 735 | Plant Virology |
| PLPTH 860 | Host Plant Resistance to Disease |
| PLPTH 911 | Plant Tissue Culture and Regeneration |
| PLPTH 912 | Molecular Approaches in Plant Pathology |
| PLPTH 915 | Advanced Techniques in Cytogenetics |
| PLPTH 927 | Fungal Genetics |
| PLPTH 930 | Genome Analysis |

# Gerontology

### Center for Aging
Lyn Norris–Baker, Director

The graduate emphasis in gerontology is an interdisciplinary program designed to be taken concurrently with or in addition to a graduate degree program in any discipline at either the master's or doctorate level. The total program requires 14 to 18 credit hours, some of which may overlap with degree requirements for the student's disciplinary degree.

Professionals working in diverse careers are seeking training in gerontology to assist them in working with the aged population. This rapidly growing segment of our population in the United States and Western society is creating an increasing demand for personnel in a variety of occupations and professions who possess specialized training in gerontology. The graduate emphasis in gerontology provides students the opportunity to integrate knowledge received in their major professional disciplines with a program of academic study and field experience in gerontology. These programs would be of special interest to students preparing for careers in architecture, psychology, counseling, management, marketing, medicine, biology, law, ministry, community and regional planning, sociology, public administration, family and child development, speech pathology, nursing, horticulture therapy, clothing and interior design, media, physical therapy, long-term care facilities, and foods and nutrition.

The Center for Aging coordinates gerontology education, research, and service across six colleges: agriculture, architecture and design, arts and sciences, business administration, education, and human ecology. Faculty and staff from these colleges as well as from the Division of Cooperative Extension and the Division of Continuing Education participate on the three center committees of education, research, and outreach. The education committee oversees the graduate emphasis in gerontology program and the undergraduate secondary major in gerontology.

**Requirements for graduate emphasis**

1. One graduate-level (700+) course in gerontology in the student's own discipline (3 credit hours). If a course is not available in the student's discipline, a special problems course may be arranged with the director of the Center for Aging.

2. Two graduate-level (500+) courses in gerontology in disciplines other than the student's own (total of 6 credit hours).

3. A practicum-colloquium in gerontological setting (3 credit hours).

4. Master's project, thesis, or report, or Ph.D. dissertation with gerontological focus or relevance to aging (2–6 credit hours).

In addition to the regularly offered gerontology electives, the education committee of the Center for Aging may approve courses with an aging focus such as intersession topics/problems or independent study courses which are offered for one semester only. For information on specific courses, contact the Center for Aging.

Gerontology faculty offer graduate courses from five colleges within the university. To enroll in the program, students need only contact the Center for Aging and request that the graduate emphasis be added to their current disciplinary program. Due to budget limitations, there are no GRA or GTA positions available.

### Courses

**Adult and continuing education**
EDACE 782 Educational Gerontology (3)

**Architecture**
ARCH 730 Environment and Aging (3)

**Clothing, textiles and interior design**
ID 610 Housing for Special Needs (3)
ID 751 Design for Exceptional Needs (3)

**Foods and nutrition**
FN 718 Physical Health and Aging (3)
FN 817 Nutrition and Aging (2-3)

**History**
HIST 520 Death and Dying in History (3)

**Horticulture**
HORT 525 Horticulture for Special Populations (3)

**Human development and family studies**
HDFS 510 Human Development and Aging (3)
HDFS 654 Death and the Family (3)
HDFS 704 Seminar in Human Development and Family Studies (Center for Aging approval required for gerontology credit)
HDFS 770 Economics of Aging (3)
HDFS 845 Adult Development and Aging (3)

**Kinesiology**
KIN 796 Topics in Physical Education (3) (Center for Aging approval required for gerontology credit)

**Psychology**
PSYCH 520 Life-Span Personality Development (3)

**Regional and community planning**
PLAN 761 Community Development Workshop (Var)(Project approval from Center for Aging required)

**Social work**
SOCWK 566 Social Work in Aging Services (3)

**Sociology**
SOCIO 744 Social Gerontology: An Introduction to the Sociology of Aging (3)
SOCIO 944 Seminar in the Sociology of Aging (3)

**Speech**
SPPAT 605 Communication Disorders and Aging (3)
THTRE 665 Theatre for Special Populations (3)

### Requirements for graduate emphasis in long-term care administration

The emphasis in long-term care administration is designed to prepare students to meet the future challenges in the changing long-term care field. Any student who completes the requirements for the emphasis is eligible to take the Kansas Nursing Home Administrators licensing examination. Students who currently possess a bachelor's degree must have completed courses previously or include as part of their graduate programs of study courses in:

1. Psychology of Aging or Human Development and Aging.

2. Biology of Aging or Physical Health and Aging.

3. Sociology of Aging.

4. An elective gerontology course.

5. Accounting.

6. Health care management or business management.

In addition, students are required to complete a course specific to long-term care issues and a 480-hour (6 credit hour) internship in a long-term care setting. (GERON 515/DHE 515).

# Human Ecology

Anthony Jurich, Chair

Professors Bollman, Jurich, McCullough, Miller, Moxley, Murray, Reagan, Russell, Schumm, Setser, Shanklin, and Spears; Associate Professors Balk, Bergen, Canter, Gould, Huck, Murray, Peterson, Poresky, Roach, Scheidt, Wanska, White, and Wright; Assistant Professors De Luccie, Miller, Minshall, and Munson.

The Ph.D. program in human ecology presents the opportunity for specialized study in one of five areas. The Ph.D. program is offered by the graduate faculty members of the Departments of Clothing, Textiles, and Interior Design; Hotel, Restaurant, Institution Management and Dietetics; and Human Development and Family Studies. A separate Ph.D. program is offered by the Department of Foods and Nutrition. Each student must identify a specialization when applying.

The following specializations are offered:

### Family life education and consultation

The family life education and consultation specialization prepares candidates to conduct, administer, and evaluate programs for enhancing the quality of family life. This specialization requires course work in human development, family studies, family life education, research methods, evaluation, and applied practice in family and community service organizations. Graduates are qualified for positions in colleges and universities, cooperative extension, human service agencies, and similar professions.

### Foodservice and hospitality management

The foodservice and hospitality management specialization integrates management and behavorial sciences concepts into the provision of quality food and services in diverse settings. Graduates are prepared with a knowledge base and skills to assume leadership roles in foodservice and hospitality management education, research, and practice.

### Life span human development
The life span human development specialization emphasizes the growth and development of the individual over the course of a lifetime, the varying contexts of human development, and the processes underlying development throughout the life cycle. The program encompasses theory and research in child and adolescent development, adult development, gerontology, family studies, and thanatology. Graduates may prepare for careers in research, applied human services, or academic positions.

### Marriage and family therapy
The marriage and family therapy specialization prepares professionals to conduct and critically evaluate therapy with marital and family groups. Students pursue a program of study that includes human development, family studies, marital and family therapy, statistics, and research methods. The doctoral program in marriage and family therapy is accredited by the Commission on Accreditation for Marriage and Family Therapy Education.

### Textiles and apparel
The textiles and apparel specialization focuses on the historic, sociopsychological, economic, chemical, or functional design aspects of textiles and apparel. Research problems are approached from a systems perspective incorporating human and environmental factors. The specialization prepares students for positions in higher education, business, industry, extension, museums, and/or government.

### Programs of study
Each student, with the guidance of an advisor and a graduate committee, prepares an individualized program of study to meet the student's goals, as well as program requirements. Programs of study include a minimum of 90 credit hours beyond the bachelor's degree, with at least 30 hours course work in the major area, 30 hours in dissertation research, and the remainder in supporting courses. Inquiries should be directed to: Chair, Ph.D. Coordinating Committee, 119 Justin Hall, College of Human Ecology, Kansas State University, Manhattan, Kansas 66506-1401.

# International Trade Studies

Charles Bussing, Committee Chair

Professors Bussing, Deyoe, Fatemi, Frey, Goodwin, Gormely, Hadja, and Murray.

International trade has grown more rapidly since World War II than the world's output of goods and services. As a result, the world's economy has become increasingly internationalized. Foreign trade has become progressively important both for U.S. industry and agriculture.

Kansas State University's mission as a land-grant university is irrevocably linked to this internationalization and its impact on economic, political, and social processes. Recognizing that the whole character of the modern world is influenced by past and present international trade, the university provides students with the opportunity to broaden their knowledge and understanding in this important area. K-State offers a full range of academic programs reflecting the notion that international trade exchanges goods, capital, and services and fosters the transmission of ideas about technological advance and scientific achievement, standard of living and ways of life, and political, diplomatic, and economic arrangements. Several departments focus on developing appropriate skills and interests at the graduate level. Students desiring to develop a proficiency in international trade can choose from the following master's programs:

### Agricultural economics
The master of science in agricultural economics offers students opportunities for careers in international trade. Students interested in such careers may include in their programs of study trade-related elective courses in agricultural economics, economics, and other departments. The courses listed below are suggested for consideration.

### Business administration
The master of business administration degree offers students strong preparation for careers in international trade and international business management. Most courses in the M.B.A. program are carefully structured to contain the worldwide dimension required by the AACSB accreditation standards. Additionally, students are allowed to choose international trade as their area of concentration in the M.B.A. program. The program consists of 33 hours, 24 hours of which are specified. The other 9 hours can be taken from courses that relate to the student's area of concentration. Those concentrating in international trade can take ECON 823 Advanced International Economics; FINAN 820 Advanced International Financial Management; ECON 681 International Trade; MKTG 844 Advanced International Marketing; and MGMT 690 International Management.

### Economics
The master of arts in economics offers students opportunities for careers in international trade. Students interested in such careers may include in their programs of study trade-related elective courses in agricultural economics, economics, and other departments. The courses listed below are suggested for consideration.

### Geography
The master of arts in geography offers students an opportunity to prepare for a career in international trade. Students must complete all requirements for the M.A. degree as set forth in the geography section of this catalog. The following courses are required: GEOG 740 Geography of Transportation; a 600-level regional geography course; and a minimum of 6 hours of trade-related courses from outside the department from those listed below.

### Grain science
The master of science in grain science may prepare students for a career in international trade. Required departmental courses give students a background in grain quality and processing. In addition students should take AGEC 623 Export Marketing and Agricultural and Food Products and additional hours from the following list that are directly related to international trade.

### Political science
The master of arts in political science and the master in public administration degrees prepare students for careers in international trade. Students working on the M.A. degree should take the required courses in political science. In addition, they may take a minimum of 6 hours from trade-related courses outside the department, such as ECON 681 International Trade and ECON 823 Advanced International Economics. Students in the M.P.A. program may focus on international trade by taking a minimum of 12 hours from among illustrative courses listed below.

### Sociology
The master of arts in sociology may prepare a student for a career in international trade when based upon undergraduate work in basic economics, sociology, and other social sciences. In addition to those required for a master's degree, courses may be selected from those listed below.

### Selected courses dealing with international trade

| | |
|---|---|
| AGEC 615 | International Agricultural Development |
| AGEC 623 | Export Marketing of Agricultural and Food Products |
| AGEC 631 | Principles of Transportation |
| AGEC 710 | Quantitative Methods in Agricultural Marketing Firms |
| AGEC 840 | Marketing Strategies and Policies in International Grain Markets |
| ANTH 511 | Cultural Ecology and Economy |
| ECON 681 | International Trade |
| ECON 823 | Advanced International Economics |
| FINAN 554 | International Financial Management |
| FINAN 820 | Advanced International Financial Management |
| GEOG 740 | Geography of Transportation |
| MANGT 690 | nternational Management |
| MKTG 544 | International Marketing |
| MKTG 844 | Advanced International Marketing |
| POLSC 541 | International Relations |
| POLSC 543 | American Foreign Policy |
| POLSC 647 | International Law |
| SOCIO 951 | Social and Institutional Dynamics |

A minimum of 12 hours of study of a modern language is recommended.

# South Asian Studies

Lelah Dushkin, Director

South Asian studies focus on the geographic, linguistic, and cultural regions of Afghanistan, Bangladesh, India, Nepal, Pakistan, Sri Lanka, Bhutan, and the Maldive Republic.

Specialization in South Asian studies is possible at the master's level in history, political science, and sociology, and in selected instances for Ph.D. students in history and sociology.

For more information contact the South Asia Center, 304 Fairchild Hall, Manhattan, Kansas 66506, (913) 532-5990.

# Agriculture

## Agricultural Economics

**Interim Department head**
**Orlan H. Buller,** Michigan State University, (Agricultural Resource Economics, Production Economics, Farm Management).

**Director of graduate studies**
**Allen M. Featherstone,** Purdue University, (Agricultural Finance and Production Economics).

**Professors**
**G. A. (Art) Barnaby,** Texas A&M University, (Finance, Government Programs, Extension Specialist).

**David Barton,** Purdue University, (Cooperatives, Agribusiness Management, Agricultural Marketing).

**Arlo W. Biere,** University of California, Berkeley, (Local Government Economics, Natural Resource Economics, Quantitative Economic Methods).

**Donald B. Erickson,** Purdue University, (Agricultural Marketing, Community Development).

**Marc A. Johnson,** Michigan State University, (Transportation, Agricultural Marketing).

**Larry N. Langemeier,** University of Missouri, (Farm Management, Accounting and Computer Methods, Price Analysis.).

**David W. Norman,** Oregon State University, (Agricultural Development).

**Richard Phillips,** Iowa State University, (Agricultural Marketing, Agribusiness, International Agricultural Development).

**John B. Riley,** Oklahoma State University, (Agribusiness Management, Agricultural Finance, Marketing).

**Bryan W. Schurle,** Ohio State University, (Farm Management, Production Economics, Quantitative Methods).

**Jeffery Williams,** Michigan State University, (Farm Management, Natural Resource Economics).

**Associate Professors**
**Robert O. Burton, Jr.,** Purdue University, (Farm Management, Farm Finance and Production Economics).

**Barry Goodwin,** North Carolina State University, (Consumer Demand, International Trade).

**Orlen Grunewald,** University of Kentucky, (Marketing).

**James Mintert,** University of Missouri-Columbia, (Livestock Marketing, Futures Markets and Price Forecasting).

**Ted Schroeder,** Iowa State University, (Marketing, Price Analysis, Econometrics).

**Assistant Professors**
**Andrew Barkley,** University of Chicago, (Agricultural Policy).

**Gary W. Brester,** North Carolina State University, (Agribusiness).

**Gordon L. Carricker,** Clemson University, (Natural Resource Economics, Sustainable Agriculture).

**Michael Langemeier,** Purdue University, (Livestock Economics).

**Assistant Ag Economist**
**John (Zach) Lea,** University of Florida, (International Grain Marketing and Agribusiness Development Policy).

### Program description

The Department of Agricultural Economics offers studies leading to a Master of Science or Ph.D. degree. The Ph.D. degree is joint with the Department of Economics. The graduate program stresses a strong foundation in economic theory and quantitative analysis, and their application in agriculturally related areas. The agricultural economics program seeks to achieve excellence in teaching, research and extension through the development of the individual student. The core curriculum is deliberately broad in order to build a framework of fundamental information so that new findings and concepts can be assimilated as they arise in the rapidly changing field of agricultural economics. The core curriculum requires of every student successful completion of courses in microeconomic, and macroeconomic theory, quantitative methods, production economics, and agricultural marketing.

A joint agricultural economics and economics graduate committee administers the Ph.D. degree program. A graduate committee in agricultural economics administers the M.S. degree program. The Ph.D. degree and the thesis option of the M.S. degree requires writing a thesis based on independent and original research. We expect original doctoral research work to be of sufficient quality and importance to merit publication in a refereed journal.

### Requirements

Most incoming students have degrees in agricultural economics, economics, business, or some other field in agriculture. Some students have degrees in other social sciences, statistics, computer science, or engineering. The most important consideration for applicants is an interest in continued study and intensive research in some area of agricultural economics with the minimum prerequisites for admission to the program. A strong background in economics and quantitative methods and a sufficient understanding of agriculture are the most important requirements.

Application for admission to the program in a fall semester should be made in the preceding winter or early spring.

For additional information and application material please contact:

Allen M. Featherstone
Director of Graduate Studies
Department of Agricultural Economics
Waters Hall
Kansas State University
Manhattan, KS 66506–4011
(913) 532-6702

### Admission

Admission to graduate study in agricultural economics requires a minimum grade point average of 3.0 (B average) in the last two years of undergraduate work that earned a bachelor's degree. Undergraduate subject matter requirements are as follows:

a. 5 or 6 semester hours of principles of economics

b. 3 semester hours of intermediate microeconomics theory or production economics and agricultural market structures

c. 3 semester hours of intermediate macroeconomic theory

d. 3 additional semester hours of agricultural economics of economics

e. a course in statistics

f. a course in calculus

Students whose undergraduate academic performance and program of study warrant admission, although some of the subject matter requirements are not met, may be admitted provisionally. Students admitted provisionally will make up these deficiencies by enrolling in appropriate courses for undergraduate credit.

Applicants with grades in the final two years of an undergraduate program that average below 3.0 may, in exceptional cases, be considered for probational admission. Applicants admitted on a probational basis must acquire regular standing by doing satisfactory graduate work during the first semester of graduate study.

### Master's degree requirements

The requirements for a master's degree in agricultural economics may be completed under one of two plans: (1) Complete a minimum of 30 semester credit hours including preparation of a thesis for which 6 to 8 credit hours are awarded. (2) Complete a minimum of 36 semester credit hours.

The 30-credit-hour program with thesis is structured to prepare students for careers in research, analysis, or to continue towards a Ph.D. program. The 36 credit hour program has fewer formal requirements but allows more flexibility to plan and prepare students for careers in public service, commerce, and industry.

The candidate is required to take a final oral examination covering the thesis and the subject matter in the major field and the minor field when a minor is selected.

### Ph.D. requirements

The Ph.D. program is offered in cooperation with the Department of Economics. A Ph.D. program of study must have at least 60 credit hours of graduate course work (the credit received for writing an M.S. thesis or report may be used to help meet the 60 credit hour requirements), and 30 hours of research credits are required for the Ph.D. dissertation. A minimum of 24 credit hours of course work

on the program of study must be taken at Kansas State University.

The program of study in agricultural economics shall include coursework in four branches: economic theory and its history, research methodology, general agricultural economics, and a specialty branch in agricultural economics. The student may choose to list a minor field in addition. No course may be listed in more than one branch or field.

After completing 15 hours of microeconomics and macroeconomics and 9 hours of econometrics and statistics, the student takes qualifying examinations in economic theory and research methodology. After completing all course work on the program of study, the student takes comprehensive examinations in two branches of agricultural economics and in the minor field when the student has declared a minor field. After passing the comprehensive examinations the student is admitted to candidacy.

The candidate prepares a written dissertation proposal including an identification of the problem, a review of relevant literature, and an outline of proposed research procedures to be used. The candidate must satisfactorily defend the proposal in a seminar at least six months before the final Ph.D. oral in which the candidate defends the dissertation.

## Research facilities

The Department of Agricultural Economics is well equipped for research in many areas of agricultural economics. Computing equipment and support staff are available to assist researchers. Interdisciplinary research is encouraged and facilitated if appropriate.

Graduate programs and research in related departments—such as economics, statistics, mathematics, computer science, industrial engineering, business administration and the production departments in agriculture—provide support for research and graduate education in agricultural economics.

## Financial support

A limited number of graduate teaching and research assistantships are awarded to graduate students qualified for regular or provisional admission. Graduate assistantships are usually for a four-tenths time basis. Stipends vary depending on time worked and level of graduate education. Graduate assistants and instructors are regarded as residents for enrollment fee purposes. From time to time, fellowships and other grant funds supplied on a scholarship basis are available to qualified students.

## Undergraduate and graduate credit in minor field

**AGEC 500. Production Economics.** (3) I, II. Application of economic principles to problems of agriculture. Economic structure and aspects of American agriculture; analysis of demand supply, production of agricultural products with particular reference to the firm. AGEC 505 is a continuation of this course and they are intended to be taken in consecutive semesters. Three hours rec. a week. Pr.: AGEC 120 or ECON 120 and MATH 205.

**AGEC 505. Agricultural Market Structures.** (3) I, II. Theory and application of economic principles to marketing problems in agriculture. Pricing of agricultural output and productive services under various forms of economic organization and competition; regional specialization, location, and trade; determinants of economic change; evaluation of economic and consumer welfare. Three hours rec. a week. Pr.: ECON 110 and AGEC 500.

**AGEC 513. Agricultural Finance.** (3) I. Analysis of capital investments, interpretation of financial statements, capital structure considerations for agricultural firms, and farm real estate pricing. Three hours rec. a week. Pr.: AGEC 308 or AGEC 318 and ACCTG 231.

**AGEC 515. Agribusiness Marketing.** (3) I. A broad view of marketing; food markets and consumption; marketing functions and institutions; prices, competition, and marketing costs; functional and organizational issues; food marketing regulations; commodity marketing. Three hours rec. a week. Pr.: AGREC 120 or ECON 120.

**AGEC 525. Natural Resource Economics.** (3) I. Emphasis on the application of welfare economics concepts in the study of current natural resource uses, policies, and problems. Introductory course for students interested in problems of natural resource use and environmental quality. Three hours rec. a week. Pr.: ECON 120 and junior standing.

**AGEC 541 Agricultural Economics and Agribusiness Seminar.** (Var.). Seminars of special interest will be offered upon sufficient demand in selected areas relating to agricultural economics and agribusiness.

**AGEC 598. Farm Management Strategy.** (3) I. A study of management concepts, tools, and decision strategies applied to farm firms. Alternative measures of farm business performances, as well as planning and evaluation techniques for an uncertain economic environment are examined. Three hours rec. a week. Pr.: AGEC 308, AGEC 500 and AGEC 513.

**AGEC 599. Agribusiness Management Strategy.** (3) II. This course integrates the risk, production, marketing, and financial management strategies of agribusiness firms. Special attention is given to the application of economic theory and quantitative analysis to business decision-making processes. In addition to case studies, a variety of analytical techniques will focus on both markets and firms involved in the production and marketing of food commodities. Three hours lec. a week. Pr.: AGEC 318, AGEC 500, AGEC 513 or FINAN 450, AGEC 515.

## Agricultural economics courses

### Graduate credit

**AGEC 605. Price Analysis and Forecasting.** (3). II. The analysis of selected agricultural prices; application of regression analysis to price analysis, the role of futures markets and market efficiency, optimal hedging strategies, commodity option pricing, and price forecasting. Three hours rec. a week. Pr.: STAT 330 or 351; AGEC 490; AGEC 505 or ECON 520.

**AGEC 610. Current Agriculture and Natural Resource Policy Issues.** (3) II. Current issues in agricultural and natural resource policy from divergent perspectives. Classroom discussion, debate, writing assignments, and student presentations. Current events are analyzed and synthesized from both economic and noneconomic perspectives. Topics may include environmental issues, international agricultural development, rural development, the politics of farm programs, and the relationship between technology, agriculture, and society. Pr.: AGEC 505 and AGEC 525 or AGEC 410.

**AGEC 615. International Agricultural Development.** (3) II. A study of principles of economic development and national and international policies that will stimulate development. Individual study is encouraged to meet student interests for understanding the problems and policies for agricultural development and the influence of such development on international policies of the United States. Three hours rec.a week. Pr.: ECON 110.

**AGEC 623. international Agricultural Trade.** (3) II. Applied economics of export marketing. Emphasis on international trade in agricultural products and understanding the international marketing system within which export sales of agricultural and food products take place. Three hours rec. a week. Pr.: AGEC 505.

**AGEC 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.

**AGEC 632. Agribusiness Logistics.** (3) I. Planning for efficient use of transportation, storage and processing facilities in the handling of raw materials and products for agribusiness firms, controlling shipments and inventory in coordination with warehouse and handling operations, and scientific selection of routes, schedules, and equipment. Pr.: ECON 110 and junior standing.

**AGEC 641. Agricultural Economics and Agribusiness Seminar.** (Var.) Seminars of special interest will be offered upon sufficient demand in selected areas relating to agricultural economics and agribusinesses. Pr.: Junior standing and consent of the instructor.

**AGEC 710. Advanced Agribusiness Management.** (3) I. Application of quantitative long-range planning tools for agribusiness. Two hours rec. and two hours lab a week. Pr.: AGEC 518 or graduate standing.

**AGEC 712. Linear Programming and Applications in Agricultural Economics.** (3) II. Application of linear programming and related topics for decision analysis in agricultural firms. Pr.: AGEC 500.

**AGEC 736. Natural Resource Policy.** (3) I. Economic evaluation of resource use policies and impact of those policies on welfare economics. Applications of welfare economics concepts. Externalities are emphasized. For intermediate-level, upper-division undergraduates with a strong economics background, beginning graduate students in economics, and other graduate students. Pr.: Six credit hours in agricultural economics and economics, and junior standing.

**AGEC 740. Seminar in Agricultural Economics Analysis.** (Var.) Seminar on methods of economic analysis will be offered upon sufficient demand. Pr.: Consent of instructor.

**AGEC 750. Agricultural Economics and Agribusiness Problems.** (Var.) I, II, S. Pr.: Junior standing and consent of the instructor.

**AGEC 805. Agricultural Marketing.** (3) S. The study of the demand for supply of agricultural commodities, alternative market structures, the dynamics of marketing institutions that affect market structures, governmental intervention in agricultural markets, futures markets in agriculture, and international agricultural commodities trade. Three hours rec. a week. Pr.: AGEC 505 or ECON 520.

**AGEC 810. Price and Income Policies for Agriculture.** (3) I. A study of the effects of government price, regulatory, and tax policies on (1) farm income levels and variability, (2) farm productivity and output, (3) economic structure of farming, and (4) performance of agricultural markets. Three hours. rec. a week. Pr.: AGEC 500 or ECON 520, ECON 510.

**AGEC 812. Advanced Farm Economics.** (3) I. A study of managerial techniques and processes applied to farm firms involved in production and marketing of agricultural products. This study includes managerial planning, evaluation, and control of farm businesses. Three hours rec. a week. Pr.: AGEC 512.

**AGEC 823. Production Economics II.** (3) I. 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.: AGEC 500 or consent of instructor.

**AGEC 831. Agricultural Marketing Management and Analysis.** (Var.) I, II, S. Marketing problems of firms that market or process farm products or handle farm supplies, with special emphasis on tools of analysis for solving marketing problems. Supervision if students' internship programs. Pr.: Consent of instructor.

**AGEC 840. International Markets and Agricultural Trade.** (3) II. Pure and monetary theories of international agricultural trade. International trade policies and trade negotiations are evaluated in detail. Special consideration is given to the international trade policy influences on agriculture. The international agricultural trade arena, imperfect competition, and exchange rate economics are discussed. Institutions are policies of major trading nations are explored. Three hours. rec. a week. Pr.: ECON 720.

**AGEC 898. Agricultural Economics Master's Report.** (Var.) I, II, S. Master's report.

**AGEC 899. Agricultural Economics Master's Research.** (Var.) I, II, S. Research for master's thesis.

**AGEC 901. Research Methods in Economics.** (3) I. A study of scientific methodology in economic research including the history of various debates regarding methodology in economics. The course also deals with problem definitions, formulation of hypotheses, listing of hypotheses, and presentation of research results. Three hours rec. a week. Pr.: Graduate standing.

**AGEC 905. Agricultural Demand and Price Analysis.** (3) II. A study of the demand for and supply of farm products, price formation and markets, the causes of price variations and instability, the dynamic analysis of agricultural prices. Three hours rec. a week. Pr.: ECON 730, AGEC 805, ECON 945.

**AGEC 922. Seminar in Agricultural Marketing.** (Var.) 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.

**AGEC 923. Economics of Agricultural Production.** (3) I. A study of agricultural production response to prices; methods of estimating supply response and price expectations; the effects of government and institutions on agricultural supply and the role of risk, technical change, and the number and size of farms on agricultural supply. Three hours rec. a week. Pr.: ECON 730, AGEC 823, ECON 945.

**AGEC 936. Quantitative Topics in Agricultural Economics.** (3) II, in even years. A study of recent developments reported in the literature concerning quantitative methods of analysis in agricultural economics and economics. The study will include assigned projects to apply selected techniques of analysis. Three hours rec a week. Pr.: ECON 935.

**AGEC 940. Seminar in Agricultural Economics.** (Var.) On sufficient demand. Problems and current developments in agricultural economics. Pr.: Consent of instructor.

**AGEC 955. Independent Study of Advanced Topics in Agricultural Economics.** (Var.) I, II, S. Advanced independent study of an agricultural economics topic based upon a student proposal approved by the student's supervisory committee. Pr.: Completion of 24 credits of graduate study.

**AGEC 999. Agricultural Economics Ph.D. Research.** (Var.) I, II, S. Research for Ph.D. dissertation.

# Agronomy

**Head**

**Professor G.L. Posler,** Ph.D., Iowa State University (Forage management and utilization: cool-season grasses, legumes, and legume-grass mixtures; summer and winter annual forages for beef cow-calf programs).

**Professors**

**M.B. Kirkham,** Ph.D., University of Wisconsin (Plant physiology: plant-water relationships; effect of soil physical characteristics on water and ion uptake; $CO_2$ enrichment).

**R.E. Lamond,** Ph.D., Kansas State University (Soil fertility–soil management: plant nutrient efficiency and management including: rates, sources and placement; soil compaction).

**G.H. Liang,** Ph.D., University of Wisconsin (Cytogenetics and somatic cell genetics: protoplast and anther culture; organelle genetics of alfalfa and sorghum; chromosome banding of sorghum and related species; transformation using pollen tubes as vectors).

**C.E. Owensby,** Ph.D., Kansas State University (Range management: grazing systems; diet supplementation; range plant physiology; fire ecology; $CO_2$ enrichment; range animal nutrition on tallgrass prairie).

**G.M. Paulsen,** Ph.D., University of Wisconsin (Crop physiology: physiology; environmental stress; preharvest sprouting; production efficiency).

**D.L. Regehr,** Ph.D., University of Illinois (Weed science: weed management practices; tillage and residue management systems; herbicide evaluation).

**W.T. Schapaugh, Jr.,** Ph.D., Purdue University (Soybean breeding and genetics: variety development; heat and drought tolerance; soybean cyst nematode resistance; breeding methodology; tissue culture).

**R.G. Sears,** Ph.D., Oregon State University (Wheat breeding and genetics: genetic improvement of hard winter wheats and triticale; tissue culture and molecular genetics).

**J.P. Shroyer,** Ph.D., Iowa State University (Crop production: cultural and production practices for small grains, alfalfa and row crops).

**E.L. Skidmore*,** Ph.D., Oklahoma State University (Wind erosion: barrier influence; residue management; water conservation and soil-physical properties; simulation modeling).

**L.R. Stone,** Ph.D., South Dakota State University (Soil and water management-soil physics: limited irrigation systems; soil water movement; crop water use patterns; soil physical and structural conditions; root growth patterns).

**S.J. Thien,** Ph.D., Purdue University (Soil biochemistry-root physiology: biochemical interaction between plant roots and soil environment; phosphorus cycling in low-input systems; chemical and biochemical reactions affecting phosphorus availability from organic and inorganic pools).

**R.L. Vanderlip,** Ph.D., Iowa State University (Crop production: crop growth modeling; development and yield of sorghum; planting and replant guidelines for sorghum and corn; stand establishment in pearl millet).

**D.A. Whitney,** Ph.D., Iowa State University (Soil fertility-soil testing: development of soil test methods; interpretation of soil tests; efficient fertilizer application).

**Associate professors**

**D.V. Armbrust*,** Ph.D., Kansas State University (Wind erosion: plant damage; residue management; soil physical properties; erosion productivity).

**P.J. Bramel–Cox,** Ph.D., Iowa State University (Sorghum breeding and genetics: selection for resistance or tolerance to drought, salinity, stalk rot, chinch bug, greenbug; recurrent selection; utilization of exotic and wild germplasm).

**T.S. Cox*,** Ph.D., Iowa State University (Wheat genetics and germplasm enhancement: multiple pest resistance; molecular mapping; interspecific hybridization; recurrent selection).

**S.W. Ehler,** Ph.D., University of Missouri (Grain production: cropping systems; stress physiology; weed management; sustainable agriculture).

**W.H. Fick,** Ph.D., Texas Tech University (Range improvement: weed and brush control; eastern gamagrass production, quality and physiology).

**J.L. Havlin,** Ph.D., Colorado State University (Soil fertility-soil chemistry: nitrogen and phosphorus management; tillage/residue effects on soil, water and nutrient cycling; spatial variability).

**L. J. Moshier,** Ph.D., Michigan State University (Weed physiology: integration of weed biology, crop culture and chemicals to control persistent weeds).

**M.D. Ransom,** Ph.D., The Ohio State University (Soil genesis, classification and mineralogy: processes of soil genesis; clay and carbonate movement in semi-arid soils; soil micromorphology; clay mineral weathering; use of satellite imagery for soil survey).

**A.P. Schwab,** Ph.D., Colorado State University (Soil physical chemistry: environmental assessment of atrazine, alachlor and nitrate movement in soil; nitrogen and phosphorus cycling).

**Assistant professors**

**J.O. Fritz,** Ph.D., University of Illinois (Forage production-management: forage quality and utilization; forage physiology; cell wall chemistry; energy utilization of forages by ruminants).

**L.J. Hagen*,** Ph.D., Kansas State University (Wind erosion: computerized wind erosion prediction, wind tunnel tests for the subprocesses of trapping, abrasion and loose particle emission; air pollution and control systems).

**J.M. Ham,** Ph.D., Texas A&M University (Environmental physics and micrometerology: energy balance relationships of the soil-plant-atmosphere continuum; modeling soil water and temperature regimes: heat and mass transfer within canopies; irrigation management; environmental quality).

**M.J. Horak,** Ph.D., University of Illinois (Weed ecology: weed management; population biology; crop-weed competition; weed biology).

**G.J. Kluitenberg,** Ph.D., Iowa State University (Soil physics: transport of water, solutes and heat in soil; transport and fate of agricultural chemicals; field-scale spatial variability of soil properties and transport processes; mass and energy exchange between soil and atmosphere).

**G.M. Pierzynski,** Ph.D., The Ohio State University (Soil chemistry-soil fertility: chemistry of phosphorus in soils influenced by inorganic and organic fertilizers; trace element chemistry; nitrogen fertilizer use efficiency).

**C.W. Rice,** Ph.D., University of Kentucky (Soil microbiology: microbial ecology and nutrient cycling; nutrient availability and environmental quality; regulation of denitrification in soils).

**William Rooney,** Ph.D., University of Minnesota (Alfalfa breeding and genetics; development of multiple pest-resistant populations; germplasm enhancement).

**D.Z. Skinner*,** Ph.D., Kansas State University (Alfalfa genetics: germplasm enhancement; molecular mapping; population development).

* Adjunct appointment, USDA–ARS

## Program objectives

The Department of Agronomy offers courses of study leading to degrees of master of science and doctor of philosophy in many diverse crop, soil, and range science specializations. These study areas include: agricultural climatology, crop-climate modeling, crop ecology, crop physiology, crop production, cytogenetics, environmental chemistry, environmental physics, forage management, plant breeding, plant genetics, range science, soil biochemistry, soil fertility, soil genesis and classification, soil microbiology, soil-plant-water relations, soil physics/biophysics, soil/water chemistry, soil/water conservation, soil/water management, and weed science.

The department consists of 43 graduate faculty members, about 75 graduate students, and several postdoctoral fellows and visiting scientists. The faculty are dedicated to providing students individualized training needed to address the many challenges facing agriculture.

Graduate programs are designed to accommodate the interest and objectives of the student. These programs require students to conduct original research. Students receive thorough training in investigative techniques by using modern facilities and through experienced guidance by faculty. Critical parts of the process involve the preparation of research findings in the form of a thesis or dissertation and their publication in a scientific journal. Students are encouraged to develop independent thought as well as a broad spectrum of knowledge. Flexibility in graduate training is

possible because of the large number of faculty and the diversity of their research interests.

## Facilities and equipment

The Department of Agronomy laboratories are well equipped with modern instrumentation for research in the many areas of specialization. Controlled environment chambers and recently constructed greenhouses are available. Excellent dryland and irrigated field research facilities are available at the agronomy farms near Manhattan, at eight agronomy experiment fields, and at four Agricultural Branch Experiment Stations located throughout the state. A large inventory of field, plot and laboratory equipment enable graduate students to plan and implement complex research programs which address challenges facing agriculture. Vehicle support provides student access to the diverse cropping and grazing systems present in Kansas. The Rannells Range Research Unit and the Konza Prairie enable native range investigations to be conducted at Manhattan. Special facilities which can be utilized by graduate students include the USDA Wind Erosion Lab, USDA Grain Marketing Lab, agronomy soil testing lab, and other service labs. Reference materials from the University Library are complemented by the agronomy graduate library, housed within the department. Graduate students benefit from excellent computer and networking facilities through the mainframe computer center, and ethernet. State-of-the-art personal computers are available for use by all students.

## Admission

Incoming students commonly have a bachelor or master of science degree in agriculture, agronomy, crop science, soil science, or related life science. The most important consideration for applicants is an interest in continued study and intensive research in a specific area of agronomy along with prerequisites for admission to the program. Preparation in the biological, physical, and mathematical sciences is considered fundamental for all areas of graduate study in agronomy. Course requirements for each student are determined by a supervisory committee with consideration given to the student's qualifications and professional interests and goals.

### Stipends

Research and teaching assistantships and research fellowships are available to graduate students in the Department of Agronomy. A majority of the students enrolled in Agronomy are supported during their graduate study. Nearly 50 percent of graduate students are appointed to a half-time graduate research assistantship. Stipends are competitive with leading universities. Graduate research assistants are assessed the in-state rate for tuition and fees. Graduate teaching assistants receive a substantial reduction of in-state tuition. An excellent graduate scholarship program provides additional assistance to several graduate students each year.

### Application procedure

Applications are accepted at any time. However, students desiring admission and consideration for an assistantship for the fall semester are urged to submit their applications early, preferably before February 1, to enhance their chances for admission and financial support. Additional information about the department and application forms for admission and assistantships may be obtained from: Dr. W.T. Schapaugh, Chair, Graduate Committee, Department of Agronomy, 318C Throckmorton Hall, Kansas State University, Manhattan, KS 66506. The completed application form, statement of objectives, transcripts, and letters of recommendation are used to determine qualifications for graduate work. GRE scores are not required.

## Agronomy courses

**AGRON 501. Range Management.** (3) I. Fundamental ecological principles of production, conservation, and use of grasslands. Application of these fundamental principles to management. Three hours rec. a week.

**AGRON 515. Soil Genesis and Classification.** (3) II. Study of the factors and processes of soil formation, classification of soils according to soil taxonomy, and use of soil survey information. Required field trips. Two hours rec. and three hours lab a week. Pr.: GEOL 100 and AGRON 305 or consent of instructor.

**AGRON 520. Grain Production.** (3) II. An upper-level course for those interested in grain production in the Central Plains. Pest control, limiting factors, and planting factors will be considered in view of climactic conditions and crop plant growth habit. From this, a crop production strategy will be developed for each crop. Pr.: AGRON 220 and AGRON 375.

**AGRON 550. Forage Management and Utilization.** (3) II. Production and utilization of forage crops. Development of forage programs for livestock production, including pasture and stored forages. Three hours rec. a week. Pr.: AGRON 220 and junior standing.

**AGRON 551. Forage Management and Utilization Laboratory.** (1) II. Identification of forage species, techniques for estimating forage quality, forage physiology, and field trips. One two-hour lab a week. Pr.: Completion of or conc. enrollment in AGRON 550.

**AGRON 560. Field Identification of Range and Pasture Plants.** (1) I, in odd years. Identification of range pasture plants through exposure to them in their natural environment. Pr.: AGRON 220 or BIOL 210 or consent of instructor.

**AGRON 600. Crop Problems.** (Var.) I, II, S. Studies may be chosen in: genetics, crop improvement, forages, ecology, weed control, plant physiology, or crop production.

**AGRON 615. Soil Problems.** (Var.) I, II, S. Studies may be chosen in: chemistry, physics, conservation, fertility, genesis, morphology, or classification.

**AGRON 630. Principles of Crop Improvement.** (3) II. Basic plant breeding techniques used to genetically improve crops. Procedures to increase, distribute, and maintain breeding stocks and varieties. Two lec. and one two-hour lab a week. Pr.: AGRON 220 and ASI 500.

**AGRON 635. Soil Conservation and Management.** (3) I. Principles, mechanics, and prediction of water and wind erosion. Influence of soil erosion on soil productivity and environmental quality. Conservation management technologies for erosion control and sustaining soil productivity. Legislation and land-use planning for soil conservation. Course requires microcomputer skills. Two hours rec. and 1 three-hour lab a week. Pr.: AGRON 305.

**AGRON 645. Soil Microbiology.** (4) I. The nature and function of soil microorganisms in the soil ecosystem. The role of soil microbial activity to soil organic matter, mineral transformations, plant nutrition, and environmental quality. Three hours rec. and two hours lab a week. Pr.: AGRON 305 or BIOL 455.

**AGRON 660. Range Research Techniques.** (3) I, in even years. Discussion of quantitative and qualitative procedures used to study vegetation. Includes application, advantages, and disadvantages of these methods. Use of statistical techniques for sampling, analysis, and presentation of data. Two hours rec. and one three-hour lab a week. Pr.: AGRON 501 and STAT 320.

**AGRON 670. Range Management Problems.** (Var.) I, II. S.

**AGRON 681. Range Ecology.** (3) II, in even years. Application of ecological principles to range ecosystem management. Study of plant-soil-animal interactions with rangelands, and discussion of plant succession, environmental influences, and ecological concepts. Two hours rec. a week and one lab credit consisting of field trips to representative range areas. Pr.: AGRON 501 and BIOL 529.

**AGRON 716. Herbicide Interactions.** (3) II, in even years. A study of systems and physiological processes in plants and soils as they affect herbicide fate and activity and are affected by herbicides. Research methodology and literature will also be discussed and evaluated. Pr.: AGRON 330 and BIOL 500 or equiv.

**AGRON 720. Weed Ecology.** (3) II, in odd years. A study of weed ecology topics including weed/crop interference, weed growth and development, herbicide resistance, biological control, and ecological approaches to weed management. Three lectures per week. Pr.: AGRON 330.

**AGRON 735. Plant Nutrient Sources.** (3) II. An examination and survey of plant nutrient sources. Includes the processes involved in the formulation of chemical fertilizers, the physical and chemical properties of various fertilizer materials, assessment of available nutrients in non-commercial fertilizer materials, and the relative environmental impacts of various plant nutrient sources. Three hours rec. a week plus two one-half day field trips. Pr.: AGRON 375 Soil Fertilizer.

**AGRON 746. Physical Properties of Soils.** (3) II. The properties of soils as affected by their physical environment, including water content, temperature, soil structure, and aeration. Two hours rec. and two hours lab a week. Pr.: AGRON 305.

**AGRON 760. 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-week field course given jointly by Kansas State University and Fort Hays State University. Pr.: AGRON 501, BIOL 529. Suitable field experience may be substituted for these prerequisites with consent of instructor.

**AGRON 762. Range Grasses.** (2) I, in even 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 198 or 210.

**AGRON 770. Plant Genetics.** (3) I. Concepts and application of basic genetic principles in higher plants. Probability, linkage, chromosome aberrations, aneuploidy analysis, gene transfer in wide crosses, tissue culture and crop improvement, and genetics of disease resistance. Three hours rec. a week. Pr.: ASI 500.

**AGRON 790. Range Management Planning.** (3) II, in odd years. Inventory and analysis of rangeland resources and development of detailed management plan. Emphasizes range management principles and practices useful in maximizing production from rangelands. Two hours rec. a week and one lab credit including field trips to ranch operations. Pr.: AGRON 501.

**AGRON 805. Soil Chemistry.** (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 305, GEOL 100.

**AGRON 810. Agronomy Seminar.** (1) I, II. A discussion of agronomic developments. Pr.: Graduate standing.

**AGRON 815. Soil-Root Environment.** (2) I. A study of plant roots and the soil influenced by them; with emphasis on their chemical, microbiological, and physical interactions in the rhizosphere. Pr.: AGRON 375 and BIOL 500.

**AGRON 816. Soil Physics.** (3) II, in even years. A study of the transport of water, heat, gases, and solutes in soil. Examples are presented that related to both agricultural and engineering land uses. Emphasis is given to understanding how soil physical properties and soil management practices influence transport processes. Three hours rec. a week. Pr.: AGRON 746 and MATH 220.

**AGRON 820. Plant-Water Relations.** (3) II. Properties of water, terminology in plant and soil water relations, environmental aspects of plant-water relations, soils as a water reservoir, water as a plant component, water movement through the plant, special aspects of transpiration, development and significance of internal water deficits, drought resistance mechanisms, water consumption by crop plants. Pr.: AGRON 220 and 305, BIOL 500.

**AGRON 825. Soil and Plant Analysis.** (3) I, in odd years. Theories and procedures for the chemical analysis of soils and plant materials. Applications of analysis in soil fertility evaluations and in research work are discussed. One hour rec. and six hours lab a week. Pr.: AGRON 305, CHM 271.

**AGRON 830. Quantitative Genetics in Relation to Plant Breeding.** (3) I, in odd years. Application of statistical principles to biological populations in relation to gene and zygotic frequencies, mating systems, and effects of mutation, migration, and selection on equilibrium populations; partitioning of genetic variance, concept and methods of estimating heritability, theoretical basis of heterosis, diallel cross and combining ability, genotype by environment interaction, genetic advance under selection, models on phenotypic expression of various crops; genetics of autopolyploids. Pr.: AGRON 770, STAT 730, 704, and 705 or equiv.

**AGRON 840. Crop Physiology.** (3) II, in odd years. Principles of nitrogen metabolism, mineral nutrition, photosynthesis, growth substances, and hardiness applied to crop production. Three hours rec. a week. Pr.: BIOL 500.

**AGRON 860. Applied Plant Breeding.** (3) II. This course considers in detail the mechanics of an applied plant breeding program for agronomic crops. Pr.: AGRON 630 or HORT 740, AGRON 770, and STAT 703.

**AGRON 893. Agricultural Simulation Modeling.** (4) I, in odd years. Techniques for developing and testing computer simulation models for research, management, and design applications in agriculture. Three lectures and one three hour work session per week. Pr.: MATH 211, STAT 705, and AGRON 455 or equivalent.

**AGRON 895. Nutrient Cycling Models.** (2) I, in odd years. This course examines several computer simulation models that describe individual nutrient cycling processes and a crop model incorporating several process models. The models examined will deal primarily with cycling of nitrogen and phosphorus. Pr.: AGRON 375 and 705 and one introductory computer programming course.

**AGRON 898. Master's Report.** (2) I, II, S. Preparation of a written report either of research or of problem work on a topic in the major field.

**AGRON 899. Master's Research.** (Var.) I, II, S. Research on a problem which may extend throughout the year and furnish data for a master's thesis.

**AGRON 900. Biometeorology.** (3) II, in even years. A comprehensive analysis of interactions between living organisms and their physical environment. Emphasis is placed on characterizing the transport of heat, water, and carbon within the soil-plant-atmosphere continuum. Includes discussions on aerodynamic transfer, surface energy balances, evapotranspiration, and soil-plant-water relations. The potential impact of climactic change on biosphere productivity will be considered. Three hours rec. a week. Pr.: MATH 211 or MATH 220, PHYS 115, and AGRON 746 or BIOL 500.

**AGRON 901. Environmental Instrumentation.** (3) II, in odd years. A laboratory practicum on the methodology and instrumentation used to measure environmental parameters. Includes discussions on instrument selection, sensor deployment, and data acquisition. Measurement of temperature, radiation, moisture, wind, $CO_2$, and surface energy fluxes will be considered. Two hours rec. and two hours lab a week. Pr.: MATH 210 or MATH 220, PHYS 115, and AGRON 746 or BIOL 500.

**AGRON 905. Soil Physical Chemistry**. (3) I, in even 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 705, 746, and CHM 585.

**AGRON 910. Topics in Plant Breeding.** (Var.) I, II, S. Discussion and lectures on important papers and contributions in this field. Pr.: Consent of instructor. Joint listing with Department of Horticulture. See HORT 910.

**AGRON 916. Advanced Soil Physics.** (3) II, in odd years. An advanced study of the transport of water, heat, and solutes in soil. The theory of unsaturated water flow, coupled heat and water flow, and the convection and dispersion of reactive solutes will be studied in detail. Spatial variability of soil physical properties will be discussed, solute transport will be presented. Three hours rec. a week. Pr.: AGRON 816, MATH 240, and PHYS 113.

**AGRON 925. Advanced Soil Genesis and Classification.** (2) II, in odd years. An advanced study of processes of soil formation and systems of soil classification including soil taxonomy. Two hours rec. a week. Pr.: AGRON 515.

**AGRON 930. Topics in Plant Genetics.** (Var.) I, II, S. Discussion and lectures on important papers and contributions in this field. Pr.: Consent of instructor. Joint listing with Department of Horticulture. See HORT 930.

**AGRON 935. Topics in Soils.** (Var.) I, II, S. Discussion and lectures on important papers and contributions in this field. Pr.: Consent of instructor.

**AGRON 940. Genetic Manipulation of Crop Plants.** (3) I, in even years. Crop evolution, gene pools and origin of species, genetic distance, use of exotic germplasm, breeding techniques, genome organization in plants, and use of biotechnology in plant breeding. Three hours rec. a week. Pr.: BIOL 540; AGRON 770, 830.

**AGRON 945. Soil Mineralogy.** (4) I, in odd years. Theory and application of methods for analyzing minerals in soil environments, including x-ray, electron optical, thin section, and wet chemical techniques. Two hours rec. and six hours lab a week. Pr.: AGRON 705.

**AGRON 950. Advanced Crop Ecology.** (3) II, in even years. Principles of growth and development of crops in relation to the environment. Three hours rec. a week. Pr.: BIOL 500, 529, and STAT 704, 705.

**AGRON 955. Soil Microbial Ecology.** (3) II, in even years. Theories and concepts of the ecology and function of microorganisms in the soil environment. Discussions will include factors regulating microbial activity, the flow of energy (carbon), and nitrogen transformations as they relate to plant productivity and environmental quality. Three hours rec. a week. Pr.: AGRON 645 and BIOCHEM 521.

**AGRON 960. Topics in Crop Physiology and Ecology.** (Var.) I, II, S. Discussion and lectures on important papers and contributions in this field. Pr.: Consent of instructor.

**AGRON 970. Advanced Plant Breeding.** (3) II, in even years. Single and multiple trait selection, mating designs, recurrent and single-cycle selection theory, stability analyses, resource allocation theory, breeding for host plant resistance. Pr.: AGRON 785 and AGRON 830.

**AGRON 999. Ph.D. Research.** (Var.) I, II, S. Research on a problem which may extend throughout the year and furnish data for a doctoral dissertation.

# Animal Sciences and Industry

**Department head**
**Jack G. Riley**, Ph.D., University of Missouri

**Animal breeding and genetics**
*Professors*
**Robert R. Schalles**, Ph.D., Virginia Polytechnic Institute (quantitative genetics of performance and carcass traits in beef cattle).

**Danny D. Simms**, Ph.D., Oregon State University (animal breeding and genetics).

**Kenneth E. Kemp**, Ph.D., Michigan State University (genetics and statistical analysis).

**Meat science**
*Professors*
**Michael E. Dikeman**, Ph.D., Kansas State University (growth and composition, meat tenderness).

**Melvin C. Hunt**, Ph.D., University of Missouri (collagen and myoglobin chemistry, histology, and low-fat processed meats).

**Cutis L. Kastner**, Ph.D., Oklahoma State University (hot processing, meat technologies, and meat safety).

**Donald H. Kropf**, Ph.D., University of Wisconsin (meat color, packaging and display lighting).

Assistant professors
**John A. Unruh**, Ph.D., Kansas State University (meat science and growth biology related to animal production).

**Monogastric nutrition**
*Professors*
**Keith C. Behnke**, Ph.D., Kansas State University (feed processing, extrusion, particle size and mixing efficiency).

**Frank Blecha**, Ph.D., Washington State University (immunology and nutritional interactions).

**Robert H. Hines**, Ph.D., Michigan State University (management and nutrition).

*Associate professors*
**Jim L. Nelssen**, Ph.D., University of Nebraska (amino acid nutrition and lactational physiology).

*Assistant professors*
**Robert D. Goodband**, Ph.D., Kansas State University (biotechnology and amino acid nutrition).

**Joe D. Hancock**, Ph.D., University of Nebraska (feed processing and alternate feed ingredients).

**Mike D. Tokach**, Ph.D., University of Minnesota (protein sources and coordination of field research).

**Physiology**
*Professors*
**Duane L. Davis**, Ph.D., University of Missouri (embryonic and uterine functions in early pregnancy in pigs).

**Larry R. Corah**, Ph.D., University of Wyoming (applied reproductive and nutritional management of beef cows).

**Mark F. Spire**, D.V.M., Texas A&M University (bovine theriogenology).

**Jeffrey S. Stevenson**, Ph.D., North Carolina State University (factors regulating ovarian follicular and luteal function in postpartum dairy cattle).

*Associate professors*
**J. Ernest Minton**, Ph.D., Oklahoma State University (environmental factors affecting neuroendocrine-adrenal and -reproductive functions in sheep and pigs).

*Assistant professors*
**Mark J. Arns**, Ph.D., Texas A&M University (gamete function in horses).

**David M. Grieger**, Ph.D., Washington State University (molecular biology.

**Randel H. Raub**, Ph.D., University of Kentucky (physiological responses of horses to exercise).

**Ruminant nutrition**
*Professors*
**Keith K. Bolsen**, Ph.D., University of Nebraska (silage and hay production and utilization).

**Frank K. Brazle,** Ph.D., University of Tennessee (nutritional management of stocker cattle).

**Benny E. Brent,** Ph.D., Michigan State University (B vitamin metabolism).

**John R. Brethour,** M.S., Oklahoma State University (beef cattle finishing systems).

**Leniel H. Harbers,** Ph.D., Oklahoma State University (forage structure and analysis).

**James L. Morrill, Jr.,** Ph.D., Iowa State University (nutritional development of dairy calves).

**T. G. Nagaraja,** Ph.D., Kansas State University (ruminal microbiology with emphasis on ruminal disorders).

**Jack G. Riley,** Ph.D., University of Missouri (beef cattle feedlot nutrition).

*Associate professors*

**Robert T. Brandt, Jr.,** Ph.D., University of Nebraska (beef cattle feedlot nutrition).

**Robert C. Cochran,** Ph.D., New Mexico State University (forage utilization by grazing beef cattle).

*Assistant professors*

**Dale Blasi,** Ph.D., University of Nebraska (applied beef cattle nutrition).

**Evan C. Titgemeyer,** Ph.D., University of Illinois (amino acid nutrition of ruminants).

## Program description

The Department of Animal Sciences and Industry is a comprehensive unit supported by about 50 faculty devoted to research, teaching, and extension activities related to domestic farm animals species. Currently, the department has approximately 400 undergraduate majors and about 100 graduate students pursuing both M.S. and Ph.D. degrees.

For graduate training, the department has animal research and teaching units located conveniently to the main campus. Those units include sheep, poultry, purebred beef, dairy, swine, and horse teaching and research units and the beef, forage, range and cow-calf research units. In addition, laboratories in both Call and Weber Halls contain state-of-the-art equipment that allow the student access to virtually any analytical technique required for their research.

Graduate training in the Department of Animal Sciences and Industry is organized within six functional discipline groups including animal breeding and genetics, food science, meat science, monogastric nutrition, physiology, and ruminant nutrition. The food science program represents a large interdisciplinary degree program and is detailed in a separate area in this catalog.

### Animal breeding and genetics

Graduate work leading to M.S. and Ph.D. degrees in animal breeding is administered by participating faculty. Graduate programs are designed specifically for each student to acquire training in genetics, animal breeding, and statistics. Additional courses will be selected from the fields of biological and physical sciences. A typical program of study will include some of the following graduate level courses: statistical and population genetics; animal breeding; population genetics; statistics and experimental design; physiology; and anatomy. Research is conducted using field data from cooperating ranches, breed association, and universities. Facilities are available for adequate analysis of most data set, including REML and BLUP procedures.

### Meat science

The meat science program is comprehensive and prepares students for fundamental and applied research, product and process development, and technical service in industry, academic, regulatory, and international positions. Faculty conduct research in tissue growth and development; germ plasm characterization; ante- and post-mortem factors and processes affecting meat quality and composition; myofibrillar, collagen, and pigment chemistry; packaging; lighting; low-fat products; by-product value enhancement; processed meats; quality assurance; and safety of meat and meat products. Facilities include a fully equipped meat laboratory that permits experimental and industry-like fresh and processed meat processing; research laboratories for physical and chemical analyses; and thermal processing, display, and sensory facilities for instrumental and sensory panel evaluation of meat products. Graduate students are actively involved in teaching, research, and extension activities as part of their training.

### Monogastric nutrition

The monogastric nutrition team offers comprehensive training that weaves a basic understanding of nutrition into an applied research program. Areas of specialized emphasis include: amino acid nutrition as influenced by age, sex, weight and physiological state of the animal; utilization of alternative feed ingredients; influences of technological advances on nutritional requirements; effects of revolutionary feed processing technologies on nutrient utilization; and manipulation of the immune response through the diet.

Innovations by the K-State monogastric nutrition team include phase feeding programs for the young pig, high nutrient density starter diets, particle size and extrusion processing to improve nutrient utilization, and somatotropin influences on nutrient requirements. Additionally, K-State is a national leader in conducting field research in modern commercial swine facilities. This allows graduate students to be exposed to the swine business while conducting timely and industry-leading research.

Graduate students are offered an array of course work to develop areas of expertise. Common areas of training include basic nutrition, biochemistry, statistics, grain science, and immunology. Seminars and discussion groups are an integral part of the graduate program. Prospective graduate students should visit with the faculty and current graduate students about the opportunities in the program.

### Physiology

Students pursuing M.S. and Ph.D. programs in physiology in the Department of Animal Sciences and Industry will be exposed to a comprehensive, interdisciplinary degree program including course work, seminars and research experiences spanning many departments including biochemistry, statistics, biology, and anatomy and physiology.

Graduate training in physiology prepares students for various careers in research, teaching, technical services, consulting, adult education, and extension in animal reproduction and related fields of animal physiology. Graduate studies will be in reproductive endocrinology, establishment of pregnancy, cell and tissue culture, molecular biology of reproduction, stress-environmental physiology, gamete physiology, and exercise physiology. Research conducted by faculty in the department includes that funded by private industry, the USDA, and the NIH.

### Ruminant nutrition

The Ruminant Nutrition program is characterized by highly productive individual research programs and a concomitant commitment to the pursuit of collaborative research efforts. Scientists within the ruminant nutrition program maintain the dual goals of conducting research which will advance the understanding of fundamental nutritional phenomena but which also provide insight into practical aspects of the nutritional management of ruminant livestock. Students entering the program are provided with a strong foundation in ruminal and post-ruminal digestion, absorption, and metabolism as well as training in the fundamental experimental procedures necessary for conducting ruminant nutrition research.

Supporting course work is frequently pursued in the areas of biochemistry, grain science, microbiology, physiology, and statistics. Areas of research emphasis within the ruminant nutrition group include dairy cattle nutrition, feedlot nutrition, cow-calf and stocker nutrition (special emphasis on grazing livestock), rumen microbiology, and silage research.

## Admission

Application for admission to graduate school should begin as early as possible in the semester prior to the proposed admission date (i.e., for fall semester, begin application process early in the preceding spring semester). Application materials may be obtained by writing to Dr. J. Ernest Minton, Chairman, Graduate Activities Committee, Department of Animal Sciences and Industry, Weber Hall, Kansas State University, Manhattan, KS 66506–0201.

All applicants must submit a completed application form, three letters of recommendation, and official transcripts of all previous college work. In addition, the applicant should write a short statement of objectives which should include the discipline area (and animal species if appropriate) in which the student desires to study. The student should mention in the statement of objectives specific faculty with whom they may have had prior contact, and with

whom they desire to work as graduate students. This information is important in placing prospective graduate students with major professors whose area of research coincides with their areas of interest.

In addition to the information noted above, international applicants must submit a TOEFL score of at least 550 or provide evidence of receipt of a degree from a U.S. university. International students must also provide a completed financial form and evidence of financial support for their entire graduate training.

The Graduate Record Examination is not required for admission, but may be helpful in the evaluation process.

Upon receipt of all of the required application documentation, the applicants file will be reviewed by the departmental graduate activities committee which includes graduate faculty members representing each of the six discipline areas. If the student is deemed acceptable for admission, a graduate faculty member willing to serve as major professor must be identified prior to forwarding of the students credentials to the graduate school.

Limited numbers of graduate research assistantships and graduate teaching assistantships are available on a competitive basis. Those students awarded an assistantship have out-of-state fees waived. Current annual stipends for GRAs at the Ph.D. level are $9,720 and at the M.S. level are $8,640. The current stipend for GTAs is $5,904 for nine months, regardless of the degree sought by the applicant.

## Animal science and industry courses

The M.S. or Ph.D. program of study shall include supportive course work from several departments including Statistics, Biochemistry, Anatomy and Physiology, Biology, Grain Science and others. Graduate level courses offered in the department of Animal Sciences and Industry are listed below.

## Undergraduate and graduate credit in minor field

**ASI 500. Genetics.** (3) I, II, S. Variation, Mendelian inheritance and related subjects. Three hours lec. a week. Pr.: BIOL 198 or 210.

**ASI 502. Principles of Dairy Food Processing.** (4) II, in even years. The application of chemical, microbiological, and physical principles to the conversion of milk into concentrated and dry milk products, hard and soft cheeses, frozen desserts, and butter. Three hours lec., and one three-hour lab a week. Pr.: A course in microbiology and ASI 411.

**ASI 503. Topics in Comparative Pathology.** (1-3) I, II, S. Selected topics in diseases of laboratory animals, wildlife, and fish for non-veterinary students. Pr.: BIOL 198. Same as AP 500.

**ASI 504. Equine Reproduction Management.** (2) II. Theory and practice in reproductive management and breeding techniques of the horse. Includes basic reproductive physiology of the stallion and mare, demonstration and practice in semen collection and processing, teasing systems, natural and artificial breeding techniques, management, and record keeping. Six hours lab a week. Pr.: ASI 400 or equiv. and senior standing.

**ASI 510. Animal Breeding Principles.** (3) I, II. The genetic principles in evaluation, selection and mating systems used in beef, dairy, sheep, swine, poultry and horse breeding. Intended for ASI majors. Three hours lec. a week. Pr.: ASI 500.

**ASI 512. Gestation of Farm Animals.** (2) I. A detailed study of gestation using the bovine as a model. Lecture covers factors affecting the physiological events of gestation and management of the pregnant animal. The laboratory provides practical training in following the development of the bovine fetus in utero. Pr.: Senior standing and consent of instructor.

**ASI 515. Beef Science.** (3) I, II. A comprehensive course covering all phases of the beef cattle industry. Practical application of nutrition, breeding, physiology of reproduction, merchandising, risk management and related areas. Special emphasis on management systems of raising, growing and finishing beef cattle. Pr.: Senior standing.

**ASI 521. Horse Science.** (3) II. A study of the light horse industry in the U.S., structure, types and breeds of horses, selection, nutrition, management, performance, breeding, and health. Three hours lec. a week. Pr.: ASI 318.

**ASI 524. Sheep Science.** (3) I. Application of scientific management principles to the sheep industry. Breeding, reproduction, nutrition, health, facilities and economic aspects as related to sheep production. Two hours lec. and two hours lab a week. Pr.: Junior standing.

**ASI 533. Anatomy and Physiology.** (4) II. General anatomy and physiology of the domestic animals. Three hours rec. and three hours lab a week. Same as AP 530.

**ASI 534. Introduction to Pharmacology of Farm Animals.** (2) II, in even years. The study of the basic principles of pharmacology as related to the proper and safe use of drugs and chemicals by the livestock industry. Same as AP 531.

**ASI 535. 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 management of swine production units of varying sizes. Two hours lec. and two hours lab a week. Pr.: Senior standing.

**ASI 550. Dairy Bacteriology.** (4) I. Application of the principles of bacteriology to the production and processing of quality milk and dairy products. Consideration of the general characteristics of microorganisms in dairy products. Relationships of bacteria in milk to public health. Two hours lec. and two two-hour labs a week. Pr.: BIOCH 120.

**ASI 580. Animal Sciences and Industry Seminar.** (1) I. Open only to senior students majoring in animal sciences and industry. One hour rec. a week..

**ASI 581. Dairy Seminar.** (1) II. Study of dairy periodicals, bulletins, literature and current research. Written and oral presentation of information on a dairy topic will be required of all students. One hour lec. a week. Pr.: Junior standing in dairy production.

**ASI 599. Animal Science Internship.** (1–6) I, S. Industry work-study experiences in beef cattle, sheep, dairy cattle, swine, horse or poultry production operations or in animal food products plants. Pr.: Permission of supervising faculty member.

## Undergraduate and graduate credit

**ASI 601. Milk Secretion.** (3) I. Anatomy and histology of the mammary gland. Physiology of lactation, milk constituents, and management practices that alter quality and quantity. Contemporary milking practices and mastitis control. Two hours lec. and two hours lab a week. Pr.: ASI 103, 318 and 533.

**ASI 605. Fresh Meat Operations.** (3) I. Provides information and exposure to fresh meat operations, including: fabrication, yields, costs, quality assurance, packaging, marketing of fresh meat and by-products. Two hours lec. and three hours lab a week. Pr.: ASI 350.

**ASI 606. Instrumental Analysis of Food and Agricultural Products.** (2) Spring Intersession. A two week course presenting modern instrumental methods currently available for analysis of food and agricultural products. Pr.: PHYS 115 and BIOCH 201.

**ASI 607. Food Microbiology.** (4) I. This course deals with the identification, enumeration and characterization of bacteria, yeast and mold associated with foods and food processing. Effects of physical and chemical agents on microorganisms will be studied. Microbiological problems in food spoilage, food preservation, food fermentation, and food-borne diseases will be discussed. Two hours lec. and two two-hour labs a week. Pr.: BIOL 455.

**ASI 609. Dairy Cattle Nutrition.** (2) I. Application of principles of nutrition to feeding dairy cattle; least cost formulation of balanced rations; discussion of current dairy cattle nutrition research. One hour lec. and two hours lab a week. Pr.: ASI 320.

**ASI 610. Processed Meat Operations.** (2) II. An intensive course in processed meats, relating the science, technology and quality control of curing, smoking and sausage manufacture. One hour rec. and two hours lab a week. Pr.: ASI 350.

**ASI 611. Beef Cattle and Sheep Nutrition.** (2) II. A detailed study of the nutrient requirements of beef cattle and sheep for various stages of growth, reproduction and lactation. Emphasis will be given to inter-relationships between nutrition, disease, management and environment. Diets will be formulated using a wide range of feed ingredients to produce optimum production at minimum cost. Current beef cattle and sheep nutrition research will also be reviewed. One hour lec. and two hours lab a week. Pr.: ASI 320.

**ASI 612. Horse Nutrition.** (2) I. A detailed study of the nutrient requirements of horses for various stages of growth, work, reproduction, and lactation. Ration formulation using various feed ingredients. Relationships among nutrition, feed-related diseases, environment and management. Review of current horse nutrition research. One hour lec. and two hours lab a week. Pr.: ASI 320.

**ASI 614. Swine and Poultry Nutrition.** (2) I. A detailed study of nutrient requirements of swine and poultry, for various stages of production. Lectures will include interrelationships between nutrition and other factors (environment, management and disease) that affect performance. Labs will emphasize evaluation of feed ingredients, diets, premixes and base mixes. One hour lec. and two hours lab a week. Pr.: ASI 320.

**ASI 615. Range Livestock Nutrition and Management.** (2) II. A detailed study of nutritional management concepts relevant to range livestock production. Emphasis will be directed toward discussion of range forage quality, range forage intake, nutrient requirements of range livestock, supplementation systems, grazing systems, computer-aided management procedures, stocking rates and reproductive management. Two hours lec. a week. Pr.: ASI 320.

**ASI 620. Livestock Production and Management.** (2) II. Student involvement in laboratory exercises related to practical livestock production and management. One hour rec. and four hours lab a week. Pr.: Appropriate ASI course (515, 521, 524 or 535).

**ASI 621. Dairy Cattle Management.** (3) II. Integration of agronomic, biologic and economic aspects of dairying with dairy farm layout, planning, operation and analysis. A field study trip and a dairy farm analysis report are required. Two hours rec., two hours lab a week. Pr.: ASI 102 and 103 and senior standing.

**ASI 630. Egg Science.** (2) I, in even years. Emphasis on the technical problems in processing and distribution of shell eggs and egg products. This course covers the chemistry and microbiology of shell eggs and egg products. Processing operations and basic principles of quality assurance are covered. Importance of new product development is discussed. Pr.: ASI 104 and 302.

**ASI 635. Poultry Meat Technology.** (2) II, in odd years. Emphasis on the technical problems that exist between production and consumption during the processing and marketing of poultry and poultry meat products. Two hours lec. a week. Pr.: ASI 104 and 302.

**ASI 645. Poultry Management.** (3) II, in odd years. A detailed study of the production and management practices involved in commercial poultry and game bird enterprises. Two hours rec. and one three-hour lab a week. Pr.: ASI 102, 104, and junior standing.

**ASI 655. Behavior of Domestic Animals.** (3) I. Behavior associated with domestication. Effects of selective breeding, physical and social environments, and developmental stage on social organization, aggressive behavior, sexual behavior, productivity and training of domestic animals. Physiology of behavior and abnormal behavior considered briefly. Pr.: BIOL 198.

**ASI 661. Animal Sciences and Industry Problems.** (1–3) I, II, S. Work offered in: animal breeding, animal nutrition, beef cattle production, dairy production, horse production, livestock evaluation, meats, poultry, sheep production, swine production. Pr.: Consent of instructor.

**ASI 671 Meat Selection and Utilization.** (2) I. Emphasis on meat cut identification, muscle and bone anatomy, grades, fabricated meat, institutional cuts, specification writing, processing, meat preparation and shrinkage costs. Two hours lec.-rec. and two hours lab a week. Pr.: FN 300 or 501, or HRIMD 440.

**ASI 694. Food Plant Management.** (2) I. A study of business management practices involved in a food plant operation; organization, plant operations, personnel, production control, purchasing, cost control, sales and legal aspects of a food operation. Pr.: Junior standing.

**ASI 695. Quality Assurance of Food Products.** (3) I. The role of the control laboratory in maintaining standards and quality of dairy and food products and ingredients. Tests and techniques for evaluating quality and sanitation and for compliance with regulatory requirements. Two hours rec. and one three-hour lab a week. Pr.: One course in bacteriology.

**ASI 702. Animal Nutrition and Diet Formulation.** (2) I. Application of basic nutrition principles, diet formulation, and diet adequacy for livestock, poultry, pets, and exotic animals. Includes practical feeding problems encountered by producers and veterinarians. Pr.: ASI 318 and first-year standing in the College of Veterinary Medicine.

**ASI 710. Physiology of Reproduction in Farm Animals.** (2) I. This course offers an in-depth study of the anatomical and physiological aspects of reproduction in farm and laboratory animals including endocrine interrelationships controlling reproductive cycles and gamete production. Literature studies and periodic laboratories deal with experimental techniques used in animal reproduction and contemporary animal production practices. One hour lec. and two hours lab a week. Pr.: ASI 400.

**ASI 713. Rapid Methods and Automation in Microbiology.** (2) Spring intersession. Rapid methods and automation is a dynamic area in applied microbiology dealing with the study of improved methods in the isolation, detection, characterization, and enumeration of microorganisms and their products in clinical, food, industrial, and environmental samples. The knowledge and techniques of this course are useful for students interested in medical, food, industrial, and environmental microbiology for early detection of beneficial as well as harmful microorganisms in their work.

**ASI 715. 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.: BIOCH 521, 522.

**ASI 725. Food Analysis.** (3) I. Principles, methods, and techniques necessary for quantitative, physical, and chemical analyses of food and food products. The analyses will be related to standards and regulations for food processing. Pr.: ASI 311.

**ASI 730. Silage Technology.** (2) I. A study of silage fermentation, nutrient conservation, aerobic deterioration process, factors affecting silage quality; and chemical analysis used to evaluate silage. Discussion of techniques used in silage research and assigned readings within the silage literature. Two hours lec. a week. Pr.: ASI 320.

**ASI 735. Environmental Physiology of Farm Animals.** (3) II. A detailed study of the effects of the environment on animal physiology and performance efficiency. Three hours lec. a week with frequent laboratory demonstrations. Pr.: AP 530.

**ASI 749. Advanced Animal Breeding.** (3) II. Application of genetic principles to livestock improvement, selection methods, mating systems, heritability estimates and methods of analyzing genetic data. Three hours lec. a week. Pr.: ASI 500 and three hours in statistics.

**ASI 750. Poultry Seminar.** (1) I, in even years. Required of all students majoring in poultry science. Also required of graduate students. One hour rec. or conference a week. Pr.: ASI 102 and 104.

**ASI 777. Meat Technology.** (4) II. Meat composition, meat product safety and spoilage, quality assurance, meat processing techniques, sausage and formed products, color, packaging, plant planning and organization, field trip. Three hours lec. and three hours lab a week. Pr.: ASI 350 and 361; senior or graduate standing.

**ASI 799. Graduate Internship in Animal Sciences and Industry.** (1–4) I, S. In-depth work-study experiences on beef cattle, sheep, dairy cattle, swine, horse or poultry production operations or in animal food products plants. Pr.: Permission of supervising faculty member.

## Graduate credit

**ASI 800. Topics in Animal Reproduction.** (1) I. This is a seminar that involves both oral and written reporting of current literature in reproductive physiology. One hour rec. a week. Pr.: ASI 400.

**ASI 801 Hormonal Control of Reproduction, Lactation and Growth.** (3) II, in even years. Basic study of endocrine glands and their hormone secretions that control reproduction, lactation, and growth in farm animals. Three hours rec. a week. Pr.: BIOCH 521.

**ASI 802. Gametes, Fertilization and Pregnancy in Farm Animals.** (2) II, in odd years. A basic study of underlying mechanisms of gamete production and fertilization, embryonic and fetal development, and the establishment, maintenance and termination (abortion or parturition) of pregnancy. Emphasis will be on current theories and the research techniques required for testing their validity. One hour rec. and three hours lab a week. Pr.: BIOCH 521.

**ASI 806. Topics in Meat Science and Muscle Biology.** (2) II. Seminar and discussion involving written and oral analyses of classical and current literature in meat science and muscle biology. Two hours rec. a week. Pr.: One course in meat science or muscle biology and BIOCH 521.

**ASI 811. Food Fermentation.** (4) II. Application of the principles of microbiology to the understanding of the fermentation of various categories of foods. Chemical, biochemical and microbiological changes under controlled and uncontrolled conditions. Two hours lec. and six hours lab a week. Pr.: BIOL 455.

**ASI 820. Rumen Metabolism.** (3) I. Metabolism, absorption, digestion, and passage of nutrients in the rumen; factors affecting the environment of the rumen; certain aspects of rumen function and dysfunction; techniques used in rumen research. Three one-hour lec. a week. Pr.: ASI 318; BIOCH 521 or 755.

**ASI 826. Nutritional Physiology.** (3) II. The course focuses on the structures and function of the gastrointestinal tract, with an emphasis on digestive physiology in the small intestine. Details of gastrointestinal tract secretion, regulation, digestion, and absorption of the major nutrient groups are emphasized with species comparisons. Three hours rec. a week. Pr.: BIOCH 521.

**ASI 840. Techniques in Domestic Animal Behavior.** (2) II, in even years. A combined seminar and laboratory type course. Current and classical studies reported and discussed, relationships between behavior and other disciplines explored and methods of data collection examined. Small-scale demonstration experiments planned, executed and reported orally and/or in scientific written style. One hour rec. and two hours lab a week. Pr.: ASI 655 and STAT 320.

**ASI 860. Analytical Techniques—Sample Preparation and Beginning Analyses.** (1) I. Sample collection, processing and handling methodologies will be addressed as they pertain to research methods in the animal sciences. Basic laboratory techniques, sample collection, and analyses of moisture and nitrogen will be covered. two hours lec., eight hours lab and one hour rec. a week for three weeks. Pr.: CHM 350.

**ASI 861. Analytical Techniques—Mineral Analyses.** (1) I. This course focuses on the analysis of mineral sin common feedstuffs. This course will cover sample preparation and atomic absorption, emission, ultraviolet/visible and fluorimetric spectrophotometric methods of analysis of feedstuffs and biological fluids. Two hours lec., eight hours lab and one hour rec. a week for three weeks. Pr.: CHM 350.

**ASI 862. Analytical Techniques—Carbohydrate and Lipid Analyses.** (1) I. This course covers the analysis of carbohydrate and lipid components of feedstuffs and biological materials using conventional as well as HPLC and gas chromatographic methods. Two hours lec., eight hours lab and one hour rec. a week for three weeks. Pr.: CHM 350.

**ASI 863. Analytical Techniques—Radioisotope Use.** (1) I, in even years. Study of radioisotope use in physiological applications of research in domestic animals including radioactive decay, detection methodology, and isotope dilution. Two hours lec., eight hours lab and one hour rec. a week for three weeks. Pr.: BIOCH 521.

**ASI 864. Analytical Techniques—Immunoassays.** (1) I, in even years. Study of measurement of biological substances and hormones utilizing enzyme-linked immunoassays (ELISA) and radioimmunoassays (RIA). Two hours lec., eight hours lab and one hour rec. a week for three weeks. Pr.: BIOCH 521.

**ASI 890. Graduate Seminar in Animal Sciences 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.

**ASI 898. Master's Report.** (2) I, II, S. A written report of either research or problem work on a topic in the major field. Pr.: Consult major professor.

**ASI 899. Master's Research in Animal Sciences and Industry.** (Var.) I, II, S. Research leading to the completion of a master's thesis. Pr.: Consult major professor.

**ASI 902. Topics in Animal Nutrition.** (2) on sufficient demand. Lectures and assigned readings concerned with determination of nutrient requirements, nutrient utilization and metabolism nutrient interrelationships and feeding frequency, feed processing, appetite factors, methods of determining design and techniques useful in animal nutrition research. Pr.: One of the following: ASI 609, ASI 611, ASI 612, ASI 614, ASI 615, ASI 730.

**ASI 905. Topics in Animal Breeding.** (2) On sufficient demand. Lectures and assigned reading concerned with animal breeding research techniques. Emphasis on discussion of advanced topics of current interest in animal breeding. Pr.: ASI 749.

**ASI 915. Food Toxicology.** (2) II, in odd years. This course deals with the study of occurrence, detection, and control of microbial toxins and chemical toxins in fresh and processed foods. The genetics, physiology, and mechanisms of toxin production by microbial cells and the chemistry, formation, and interactions of chemical toxins with food systems during food processing will be addressed. Two hours lec. a week. Pr.: ASI 607 and 715.

**ASI 920. Energy Utilization in Domestic Livestock.** (2) I, in odd years. Comprehensive discussion of the development and application of energy systems used to guide livestock feeding, procedures used in energy experimentation, dietary/digestive/environmental factors that influence efficiency of energy utilization, and the efficiencies with which different energy substrates are used to support various maintenance and production functions. Emphasis will be placed upon ruminants. Two hours lec. a week. Pr.: BIOCH 521.

**ASI 921. Protein and Amino Acid Utilization in Domestic Livestock.** (2) I, in even years. Comprehensive discussion of protein and amino acids and their role in digestion, absorption, metabolism, protein synthesis, and degradation in livestock. Emphasis on techniques and interpretation of results from experiments designed to evaluate protein utilization and factors which influence amino acid metabolism in monogastrics and ruminants. Two hours lec. a week. Pr.: ASI 820 or ASI 826.

**ASI 923. Vitamin and Mineral Nutrition of Domestic Livestock.** (2) II, in even years. A detailed examination of

the vitamin and mineral nutrition of domestic livestock. Emphasis will be placed on current literature on the determination of vitamin and mineral requirements, practical considerations for vitamin and mineral supplementation in livestock feeding, and the potential for vitamin and mineral deficiency and toxicity in domestic livestock. One hour lec. and two hour lab a week. Pr.: ASI 820 or ASI 826.

**ASI 925. Rumen Microbiology.** (2) II, in odd years. Two hours lecture a week dealing with microorganisms of the rumen, their habitat, diversity, structure, interactions, and biochemical activities. Pr.: BIOL 455.

**ASI 926. Rumen Microbiology Laboratory.** (1) II, in odd years. This course will teach techniques available for enumeration, isolation and identification of ruminal microorganisms. Two hours lab a week. Pr.: ASI 925 or concurrent enrollment.

**ASI 930. Advanced Meat Science.** (3) I. On sufficient demand. 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. Three hours rec. a week. Pr.: ASI 777 or equiv.; and a course in biochemistry.

**ASI 961. Graduate Problem in Animal Sciences and Industry.** (Var.) I, II, S. In-depth study of a topic supervised by a member of the graduate faculty. Pr.: Permission of supervising faculty member.

**ASI 990. Seminar in Animal Sciences Research.** (1) I, II. Weekly evaluation of the scientific literature and the reasoning underlying the selection of research problems, the formulation and testing of hypotheses, and the evaluation and presentation of results. Pr.: Approval of major professor.

**ASI 999. Doctoral Research in Animal Sciences and Industry.** (Var.) I, II, S. Research leading to the completion of a Ph.D. degree. Pr.: Consult major professor.

# Entomology

**Head**

**C. Michael Smith,** Ph.D., Mississippi State University. Development and deployment of plant resistance in integrated crop management systems.

**Professors**

**Robert J. Bauernfiend,** Ph.D., University of Wisconsin. Extension Specialist, Horticultural Insects.

**Richard W. Beeman,** Adjunct, U.S. Grain Marketing Research Laboratory, Ph.D., University of Wisconsin. Insect genetics and insecticide toxicology.

**H. Derrick Blocker,** Ph.D., North Carolina State University. Leafhopper systematics, biology and distribution of insects, curator of research collection of insects.

**Alberto B. Broce,** Ph.D., University of Florida. Biology, ecology, behavior and management of insects and other arthropod pests of livestock.

**Leroy H. Brooks,** Ph.D., Kansas State University. Extension Specialist, Wheat and sorghum insects and the safe use of insecticides.

**Donald C. Cress,** Ph.D., Oklahoma State University. Extension Pesticide Coordinator for Pesticide Applicator Training, Pesticide Impact Assessment and IR-4.

**Richard J. Elzinga,** Ph.D., University of Utah. Arthropod morphology, mite systematics.

**Gerald L. Greene,** Ph.D. Oregon State University. Biology, ecology, and control of insects affecting confined livestock operations.

**Tom L. Harvey,** Ph.D., Oklahoma State University. Wheat and sorghum resistance to insects, insect pests of cattle.

**Jimmy H. Hatchett,** Adjunct, USDA-ARS. Ph.D., Purdue University. Insect resistance in small grains, particularly wheat resistance to Hessian fly, insect biotype genetics.

**Theodore L. Hopkins,** Ph.D., Kansas State University. Insect biochemistry, physiology and toxicology; Mechanisms of cuticle sclerotization and insect-plant biochemical interactions.

**William H. McGaughey,** Adjunct, U.S. Grain Marketing Research Laboratory, Ph.D., Iowa State University. Microbiological control of stored-product insects

**Donald E. Mock,** Ph.D., Cornell University. Extension Specialist. Management of arthropods affecting livestock; biting pests of man.

**John C. Reese,** Ph.D., University of Wisconsin. Physiological mechanisms of insect-plant interactions and host-plant resistance.

**Gerald E. Wilde,** Ph.D., Cornell University. Insects attacking field crops; particularly corn, sorghum and wheat.

**Associate professors**

**K. O. Bell,** Adjunct, Kansas State Board of Agriculture, Ph.D., Kansas State University. Insect survey and detection programs in Kansas

**Lawrent L. Buschman,** Ph.D., University of Florida. Insect and mite pests of corn in southwest Kansas.

**David W. Hagstrum,** Adjunct, U.S. Grain Marketing Research Laboratory, Ph.D., University of California, Riverside. Ecology of stored-product insects.

**Randall A. Higgins,** Ph.D., Iowa State University. Research and extension on development of practical pest management guidelines for field crops, emphasizing multiple species stress.

**George E. Lippert,** M.S., West Virginia University. Extension Specialist, Southeast Area Extension Office, Chanute, KS.

**David C. Margolies,** Ph.D., North Carolina State University. Insect and mite ecology emphasizing life history, dispersal, arthropod-host interactions, and ecological genetics.

**James R. Nechols,** Ph.D., Cornell University. Biological control, ecology and behavior of parasitic Hymenoptera, and horticultural entomology.

**Phillip E. Sloderbeck,** Ph.D., University of Kentucky. Extension Specialist. Southwest Area Research and Extension Center, Garden City, KS.

**Assistant professors**

**Ralph E. Charlton,** Ph.D., University of Massachusetts. Insect chemical communication, mechanisms of mate and host plant location.

**Barry A. Dover,** Ph.D., Texas A&M University. Biological control of stored-product insects with emphasis on host-parasite interactions.

**Paul W. Flinn,** Adjunct, U.S. Grain Marketing Research Laboratory, Ph.D., Pennsylvania State University. Insect ecology, modeling and expert systems

**Srinivas Kamhampati,** Ph.D., Simon Fraser University. Insect genetics.

## Programs

The Department of Entomology has an internationally recognized graduate program, leading to the M.S. or Ph.D. degree. A wide variety of opportunities for graduate study are offered in several areas of research in which the faculty have established expertise.

Plant resistance to insects involves the study of interactions between arthropods and their host plants, with emphasis on arthropod behavior and physiology as it relates to resistance of plants and stored products. This program also involves the development of multiple pest-resistant crop cultivars, deployment of plant resistance in pest management, and genetic aspects of arthropod biotype formation.

Arthropod pest management research involves the development of integrated management programs for arthropod pests of major agricultural commodities in Kansas, with emphasis on the integration of chemical, cultural, biological, and resistant host plant strategies.

Interdisciplinary programs emphasize crop/livestock commodity loss assessment and the development of management software to aid producers.

Insect ecology and behavior research is concerned with the ecology, insect feeding behavior, foraging behavior and aspects of host selection behavior of herbivorous arthropods, parasitoids and animal pests. This program is strongly oriented toward mechanisms and evolution of insect-host interactions.

Biological control research addresses natural enemy-pest interactions in relation to biotic and abiotic factors that affect the impact of predators, parasitoids, and pathogens on arthropod pests. Current programs emphasize parasitoids of pests that affect horticultural crops, small grains and livestock, and pathogens of stored product pests.

Insect genetics research involves molecular, population, qualitative and quantitative genetics of insects and mites, emphasizing mechanisms and processes of evolution and development. Biochemical, genetic, and developmental traits are used to study embryogenesis, insecticide resistance and the evolution of arthropod biotypes.

Insect physiology, biochemistry, and toxicology programs are studying insect development, nutrition, reproduction, hormonal regulation of cuticle formation, sensory physiology, chemical ecology, and the mechanisms underlying insect-plant interactions. Toxicological research is conducted on environmental fate and metabolism of insecticides and natural products, and genetic, ecological, and biochemical aspects of insecticide resistance.

Stored-product insects research involves the study of the ecology, behavior, physiology, biochemistry, and genetics of stored-product insects; the detection of insect infestations in grain storage through developing or improving grain sampling and monitoring techniques; improvement of traditional grain storage practices for developing countries; and the integrated control of stored-grain insects.

Veterinary entomology research focuses on the ecology, behavior, morphology and physiology of insects and other arthropods of veterinary importance, as well as research on host-pest relations, biological and chemical control of livestock pests.

Morphology and systematics research involves the study and analysis of systematics, evolution, and functional morphology of insects and allied groups.

Faculty and students have earned many awards for professional and academic excellence in entomology. Various faculty have received national awards for excellence in research, teaching and extension. Others have served as presidents of the Central States Entomological Society and the Kansas State University chapter of the Society of Sigma Xi.

Graduate student academic teams have competed actively in the annual Linnean Games, sponsored by the Entomological Society of America, winning the national championship in 1983 and 1989 and finishing second in 1985. Faculty have competed successfully for several years for competitive research grant awards from the National Science Foundation, National Institutes of Health, and the Competitive Grants Program of the U.S. Department of Agriculture.

The goal of the department is to provide students with opportunities for basic and practical experience in research, teaching and extension. Faculty encourage students to participate in the preparation and writing of extramural-funded grant proposals. Faculty and students publish in many of the leading scientific journals in the world. The department encourages presentation of student research at professional meetings by offering student travel and research awards. In addition to a seminar series that brings nationally and internationally recognized scientists to the department, faculty and students participate together in journal discussion groups on a variety of entomological topics.

## Facilities

The Department of Entomology is housed in Waters Hall. Well-equipped laboratories are available for all described programs. The department maintains a student computer laboratory, a scanning electron microscope laboratory, and a research insect collection. Virtually all offices and laboratories contain microcomputers and there are numerous sites in the department with direct access to local and global electronic mail services. Classrooms and teaching laboratories have been renovated and utilize multimedia assisted instruction. Facilities include new greenhouses, bioclimatic chambers, and rearing rooms. Field research is conducted on experimental farms at Manhattan and at branch experiment stations throughout the state. Cooperative research programs exist with the Departments of Animal Sciences; Agronomy; Biochemistry; Grain Science and Industry; Wheat Genetics Resource Center, Department of Plant Pathology; Department of Horticulture, Forestry and Recreational Resources; the College of Veterinary Medicine; the U. S. Grain Marketing Research Laboratory, and other U.S. and international organizations.

## Degrees

### Admission

All applicants for graduate study are expected to have a background in biology, chemistry, mathematics and the physical sciences. An overall 3.0 GPA (B average) is expected and results of the Graduate Record Examination are encouraged but not required. International students must present evidence of proficiency in English (TOEFL or other acceptable examination). Applicants should submit transcripts of all previous academic training, a letter describing career objectives and have three letters of recommendation sent. Applications are considered by the departmental graduate affairs committee. Acceptance into the department is based upon approval by the graduate affairs committee, the department head, an advisor with whom the graduate program will be developed, and admission by the Graduate School. The student is informed of acceptance and available financial aid promptly after submission of a completed application.

**Performance standards and evaluation**

Students and their major advisor are responsible for the selection of a supervisory committee, which must approve a program of study by the end of the second semester of residence. The plan should consist of a curriculum vitae, a proposed course of study and a thesis or dissertation outline. During subsequent committee meetings a detailed research proposal is developed and approved by the end of the third semester of residency. The program of study for all Ph.D. students should prepare them to demonstrate proficiency in at least five of the following areas: internal and external morphology; systematics and evolution; physiology; behavior; genetics; ecology; and principles of pest management (to include no more than two of: integrated pest management; biological control; toxicology; host resistance and at least one area of specialization outside the department (i.e., statistics, biochemistry, plant or animal physiology). Proficiency is demonstrated through satisfactory completion of written and oral preliminary exams. Teaching and/or extension training opportunities may be added to these minimum requirements by the student's supervisory committee. All Ph.D. students are encourage to enroll in External Insect Morphology, Internal Insect Morphology, Insect Taxonomy, Taxonomy of Immature Insects, and Insect Physiology, unless these courses have been previously taken at other institutions.

The final oral examination at the master's level will be both comprehensive and a defense of the candidate's thesis or report. In case of failure, a second examination may be scheduled in accordance with university regulations. Ph.D. students take both written and oral preliminary examinations no later than the semester following completion of the second year of the student's program. Both examinations must be complete no later than seven months before the final Ph.D. examination. Oral examinations come after written examinations and may be taken only if written examinations are passed. The examination is failed if the written portion is failed, and the student may not proceed to the oral portion. Such an instance constitutes one attempt. No more than one additional attempt may be permitted without approval of the Graduate Council. The circumstances under which a second attempt involves the entire written portion or merely a repetition of failed sections is governed by the policy within the program. The final oral examination for the Ph.D. degree will be a defense of the candidate's dissertation.

## Financial assistance

### Stipends

The Department of Entomology supports graduate study and development in numerous ways. Stipends are available as graduate research, teaching, and extension assistantships. Department faculty successfully secure research grants from USDA, NSF, and other federal agencies, commodity commissions, agribusiness corporations, and private foundations, which fund many graduate students on research assistantships. The department also supports two teaching assistantships, one extension assistantship and several research assistantships. The level of financial support is essentially the same for students regardless of the source. During the 1992–1993 academic year that level was $10,968 for M.S. students and $11,700 for Ph.D. The stipends normally increase each year. Student fees are assessed at in-state rates for all graduate assistants.

Students are encouraged to seek teaching experience. A student can obtain teaching experience as a paid, non-credit hour teaching assistant or a graduate teaching assistant receiving variable credit for ENTOM 932 Topics in General and Systematic Entomology.

**Performance requirements for continuation**

In order to maintain financial assistance from assistantships or fellowships for teaching or research, graduate students are expected to maintain a B average in all course work. Failure to maintain that average will result in academic probation for one semester before reinstatement as a regular graduate student.

## Entomology courses

### Graduate credit

**ENTOM 612. Insect Pest Diagnosis.** (2) I. Offered 1993 and alternate years. Diagnosis of plant damage by insects and mites, recognition of harmful insects and mites and beneficial insects. Emphasis on field crop pests but pests of other crops will be considered if there is sufficient interest. One hour lecture and two hours lab a week. Pr.: ENTOM 314 or 710.

**ENTOM 620. Insecticides: Properties and Laws.** (2) II. Offered 1992 and alternate years. Study of the chemical and biological properties of insecticides. Formulations, safe handling, environmental impact and laws regulating pesticide use. Two hours lectures a week. Pr.: CHM 190.

**ENTOM 651. Internship in Crop Protection.** (1–2) I. On-the-job training in various areas of crop protection. One hour credit for each four weeks of supervised work. A maximum of two credits may be applied towards a B.S. in pest science management. Credit is allowed only for approved work-study programs. Pr.: Junior standing in pest science management curriculum; or AGRON 330, ENTOM 312, and PLPTH 500.

**ENTOM 652. Seminar in Crop Protection.** (1) II. A discussion of modern developments in the use of integrated pest management. Pr.: AGRON 330, ENTOM 312, and PLPTH 500. One hour discussion a week.

**ENTOM 706. External Insect Morphology.** (3) I. Offered 1992 and alternate years or on sufficient demand. External form and structure of insects with emphasis on the functional aspects of present structure. Theories of the evolution of structure from the ancestral to the derived state including, where possible, successive evolutionary stages. Differences between leading theories are discussed. Designed for beginning graduate students and advanced undergraduates. One hour lecture and six hours lab a week. Pr.: ENTOM 300 or 312 and 313.

**ENTOM 710. Insect Taxonomy.** (3) II. Offered 1993 and alternate years. Laboratory study of insect Order and family-group identification. Proper preparation and maintenance of adult insect collections. Lecture stresses the principles of systematics, legal principles of nomenclature, and the phylogeny of insects and their near relatives. For beginning graduate and advanced undergraduate students. One hour lecture and six hours lab a week. Pr.: ENTOM 300 or 312 and 313; ENTOM 706 recommended but not required; insect collection desirable.

**ENTOM 767. Insect Pest Management.** (3) I. Offered 1994 and alternate years. A presentation of the items necessary to consider in order to develop a sound pest management program, from identification of a problem to recommendations made to growers for dealing with a pest. Two hours lecture and one lab a week. Pr.: ENTOM 300 or ENTOM 312.

**ENTOM 799. Problems in Entomology.** (Var.) I, II, S. For nonthesis or nondissertation studies. Work in various fields of entomology. Pr.: Consent of instructor.

**ENTOM 805. Insects of Stored Products.** (3) II. Offered 1992 and alternate years. Biology, ecology, and behavior of stored-product insects and current practices involved in their control. Two hours lecture and three hours lab a week. Pr.: ENTOM 300, or 312 and 313, or consent of instructor.

**ENTOM 815. Experience in Extension Entomology.** (1–3) II. Major emphasis is to give students a realistic view of the history, structure, philosophy, and position responsibilities assumed by entomology state and area specialists within the Cooperative Extension Service through hands-on experience. Pr.: ENTOM 612 or 767.

**ENTOM 820. Biological Control.** (3) II. Offered 1993 and alternate years. The theory and practice of biological control, with an emphasis on natural enemies of insect pests. Relationship and importance of insect ecology and integrated pest management to biological control. Experimental approaches, evaluation, recognition and life histories of beneficial species will be covered. Two hours lecture and two hours lab a week. Pr.: ENTOM 312 and 313 and ENTOM 891 or BIOL 529 or 631 or equivalent.

**ENTOM 821. Measuring Behavior.** (1) II. A techniques course stressing data acquisition and analysis in behavioral research. Two hours lab each week. Pr.: ENTOM 312 or equivalent, and ENTOM 875 or BIOL 630, or consent of instructor.

**ENTOM 845. Insect Control by Host Plant Resistance.** (3) I. Offered 1992 and alternate years. 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 300 or 312 and 313 and a course in either plant or animal genetics.

**ENTOM 857. Toxicology and Properties of Insecticides.** (3) I. Offered 1993 and alternate years. A study of the classification of insecticides, their types of formulations, biological properties, mode of action, and first aid treatment. Synergism, antagonism, and other interactions. Two hours lecture and two hours lab a week. Pr.: CHM 350 or consent of instructor.

**ENTOM 865. Internal Insect Morphology.** (3) II. Offered 1993 and alternate years. Internal anatomy of representative insects; plan and structure of internal systems. One hour lecture and six hours lab a week. Pr.: ENTOM 706.

**ENTOM 875. Insect Physiology.** (3) I. Offered 1993 and alternate years. Functions of insect systems for development, metamorphosis, and reproduction. Physiological and biochemical mechanisms underlying insect activities, behavior, and ecological adaptations. Two hours lecture and three hours lab a week. Pr.: ENTOM 865 or consent of instructor.

**ENTOM 892. Insect Ecology.** (4) I. Offered 1994 and alternate years. Abiotic and biotic factors underlying the distribution and abundance of insects. How these factors affect insect population processes, life history adaptations, and community structure. Special attention given to current literature and experimental approaches. Three hours lecture and two hours lab a week. Pr.: BIOL 529 or BIOL 631 or equiv.

**ENTOM 898. Master's Report in Entomology.** (Var.) I, II, S. Work in various fields of entomology. Pr.: Consent of instructor.

**ENTOM 899. Master's Research in Entomology.** (Var.) I, II, S. For student majoring in entomology. Pr.: Knowledge in special area and consent of instructor.

**ENTOM 910. Insect Genetics.** (3) I. Offered 1993 and alternate years. The course will initially describe the variety of genetic systems found in insects. Laboratory and statistical techniques will be discussed for studying genetic variation in insect populations. The final part of the course will focus on means for genetic manipulation of populations. The laboratory session will be used to discuss and/or demonstrate techniques for studying insect genetics. 2 hours lecture and one 3-hour lab each week. Pr.: BIOL 430 or ASI 500, ENTOM 710 and ENTOM 875.

**ENTOM 920. Insect Behavior.** (3) II. Offered 1993 and alternate years. The study of the mechanisms, ecology, and evolution of behavior in social and nonsocial insects. Pr.: ENTOM 312, 313, and 875. Three hours lecture a week.

**ENTOM 930. Topics in Environmental and Physiological Entomology.** (Var.) II. Selected topics for advanced study in insect behavior, ecology, genetics, physiology, and related areas. Pr.: Consent of instructor.

**ENTOM 932. Topics in General and Systematic Entomology.** (Var.) I, II. Offered on demand. Principles of taxonomy; advanced taxonomy; taxonomy of immature insects; acarology; biological literature; and teaching experience. Pr.: ENTOM 710 and consent of instructor.

**ENTOM 995. Entomology Seminar.** (1) I, II. Pr.: Consult seminar committee. Pass/fail grade only.

**ENTOM 999. Research in Entomology.** (Var.) I, II, S. Dissertation credit for students majoring in entomology. Pr.: Knowledge in special area and consent of instructor.

# Grain Science and Industry

**Department head**

**Richard R. Hahn,** Ph.D., Physical–Organic Chemistry, Kansas State University. Grain processing and utilization, starch utilization, cereal based foods, commercialization and management.

**Professors**

**Keith Behnke,** Ph.D., Grain Science, Kansas State University. Feed Technology Research Scientist: feed processing research as it affects animal nutrition.

**Charles W. Deyoe,** Professor and Director of Food and Feed Grains Institute and International Grains Program, Ph.D., Biochemistry and Nutrition, Texas A&M University. Feed Technology Research Scientist: feed manufacturing processes, nutrition, grain quality, processing, and utilization.

**W. Dale Eustace,** Ph.D., Grain Science, Kansas State University. Milling Technology Research Scientist: large and small scale wheat and corn milling, wheat conditioning, and milling of other grains.

**R. Carl Hoseney,** Ph.D., Grain Science, Kansas State University. Research Cereal Chemist: cereal structure and function.

**Robert McEllhiney,** M.B.A., Indiana University. Feed Technology Research Scientist: feed production management, transportation, feed plant design, energy management, materials handling and processing.

**John Pedersen,** Ph.D., Entomology, Kansas State University. Stored Grain Research Entomologist: stored grain insects and their control, grain quality and preservation, food plant sanitation, molds and mycotoxins.

**Joseph Ponte,** M.S. Agricultural Biochemistry, University of Minnesota. Research Cereal Chemist: baking science and technology, cereal science.

**Paul Seib,** Ph.D., Biochemistry, Purdue University. Research Biochemist: starch and cereal grain carbohydrates, vitamin C chemistry and nutrition.

**Chuck Walker,** Ph.D. Cereal Chemistry, North Dakota State University. Research Baking Scientist: Baker's National Education Fund Professor of Bakery Science, bakery science education, experimental baking and ovens, starch and dough rheology, lab computerization.

**David Wetzel,** Ph.D., Analytical Chemistry, Kansas State University. Research Analytical Chemist: analytical method development and application of instruments to problems in cereal chemistry, specializing in chromatography and spectroscopy, supercritical fluid extraction, high performance liquid chromatography, near infrared spectroscopy.

**Associate professors**

**Jon Faubion,** Ph.D., Cereal Chemistry, Kansas State University. Research Cereal Chemist: cereal chemistry, microstructure of cereals and cereal food products, food functionality of grain components, dough texture and rheology.

**Ekramul Haque,** Ph.D., Agricultural Engineering, Kansas State University. Grain Processing Technology Scientist: food and feed grains processing, grain storage.

**Carol Klopfenstein,** Ph.D., Food Science, Kansas State University. Research Cereal Chemist, Nutritionist: nutritional properties of grains and legumes.

**Research associates**

**Carl Reed,** Ph.D., Grain Science, Kansas State University. Grain Storage Specialist: grain quality measurement, control of storage pests, properties of stored grain masses.

## Programs

The Department of Grain Science and Industry offers courses of study leading to degrees of master of science and doctor of philosophy in grain science. Grain science faculty collaborate with the scientists at the USDA Grain Marketing Research Laboratories and the American Institute of Baking and there are graduate programs that are collaborative with those laboratories.

The department has modern teaching and research facilities which include a pilot flour mill, feed mill, bakery, extrusion laboratory, and grain storage and handling facility. In addition, more than 10 cereal chemistry laboratories are equipped with ultracentrifuges, freeze-dryers, gas chromatographs, liquid chromatographs, balances, rapid viscosity analyzer, differential scanning calorimeter, thermo-mechanical analyzer, classical rheometer (Instron), dynamic rheometers, gel electrophoresis apparatus, a full array of glassware, rapid analyzers for Kjeldahl nitrogen, fiber, and glucose, as well as recording mixers and starch viscameters.

The Department of Grain Science and Industry has a 83-year history of academic interest in the milling industry with particular emphasis on milling and baking properties of wheat cultivars. The wheat milling facilities range from a bench-scale mill (batch of 0.5 kg of grain) to a pilot mill with a capacity of

6 MT/8h. Specialty dry mills are also available to purify, fractionate, and grind any seed-like material, including all cereals, legumes, pulses, spices, and gums. Plans are under way to fabricate a wet-milling laboratory for grain.

The department occupies another unique position by having a fully functional pilot feed mill for research and development studies by university, industry, and government organizations. The feed mill at Kansas State University is a modern concrete and steel structure on campus which houses the latest in equipment in the feed milling industry. Its capabilities include cleaning and receiving raw materials, classification of raw materials, grinding and pelleting, flaking, or extruding. A premix room for micro-ingredients and a large-scale batching system facilitate accurate proportioning and weighing of feed ingredients. The feed mill is capable of producing all physical forms of formulated animal feeds, except blocked feeds.

The Extrusion Processing Center, which is constructed for food-grade work, houses a Wenger Model X-20 single-screw extruder, a Wenger Model TX-52 twin-screw extruder, and a gas-fired belt dryer.

Departmental facilities for research include well-equipped laboratories for all areas of research in cereal chemistry. This includes laboratories equipped for chemical research and special laboratories equipped for studies of the physical properties of flour, doughs and food systems. Pilot bakery facilities provide an excellent environment for teaching and research. A fully-equipped computer laboratory is available to all students.

The Swanson Memorial Resource Room, located in Shellenberger Hall, contains a collection of volumes relevant to the grain science discipline.

## Admission

Correspondence and questions regarding Graduate School are handled by the chair of the Graduate Admissions Committee. You should write to the department requesting information and application forms. Complete the forms when received, obtain the necessary transcripts and request letters of recommendation be sent to The Chair, Graduate Admissions Committee. All applicants whose native language is not English are required to attain a minimum score of 550 on the Test of English as a Foreign Language before they are admitted to the Graduate School at Kansas State University. The completed application will be evaluated by the department's graduate admissions committee, which will provide a recommendation for action. Files will also be directed to faculty with interest and research activity in the applicant's field of specialization.

No student is admitted and then assigned to a faculty member for supervision, rather, the faculty member evaluates the application information presented and decides whether or not to supervise the student (i.e., become the student's major professor). Once this agreement has been made, the application is submitted, with the committee recommendation to the department head for approval and then forwarded to the Graduate School. The Graduate School has the ultimate authority of approving or denying graduate admission.

## Assistantships

Graduate research assistantships in grain science and industry are designed to support the research project areas of the individual faculty members. Those projects may be Kansas Agricultural Experiment Station projects directed by the faculty member or sponsored research projects funded by industrial, state, or federal agencies. In all cases, the decisions regarding support and awarding of assistantships are made on a competitive basis. Funds are not always adequate to award assistantships to all students who would like support. Decisions regarding initial and continuing support are based on both academic performance and research progress. Failure to maintain high quality academic work or research activity can be reason to cancel or discontinue an assistantship.

Graduate research assistantships may be awarded as five-tenths or four-tenths appointments and, less frequently, other levels. The university fiscal year begins on June 18 and ends the following June 17. Thus, assistantship appointments for a nine-month period are normally started in August and additional appointments are made for the summer months. In most cases, assistantships are continued for a 12-month period.

The department has a very limited number of graduate teaching assistantships. Those are assigned to graduate students who assist faculty with teaching activities. All GTAs are awarded for a nine-month period only. In most cases, students supported with GTA funds will have opportunities for GRA support during the summer and are expected to work on research project activities of the faculty.

All graduate students receiving five-tenths time appointments are expected to carry full semester course loads (10 credit hours). A full course load for those students appointed at the four-tenths level is 12 credit hours.

Graduate students receiving assistantships are considered university employees and are eligible for the in-state tuition rate. Graduate assistants appointed at the five-tenths level are expected, as employees of the university, to work 20 hours per week on any assignment needed by the department. That work is most often the research activity assigned by the major professor, but it can involve other assigned activity. Students with four-tenths assignments are expected to work 16 hours per week. Research for thesis or dissertations is not necessarily the work required for a research assistantship.

## Master of science

### General requirements

Except under special conditions, candidates for the master's degree are required to spend one academic year in residence.

A committee of at least three graduate faculty members supervises the program of study for the master's degree. The candidate's major professor serves as committee chair. The committee is selected by the student and his or her major professor, with selection of the committee subject to approval by the Graduate School. The supervisory committee's responsibilities include approval of a thesis or report research proposal, guidance in and approval of a written plan of study which describes course work to be completed, approval of the final copy of the thesis or report, and administration of a final oral examination.

A master's degree requires a minimum of 30 semester hours of graduate credit consisting of: 24 hours of course credit work and a minimum of 6 research hours resulting in a thesis.

The student must submit a written plan of study to the Graduate School prior to the end of the second semester that the candidate is enrolled at Kansas State University.

A candidate will submit the thesis or report to all committee members before the examination is scheduled. A copy is to be available at the final oral examination.

A final oral examination is required of all students. This must include a defense of the thesis in the grain science department, and may include interpretation of other scholarly work, and testing of the student's understanding of their fields of study.

## Doctor of philosophy

The Ph.D. degree normally requires three years beyond the master's degree. It is awarded to candidates who have demonstrated unique ability as scholars and researchers and proficiency in communication. The degree also certifies that the candidate has an understanding of the subject matter in the discipline and possesses the ability to make original contributions to knowledge.

### General requirements

Graduate study beyond the bachelor's degree equivalent to 90 or more semester hours is required for the doctor of philosophy degree. Those hours include enrollment in at least 30 hours of research and 30 hours earned previously for the master's degree. At least a year in residence at the university is required.

A significant portion of the courses for a Ph.D. must be at the 900-level. No more than 6 hours of 500-level supporting courses in addition to those on the master's degree will be permitted on a Ph.D. program of study and those only with written justification from the student's advisory committee and the department head.

The student and major professor select an advisory committee. Selection of the committee is subject to approval by the Graduate School. The committee consists of the major professor and at least three other members of the graduate faculty. One member of the committee must be a member of the graduate faculty in a department other than that of the major professor.

The duties of the supervisory committee include advising the student on preparation of a plan of study and development of a doctoral research proposal, administration of a preliminary written examination, approval of the final form of the dissertation, and administration of the final oral examination.

It is expected that each graduate student's dissertation or thesis will be published in the scientific literature. Graduate students are expected to prepare draft manuscripts prior to or by the time of their final oral exam. Publication of some items can precede publication of thesis or dissertation but guidance regarding prior publication should be followed.

## Course work

Grain science includes the science and technology of cereals and other grains, their basic properties and their utilization in foods, feeds, and other industrial products. Knowledge of chemical, biological, physical, and mathematical sciences is fundamental to grain scientists. As part of their degree programs, students will develop strong written and oral communication skills.

The course requirements for each graduate student in grain science will be drawn from the fields listed above. Specific requirements for each individual will be determined by the major professor and the supervising committee, with due consideration given the student's qualifications and professional plans and interests. The student may be required to make up deficiencies in course work not taken in their undergraduate curriculum.

### Suggested courses for the M.S. degree

All students:
GRSC 815 Fundamentals of Grain Processing
GRSC 602 Cereal Science
GRSC 900 Graduate Seminar in Grain Science
A graduate-level grain science course in at least one specialty area (i.e., baking, milling, feed science)
Statistics, STAT 703, STAT 704, and STAT 705
BIOCH 755 Biochemistry or BIOCH 521 General Biochemistry
BIOCH 755 Biochemistry Lab is also suggested

### Additional suggested courses for the Ph.D. degree

All students:
STAT 720 Design of Experiments
GRSC 900 Graduate Seminar in Grain Science
BIOCH 755 Biochemistry I for those in cereal science programs
GRSC 900 Graduate Seminar in Grain Science

### Cereal science programs

10 credit hours of chemistry and/or physics, including an advanced course in biochemistry and an acceptable course in physical chemistry which has calculus as a prerequisite.

### Undergraduate and graduate credit in minor field

**GRSC 500. Milling Technology I.** (4) II. Principles and practices of wheat flour milling with full-scale equipment including grain storage, blending, cleaning, conditioning plant, and a modern pneumatic 240 hundred weight flour mill, with instrumentation and air conditioning, etc. Two hours lec. and six hours lab a week. Pr.: GRSC 100 and 110.

**GRSC 505. Cereal and Feed Analysis.** (3) II. Methods of analyzing and testing cereal grains, cereal, and feed products. One hour lec. and six hours lab a week. Pr.: CHM 230 and BIOCH 120.

**GRSC 510. Feed Technology I.** (4) I. Introduction to the engineering 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.: ASI 318 and GRSC 110.

**GRSC 520. Extrusion Processing in the Food and Feed Industries.** (4) II. The course is designed to provide the student with an understanding of extrusion technology and the ability to apply it to product development and production through a "hands-on" approach. Major emphasis is on laboratory exercises in which students will operate pilot scale extrusion equipment to produce readily-recognizable commercial products such as cheese curls, breakfast cereals, pasta, pet food, etc. Emphasis will also be placed on process and product development, analysis and problem solving techniques. Three hours of lec. plus one three-hour lab. a week. Pr.: Junior standing and STAT 320 preferred.

**GRSC 591. Commercial Feed and Food Manufacturing Internship.** (2) I. A practical application of feed and food manufacturing technology during an eight-week summer internship with an active commercial feed and food manufacturing company. The course will stress applied aspects of commercial feed and food manufacturing, which can include, but not be limited to plant operations, maintenance, personnel and labor relations, business management, warehousing, ingredient procurement, quality assurance, and fleet management. Pr.: GRSC 510 or 500 or 635.

## Grain science and industry courses

**GRSC 602. Cereal Science.** (3) I, II. The characteristics of cereals, legumes, their components and their processing to foods. Three hours lecture a week. Pre.: BIOCH 120.

**GRSC 610. Electricity and Control of Milling Processes.** (3) II. Major emphasis will be given to application of electricity to machinery for grain processing and electrical code. Two hour lecture, two hour lab. Pr.: Either GRSC 500, 510, or 635.

**GRSC 625. Flour and Dough Testing.** (3) II. Physical and chemical methods used in evaluating wheat flour and dough. One hour lecture and six hours lab a week. Pr.: GRSC 602.

**GRSC 630. Management Applications in the Grain Processing Industries.** (3) II. This course deals with management principles and their specific application to the processing industries. Industry and allied trade personnel in management positions will give a number of lectures in their field of expertise. Special emphasis is placed on grain industry organizations, labor contracts, supervision, scheduling and planning, regulatory agencies and cost control. Three hours lec. a week, Pr.: Econ 1 and with GRSC 510, GRSC 500, GRSC 120, or consent of instructor. Junior standing.

**GRSC 635. Baking Science I.** (2) I. Introduction to properties of ingredients used in baking, reactions of ingredients during processing into baked products. Two hours lec. a week. Pr.: BIOCH 120.

**GRSC 636. Baking Science I Laboratory.** (2) I, II. Laboratory exercises in theory and production of yeast-leavened baked products. Six hours lab a week. Pr.: 635 or conc. enrollment.

**GRSC 640. Advanced Flow Sheets.** (2) II. Design flow diagrams for dry milling processes. Uses a combination of methods that lead to practical applications and analytical techniques. Six hours lab a week. Pr.: GRSC 500 or 510.

**GRSC 650. Concepts of Modern Feed Mill Design.** (3) I. Principles of modern feed mill design, feasibility and equipment selection for plant improvement and new plant construction. Emphasis is place don the effects of design on plant operation efficiency, product quality, and manufacturing costs. Pr.: GRSC 510, junior standing.

**GRSC 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 lecture and three hours lab a week. Pr.: Minimum of eight hours of biological science; junior standing.

**GRSC 655. Cereal Food Plant Design and Construction.** (3) I. Drawing assignments relative to the building, or modification, of food plants. Emphasis is also given to practical information regarding plant construction project design and management. Power transmission systems design and sheet metal pattern layouts, relative to cereal foods plant, are covered through problem assignments and CAD software programs. Two hours lecture and three hours lab a week. Pr.: ME 212 Engineering Graphics I, senior status in grain science, either GRSC 500 Milling Tech I or GRSC 730 Milling Tech II.

**GRSC 661. Qualities of Feed and Food Ingredients.** (3) I. Physical and nutritional properties of feed and food ingredients and the effects of origin, processing, storage and other factors upon them. Three hours lecture a week. Pr.: BIOCH 120.

**GRSC 670. Bakery Layout.** (1) I. Equipment used to produce bakery foods is studied, and the students prepare a bakery layout. Two-hour lab. Pr.: PHYS 113, and GRSC 635 and GRSC 636.

**GRSC 701. Practicum in Bakery Technology.** (1). Intersession only. One week intensive course during the January intersession. Lectures and hands-on laboratory experience with commercial production scale baking equipment for breads and rolls, cookies and crackers, and cakes and sweet doughs. Restricted to upperclass bakery science and management majors.

**GRSC 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.: GRSC 602 or 661.

**GRSC 725. Feed Manufacturing Processes.** (3) II. 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, and ASI 318.

**GRSC 730. Milling Technology II.** (2) 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 practice of wheat conditioning, drying, and aeration are elaborated upon. Two hours lecture a week. Pr.: GRSC 500.

**GRSC 731. Milling Technology II Laboratory.** (2) I. The processes for milling other grains such as corn, oats, sorghum, different classes of wheat, and rye are studied in theory and by practice on small-scale laboratory milling units. Six hours lab a week. Pr.: GRSC 730 or conc. enrollment.

**GRSC 734. Milling Processing Technology Management.** (3) II. A capstone course for milling science and management students. The objective is to familiarize students with the structure of the U.S. flour milling industry, the managerial and processing operations involved in the management of a flour mill, modeling simulation techniques for flour milling operations, engineering economic parameters used in management operations, investment projects and evaluation of new milling technologies. Two hours lecture and three hours of lab per week. Pr.: GRSC 730.

**GRSC 737. Baking Science II.** (2) 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 lecture a week. Pr.: GRSC 635.

**GRSC 738. Baking Science II Laboratory.** (1) II. A laboratory course to accompany GRSC 737. Three hours lab a week. Pr.: GRSC 737 or conc. enrollment.

**GRSC 750. Feed Technology II.** (4) II. Advanced study of engineering principles of feed plant production, materials handling, grinding, pelleting, and other major processing operations. Three hours lecture and three hours lab a week. Pr.: GRSC 510, PHYS 114 or 214, and one course each in statistics and computer programming.

**GRSC 751. Air Handling in Grain Processing.** (3) II. Emphasis is given to pneumatic conveying, exhaust systems, and air handling in the grain processing industry. Two hours lecture and three hours lab a week. Pr.: MATH 210 and PHYS 213.

**GRSC 785. Advanced Flour and Feed Technology.** (3) II. Design and use of exhaust systems, pneumatic conveying systems, bins and hoppers, and the practical applications of electrical interlocking, instrumentation, and microprocessors to automatic mill control. Also other subjects such as sound measurement and explosion detection and prevention are covered. Two hours lecture and three hours lab a week. Pr.: GRSC 730 or 750.

**GRSC 790. Grain Science Problem.** (Var.) I, II, S. Pr.: Consent of staff.

**GRSC 805. Nutritional Properties of Cereal and Legumes.** (3) II. Special emphasis is given to the nutritional properties of grains and legumes and their processed products. Pr.: BIOCH 521, GRSC 602, or conc. enrollment.

**GRSC 811. 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.: CHM 271 or GRSC 505 and BIOCH 120.

**GRSC 815. Fundamentals of Processing Grains for Food.** (3) I. Unit processes in the receiving and storing of grains; grinding, sifting, mixing, conveying, cooling, drying air qualities, air flow, compaction, extrusion, etc. This course is not open to undergraduate majors in the department. Two hours lecture and three hours lab a week. Pr.: A course in physics.

**GRSC 899. Research in Grain Science.** (Var.) I, II, S. Research may be used as basis for the M.S. thesis. Pr.: Consent of staff.

**GRSC 900. Graduate Seminar in Grain Science.** (1) I, II. Discussion of technical problems in the cereal industry. One hour lecture a week. Attendance required of all graduate students in grain science.

**GRSC 901. Starch Chemistry and Technology.** (2) II. Offered a 1991–1992 and alternate years. Chemical and physical properties of cereal and legume starches. Isolation, structure, assay methods, and properties in solution. Methods of modifying starches for industrial use, including chemical, physical, and enzymic modification. Pr.: BIOCH 521, GRSC 602. Offered 1992 and alternate years.

**GRSC 905. 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 lecture a week. Pr.: BIOCH 521 and 522.

**GRSC 910. Topics in Grain Science.** (Var.) I, II, S. Discussions and lectures on important areas and contributions in the field of grain science not currently covered in present courses. Pr.: Consent of instructor.

**GRSC 915. Advanced Cereal Chemistry.** (3) II. The chemistry of cereal components at the molecular level. The role and interactions of the various constituents, their functionality in producing an end product, and their influence on nutritional properties. Three hours lecture a week. Pr.: BIOCH 521 and 522.

**GRSC 999. Research in Grain Science.** (Var.) I, II, S. Research may be used as basis for Ph.D. dissertation. Pr.: Consent of staff.

# Horticulture, Forestry, and Recreation Resources

**Professors**

**Mary Lewnes Albrecht,** Ph.D., The Ohio State University (Floral induction of herbaceous perennials and other florist crops; field-grown cut flowers, floricultural plant physiology).

**Wayne A. Geyer,** Ph.D., University of Minnesota (Agroforestry).

**Paul H. Jennings,** Ph.D., North Carolina State University (Stress physiology with emphasis on chilling injury of germinating seeds and seedlings).

**Charles W. Marr,** Ph.D., University of Tennessee (Evaluation of containerized vegetable transplants under field and greenhouse environments; intensive vegetable crop production technologies).

**Richard H. Mattson,** Ph.D., University of Minnesota (Human mental and physiological responses to horticultural activities within institutional, community-based, vocational rehabilitation programs, horticultural therapy).

**Frank D. Morrison,** Ph.D., Michigan State University (Fruit and nut production; herbicides).

**John C. Pair,** Ph.D., Kansas State University (Ornamental horticulture and turfgrass evaluations).

**Associate professors**

**Ted T. Cable,** Ph.D., Purdue University (Human dimension of natural resources management).

**Edward W. Hellman,** Ph.D., University of Arkansas (Grape and blackberry production, fruit physiology).

**Houchang Khatamian,** Ph.D., University of Guelph (Ornamental physiology, culture and nutrition and tissue culture).

**Charles E. Long,** Ph.D., Kansas State University (Woody ornamentals and herbicides).

**C. B. Rajashekar,** Ph.D., Colorado State University (Fruit science, environmental stress physiology, cold tolerance, and molecular biology).

**Steven C. Wiest,** Ph.D., Cornell University (Structural alterations of membrane proteins induced by heat; mechanism of freezing injury; modeling thermal environments).

**Assistant professors**

**Jack D. Fry,** Ph.D., Colorado State University (Turfgrass and environmental stress).

**Karen B. Gast,** Ph.D., University of New Hampshire (Postharvest physiology of fruit, vegetable, florist and ornamental crops).

**William J. Lamont Jr.,** Ph.D., Cornell University (Environmental physiology of vegetable crops and sustainable production technology).

## Programs

The Department of Horticulture, Forestry, and Recreation Resources, with 22 faculty involved in teaching, research, and extension, maintains a horticulture research facility of 57 acres and a turfgrass research farm of 7 acres near the campus. In addition, the department operates a 80-acre experimental field in Wichita, an 80-acre pecan experimental field near Chetopa, and a vegetable research field of 10 acres in eastern Kansas near DeSoto. Excellent greenhouse and controlled environmental facilities of nearly 25,000 square feet are available for teaching and research. Research in basic and applied areas of horticulture is supported by modern and well equipped field and laboratory facilities. Research labs support a wide range of studies in the areas of crop production/improvement/adaptation, in-vitro culture, biotechnology, plant-environment interactions, stress physiology, and molecular biology. The department also participates in interdepartmental food science program. The department will be relocated from Waters Hall to east wing of Throckmorton Hall (October 1993) with new state-of-the-art research and teaching facilities.

Graduate students participate in activities of the Graduate Club, the American Horticultural Therapy Association, and Pi Alpha Xi (national honorary in floriculture, landscape and ornamental horticulture).

## Degrees

K-State offers master of science and doctor of philosophy degree programs in a diverse number of horticultural commodity and discipline areas. Master of science specializations include ornamental horticulture, floriculture, turfgrass, vegetable crop, fruit crop, horticultural therapy, and horticultural disciplines including environmental stress physiology, molecular biology, tissue culture, and plant growth regulators. Doctor of philosophy specializations are available in most of these commodity and discipline areas. The department is also involved in the food science program.

The graduate faculty participate in training graduate students to excel in research, teaching or extension activities. Independent and original research is an important part of the graduate program and forms a basis for a graduate thesis. Research can be conducted within the department or in other cooperating departments.

## Requirements

Students seeking admission into the horticulture graduate program must have a degree in horticulture, botany, biology, or related agricultural science; those specializing in horticultural therapy may have degrees in horticultural therapy, plant sciences, education, medicine or social/behavioral sciences. All graduate students must have adequate background in horticulture, plant physiology, mathematics, and physical sciences.

Application to graduate programs should be addressed to Graduate Committee Chair, Department of Horticulture, Forestry and Recreation Resources, Waters Hall 227, Manhattan, Kansas 66506–4002. The completed application materials should be received by March 15 for fall admission and September 15 for spring admission. The application package must contain the following:

(1) a statement of graduate study goals and objectives including the area of research interest, (2) undergraduate and graduate transcripts, (3) three letters of recommendation preferably from academic or professional sources, (4) recent Graduate Record Exam scores, (5) Test of English as a Foreign

Language scores for students whose native language is not English (minimum acceptable score: 550), and (6) financial statement for international students indicating financial support for the first year of graduate school ($15,500).

### Financial support

A limited number of assistantships (GRA, GTA, and assistant instructor) are available to qualifying students. The assistantships are awarded based on students academic standing (GPA and GRE scores). The application for assistantships should be made before March 15 along with application materials for fall admission.

## Horticulture courses

### Undergraduate and graduate credit in minor field

**HORT 508. Landscape Maintenance.** (3) II. Fundamental principles of maintaining ornamental plantings of trees, shrubs, perennials, and turf in the nursery, home grounds, parks, and similar areas. Three hours rec. a week. Pr.: HORT 374 and/or HORT 375.

**HORT 520. Fruit Production.** (3) I. Principles and practices of cultivating fruit and nut crops commercially and in the home grounds. Laboratory offers experiences in pomological practices. Two hours rec. and two hours lab a week. Pr.: HORT 200 or equiv. and HORT 350.

**HORT 525. Horticulture for Special Populations.** (3) I. An intensive study of the concepts and methods of using plants and gardening as therapeutic activities with developmentally disabled geriatric, economically and socially disadvantaged, emotionally disturbed, or educationally deprived clients. Two hours rec. and two hours lab a week. Pr.: BIOL 210 or HORT 200.

**HORT 530. Horticultural Therapy Seminar.** (1). II. Guest lecturer and student presentations of topics relating to professionalism, current issues, or goals of horticultural therapy. The course is intended to help students focus expectations and assumptions about a professional career in horticultural therapy and to give them practice in articulating their understanding of the field. Pr.: HORT 255 and HORT 525.

**HORT 535. Horticultural Therapy Field Techniques.** (3) I, II. Students under supervision will plan conduct, and evaluate horticultural therapy activities at Manhattan institutional sites selected according to student's interest. A weekly discussion session addresses evaluation and issues of professionalism. Two hours rec. and two hours lab a week. Pr.: HORT 525.

**HORT 540. Horticultural Therapy Field Experiences.** (12) I, II. Supervised training at institutions with horticultural therapy programs to gain experience in the application and use of horticultural activities for special populations. Six months intensive training provided within student's specialization. Pr.: HORT 535.

**HORT 551. Landscape Contracting.** (3) II. In odd years. The use, interpretation, and development of planting plans (including contracting, construction, and specifications) as applied to landscape horticulture. Two hours rec. and two hours lab a week. Pr.: HORT 374 and/or HORT 375.

**HORT 560. Vegetable Crop Production.** (3) II. Study of production principles and cultural practices involved in the growing of vegetable crops. Two hours lec. and two hours lab or field trips a week. Pr.: HORT 200.

**HORT 570. Greenhouse Management.** (3) I. Greenhouse construction, environmental control, crop scheduling, and management. Two hours rec. and three hours lab a week. Pr.: HORT 200.

**HORT 575. Nursery Management.** (3) II. A study of the various practices and methods of operating a commercial nursery for the production of ornamental woody plants used for landscaping purposes. Two hours rec. and three hours lab a week. Pr.: BIOL 210, HORT 200, HORT 350, and AGRON 305.

**HORT 582. Pesticide Application Technology.** (3). II. The equipment, procedures, and techniques used in applying pesticides. Emphasis is placed on types, theory, operation, calibration, and maintenance of application equipment. Two hours rec. and three hours lab a week. Pr.: HORT 200 or BIOL 210 and an entomology or weed science.

**HORT 585. Arboriculture.** (3) II. Principles and practices of maintaining shade and ornamental trees under urban environments. Two hours rec. and three hours lab a week. Pr.: HORT 200 and HORT 374.

**HORT 590. Horticulture Field Study.** (1-4) I, II, S. Principles of commercial horticulture activity including exposure to multiple phases of the working horticulture enterprise. Students will be placed according to specific interest. For juniors and seniors in horticulture only. Pr.: HORT 200, plus one other core curriculum horticulture course.

### Undergraduate and graduate credit

**HORT 615. Turf Management.** (3) I. Turfgrass identification and adaptation; establishment and maintenance of lawn and recreational turf areas; turfgrass pests and their control. Pr.: HORT 200, AGRON 305.

**HORT 625. Floriculture.** (4) II, in odd years. The principles and commercial practices for providing greenhouse florist crops. The relationship is stressed between a plant's physiological response and its greenhouse environment. Aspects of postharvest physiology are also covered. Three hours lec. and two hours lab a week. Pr.: HORT 350 and HORT 570.

**HORT 640. Horticultural Problems.** (Var.) I, II, S. Problems and reports in floriculture, olericulture, ornamental horticulture, pomology, turfgrass and horticultural therapy. Pr.: Consent of instructor.

**HORT 700. Vegetable Crop Physiology.** (3) I, in even years. Study of basic principles of applied physiology using specific vegetable crops as examples. Three hours lec. a week. Pr.: HORT 560, BIOL 500.

**HORT 706. Turfgrass Sciences.** (3) II. A study of environmental stresses on turfgrass growth and management. Microclimate effects on turf are studied. Temperature, moisture, aeration, light, traffic aspects are discussed. Three hours rec. a week. Pr.: HORT 612.

**HORT 730. Fruit Science.** (3) II. Detailed discussion of selected topics in fruit physiology. Three hours rec. a week. Pr.: HORT 520, BIOL 500.

**HORT 740. Horticultural Plant Breeding.** (3) I, in even years. Breeding methods and their application to the economic improvement of flowers, fruits, shrubs, trees, turfgrasses and vegetables. Pr.: ASI 500 or equiv.

**HORT 751. Advances in Horticultural Therapy.** (3) I. New developments and applications of gardening or horticultural activities for special populations will be emphasized. Procedures for management of horticultural therapy programs, designing therapeutic or rehabilitation activities and evaluation methods will be discussed. Reading of selected research publications relating to horticultural therapy will be assigned. Pr.: HORT 535.

**HORT 780. Topics in Horticulture.** (Var.) I, II, S. discussion and lectures of important papers and contributions in this field. Pr.: Consent of instructor.

**HORT 792. Handling and Processing Fruits and Vegetables.** (3) I, in odd years. Field trips required. Principles of harvesting, grading, handling, nutritive value, and processing of fruits and vegetable crops. Pr.: BIOL 198 or equiv., and a course in organic chemistry or biochemistry.

### Graduate credit

**HORT 846. Plant Research Methods.** (3) I. Review of history and forms of plant science literature. Discussion on selecting experimental procedures, interpreting data, and reporting results. Two hours rec. and two hours lab a week. Pr.: One statistics course or consent of instructor.

**HORT 898. Master's Report.** (2) I, II, S. Investigations in pomology, olericulture, floriculture, ornamental horticulture, turfgrass, or horticultural therapy for preparation of master's report. Pr.: Consent of instructor.

**HORT 899. Research–M.S.** (Var.) I, II, S. Investigations in pomology, olericulture, floriculture, ornamental horticulture, turfgrass, or horticultural therapy for preparation of master's thesis. Pr.: Consent of instructor.

**HORT 910. Topics in Plant Breeding.** (Var.) I, II, S. Discussion and lectures on important papers and contributions in this field. Same as AGRON 910. Pr.: Consent of instructor.

**HORT 921. Horticultural Crop Nutrition.** (2) I, in odd years. Nutritional requirements of horticultural crops and factors affecting these requirements. Review of current literature on horticultural crop nutrition. Two hours lec. or reports a week. Pr.: HORT 200, AGRON 305, and a plant physiology course.

**HORT 940. Plant Regulators in Horticulture.** (3) I, in even years. A study of synthetic plant regulators used to initiate, induce, promote, inhibit, or alter characteristics of horticultural plants and crops. Included are kinds and types of exogenous plant regulators used on crops, their activity, plant responses, benefits and problems, and application technology. One hour lec. and two hours rec. a week. Pr.: BIOCH 510 or BIOL 500, and one graduate plant commodity course.

**HORT 951. Horticulture Graduate Seminar.** (1) I, II. Student presentations and discussion of investigational works in the various branches of horticulture.

**HORT 960. Environmental Plant Stress.** (3) II, in odd years. Physiological, biochemical and morphological factors involved n stress development and resistance will be discussed. Pr.: BIOL 800.

**HORT 999. Research in Horticulture, Ph.D.** (Var.) I, II, S. Investigations in pomology, olericulture, floriculture, ornamental horticulture, and turfgrass. Data collected may form basis for a thesis or dissertation. Pr.: Consent of instructor.

# Plant Pathology

**Bockus, W.W.** Ph.D., Plant Pathology, Univ. California, Davis, 1978. Soilborne and foliar fungal diseases of wheat. Participates in development of wheat germplasm tolerant to fungal pathogens in Kansas. Studies effects of various cultural practices (tillage, fertilizers, etc.) on diseases caused by these pathogens. Studies biology of these fungi (life cycles, interactions with other soil organisms, effect of environment on their activity) in laboratory, greenhouse, and field. Teaches Plant Disease Control, Plant Pathogenic Fungi.

**Bowden, R.L.** Ph.D., Plant Pathology, Univ. Wisconsin-Madison, 1989. Extension, research; diseases of small grains and forages, primarily wheat and alfalfa. Crop loss assessment and disease management.

**Browder, L.E.** Ph.D., Plant Pathology, Kansas State Univ., 1965. (Adjunct Emeritus; USDA, ARS.) Interaction of wheat and the wheat-leaf-rust fungus. Teaches Host Plant Resistance to Disease.

**Claflin, L.E.** Ph.D., Plant Pathology, Kansas State Univ., 1972. Applied phytopathogenic bacteriology. Bacterial and fungal diseases of corn, millet, and grain sorghum. Develops control through chemicals, tolerant hybrids, and ecological applications. Teaches Plant Pathogenic Bacteria.

**Eversmeyer, M.G.** Ph.D., Plant Pathology, Kansas State Univ., 1971. (Adjunct; USDA, ARS.) Epidemiology and ecology of wheat diseases. Studies development of wheat disease epidemics in the Hard Red Winter Wheat Region. Surveys disease incidence and yield losses on commercial fields and nurseries and includes in data bank for development of simulation models. Studies spore production and movement, infection indices, incubation periods, overwintering, and disease loss thresholds to develop or improve models for forecasting epidemic development and yield reduction and to develop concepts for control of disease development.

**Gill, B.S.** Ph.D., Genetics and Plant Breeding, Univ. California, Davis, 1973. Cytogenetics, molecular cytogenetics, and evolution of polyploid plant species; crop plant genetics, pathology, and breeding; management of wheat genetic resources, germplasm, and genetic stocks. Teaches Advanced Techniques in Cytogenetics.

**Heaton, L.A.** Ph.D., Plant Pathology, Purdue Univ., 1986. Molecular plant virology. Protein structure-function relationships during virus replication and host interactions. Mechanisms of monocotyledonous resistance. Teaches Plant Virology.

**Hetrick, B.A.D.** Ph.D., Plant Pathology, Oregon State Univ., 1978. Ecology, biology, and taxonomy of vesicular-arbuscular mycorrhizal fungi. Assesses the influence of these fungi on cultivated and native grasses. Collaborates with biologists and agronomists to study tallgrass prairie ecosystems at Konza Prairie Research Natural Area. Examines how mycorrhizal fungi can mitigate the effects of heavy metal and other soil contaminants on plant growth. Collaborates with civil engineers and agronomists interested in revegetation of soils contaminated with hazardous substances. Teaches Principles of Plant Pathology.

**Hulbert, S.H.** Ph.D., Genetics, Univ. California, Davis, 1987. Specificity in plant-fungi interactions. Genetic and molecular structure of complex disease resistance loci. Uses RFLPs as tools to molecularly characterize determinants of specificity and study the population genetics of pathogenic fungi. Teaches Genome Analysis.

**Jardine, D.J.** Ph.D., Plant Pathology, Michigan State Univ., East Lansing, 1985. Extension, research; field row crops; state leader for plant pathology. State-wide coordination of extension work in Plant Pathology. Extension and applied research on field row crops, primarily corn, sorghum, soybeans, sunflowers, and dry beans.

**Johnson, L.B.** Ph.D., Plant Pathology, Purdue Univ., 1964. Plant cell culture. Regeneration of alfalfa plants from protoplasts; selection of disease-resistant mutants from protoplast-derived material. Studies expression of disease resistance and susceptibility in cell culture; protoplast fusion as a tool for the introduction of disease resistance and other traits into alfalfa; transformation for plant improvement; and chloroplast inheritance and plastid DNA polymorphism in *Medicago*; alfalfa chromosome mapping. Teaches Plant Tissue Culture.

**Leach, J.E.** Ph.D., Plant Pathology, Univ. Wisconsin–Madison, 1981. Plant disease physiology. Physiology and molecular biology of host-parasite interactions. Studies mechanisms by which monocotyledonous plants resist bacterial pathogens. Teaches Plant Disease Physiology.

**Leslie, J.F.** Ph.D., Genetics, Univ. Wisconsin–Madison, 1979. Biochemical, molecular, and population genetics of model (*Neurospora* spp.) and plant pathogenic fungi (*Fusarium graminearum, F. moniliforme*); protoplast fusion, transposable elements, and genetics and regulation of nitrogen metabolism in *F. graminearum* and *F. moniliforme*; genetics of vegetative incompatibility in *Neurospora spp.* and *F. moniliforme* and the relationship of vegetative incompatibility to pathogenicity (stalk rot); chromosome rearrangements, protein polymorphisms, and genetic load in *Neurospora spp.* Teaches Fungal Genetics.

**O'Mara, J.L.** M.S., Plant Pathology, New Mexico State Univ., 1987. Extension. Plant disease diagnostician. Coordinates the Kansas State University Plant Disease Diagnostic Clinic. Diagnose statewide disease problems of horticultural and field crops. Teaches Plant Disease Diagnosis.

**Pfender, W.F.** Ph.D., Plant Pathology, Univ. Wisconsin-Madison, 1981. Microbial ecology. Studies interactions of selected soil- and straw-borne pathogens with other components of the soil and plant microflora, to develop information needed to devise biological, cultural, or other control methods; work includes laboratory and field investigations with Kansas field crops. Studies the use of micro-organisms to clean up soils polluted with pesticides and other chemicals. Teaches Ecology and Epidemiology of Plant Pathogens.

**Sauer, D.B.** Ph.D., Plant Pathology, Univ. Minnesota, 1967. (Adjunct; USDA, ARS.) Stored grain pathology. Fungal pathogens of stored grain; toxic metabolites of stored grain; control of stored grain diseases; origin, classification, and objective detection of off-odors in grain.

**Schwenk, F.W.** Ph.D., Plant Pathology, Univ. California, Berkeley, 1969. Soybean pathology. Studies ways to reduce losses due to charcoal rot and Phytophthora root rot; develops techniques to regenerate soybean plants from single cells and or protoplasts.

**Stuteville, D.L.** Ph.D., Plant Pathology, Univ. Wisconsin-Madison, 1964. Alfalfa pathology. Biology of the causal organisms and nature of heritability of resistance to downy mildew and rust of alfalfa. Cooperatively develops alfalfa resistant to anthracnose, downy mildew, Phytophthora root rot, bacterial leaf spot, and summer black stem. Cooperates in development of *Medicago* somatic hybrids for improved disease resistance. Teaches Plant Pathology Methods.

**Tisserat, N.A.** Ph.D., Plant Pathology, Univ. Wisconsin-Madison, 1982. Extension, research; horticultural diseases. Extension and applied research on diseases of vegetables, turf, fruit, and trees.

**Todd, T.C.** M.S., Plant Pathology, Oklahoma State Univ., 1982. Plant nematology. Ecology, pathology, and control of plant-parasitic nematodes on cultivated and native grasses; crop loss assessment and evaluation of the role of nematodes in plant diseases in Kansas. Teaches Plant Nematology.

**White, F.F.** Ph.D., Microbiology and Immunology, Univ. Washington-Seattle, 1981. Plant molecular genetics. Bacterial and plant relationships. Plant cell transformation. Molecular basis of phytobacterial pathogenicity. Plant development. Recombinant DNA technology. Teaches Molecular Approaches in Plant Pathology.

**Willis, W.G.** Ph.D., Plant Pathology, Kansas State Univ., 1967. Extension specialist, emeritus. Wheat and alfalfa diseases.

## Programs

Plant pathology is the study of plant diseases, their cause, effects, and control. The discipline is closely integrated with the other biological sciences, with unique strengths in basic and applied research.

We have personnel working on the major crops in Kansas (wheat, sorghum, alfalfa, corn, soybeans), on horticultural plants, on each of the major pathogen groups (fungi, including beneficial fungi; bacteria; viruses; and nematodes), in specialty areas such as disease physiology, epidemiology, stored grain pathology, disease diagnosis, and genetics of host-parasite interactions, and in the newer areas of biotechnology, including molecular genetics and cell and tissue culture. Molecular genetics is a departmental strength. We also cooperate on interdepartmental research projects; the interdisciplinary Wheat Genetics Resource Center is situated in Plant Pathology.

The department has an exceptionally strong invited seminar series, with an average of 20 to 30 outside speakers per year from universities, research centers, and private industries from around the world.

Plant pathology currently has 24 faculty members. We have 25 to 30 graduate students, about 10 to 15 postdoctoral fellows visiting scientists, and about 20 technical research assistants.

Plant pathology shares Throckmorton Hall, built in 1981, with the agronomy department. Laboratory space is modern and well-equipped, and interaction with other departments is strong. Phase II, a $27-million project scheduled to be completed by mid-1994, will double the space available to plant pathology and include the Department of Horticulture, Forestry, and Recreation Resources. The plant science departments share 100,000 square feet of new greenhouse space attached to Throckmorton Hall.

## Degree options and requirements

The department offers a full range of courses leading to the M.S. and Ph.D. degrees. These cover diseases caused by bacteria, fungi, nematodes, and viruses; bacterial and fungal genetics; disease control, diagnosis, ecology, epidemiology, and physiology; host plant resistance to disease; plant pathology methods; plant tissue culture and regeneration; plant cytogenetics; and student seminar, special problems and topics, and research.

Incoming graduate students are expected to have background course work in the biological sciences (botany or biology, plant pathology, entomology, mycology, microbiology, genetics); chemistry (inorganic, organic, biochemistry); mathematics; physics; statistics; and soil science or geology. Some course work to remedy background deficiencies can be taken along with graduate courses. Grades in relevant courses should be A or B, with an overall grade point average of at least B. We do not require a GRE score.

Students working toward an M.S. degree are required to take any two of the following: Plant Nematology, Plant Virology, Plant Pathogenic Bacteria, and Plant Pathogenic Fungi. They are also required to take either Ecology and Epidemiology of Plant Pathogens or Plant Disease Physiology. Seminar in Plant Pathology is to be taken once for credit, in addition to the thesis defense seminar. Research (or Report) and electives selected in conference with their committee constitute the remainder of the program.

Students working toward Ph.D. degree are required to take all of the following: Plant Nematology, Plant Virology, Plant Pathogenic Bacteria, Plant Pathogenic Fungi, Ecology and Epidemiology of Plant Pathogens, and Plant Disease Physiology. Seminar in Plant Pathology is to be taken three times for credit, in addition to the thesis defense seminar. Research and electives selected in conference with their committee constitute the remainder of the program.

Once each year, each graduate student who has completed at least one semester at K-State will be asked to summarize the progress they are making toward their degree. This formal report will include research objectives, tentative thesis title, a timetable of meeting Graduate School requirements, and a summary of progress.

## Admission

Applications are accepted at any time of the year, and graduate studies can begin during fall, spring, or summer terms. Applying early increases the probability of being awarded an assistantship. Application blanks can be ob-

tained from the Department and from the Graduate School. All application materials should be sent to the department. There is no application fee. For information, contact:

Graduate Studies
Department of Plant Pathology
Throckmorton Hall
Kansas State University
Manhattan, KS 66506–5502

Telephone: (913) 532-6176
FAX: (913) 532-5692

## Financial assistance

Financial support may be available to qualified students, with priority to U.S. students. Departmental graduate research assistantships for 1993–1994 are $12,600 for students working toward an M.S. degree and $13,800 for students working toward a Ph.D. degree; assistantships increase about $600 per year. Out-of-state (but not in-state) tuition is waived with either of these appointments. All applications are evaluated for available assistantships. Students may also be eligible to apply for fellowships from private and federal sources.

Departmental assistantships are limited to 30 months for M.S. from B.S., 42 months for Ph.D. from M.S., and 54 months for Ph.D. from B.S. degree. Duration of assistantship from grants and other sources is determined by the faculty member in charge. Continuation of all assistantships depends upon continued satisfactory progress toward the degree and availability of funding.

All students on half-time assistantships are required to enroll in at least 10 credit hours during each regular semester and 3 credit hours during the summer. Research hours can be taken as needed to fill in these credits. This requirement will be waived during the semester in which the degree is granted, although students must be enrolled during that semester.

Although there are no formal GTAs in plant pathology, all graduate students assist in teaching at least one course in the department during their graduate studies. In consultation with the student's advisor and the faculty member responsible for the course, the student can sign up for 1–2 credits of either PLPTH 750 (Problems in Plant Pathology; for assisting in courses numbered 699 and below) or PLPTH 920 (Topics in Plant Pathology; for assisting in courses numbered 700 and above).

Students on departmental assistantships are expected to serve as teaching assistants in departmental undergraduate courses (currently PLPTH 500, 607, 613, and 650) as needed, but not more than once each year.

Students whose native language is not English are required to first score at the appropriate level on an English comprehension test administered by the English Language Program at K-State. Cost of this test is borne by the department.

## Plant pathology courses

**PLPTH 500. Principles of Plant Pathology.** (3) II. An introductory class in the nature of plant pathogens and the cause, effect, and control of plant diseases. Diseases of field and horticultural crops will be addressed. Two hrs lecture, one 2-hr. lab a week. Not open to students with credit for PLPTH 510 or PLPTH 520. Pr.: BIO 198, 210, or equiv., and junior standing.

**PLPTH 607. Plant Disease Diagnosis.** (2) I. Theory and principles, with laboratory and practical experience in diagnosing diseases of field and horticultural plants. Two hr. lecture and four hr. lab a week. To meet first 10 weeks of semester. Pr.: PLPTH 500.

**PLPTH 613. Plant Disease Control.** (3) I. Disease control strategies are developed in a practical manner. Control economies and practices are considered in relation to principles and current research. Biological, cultural, physical, chemical, and regulatory methods are discussed. Two hrs lecture, one 2-hr. lab a week. Pr.: PLPTH 500.

**PLPTH 650. Plant Nematology.** (3) II, in even-numbered years. An introduction to the morphology, taxonomy, and ecology of phytoparasitic and free-living nematodes found in plants, soil, and fresh water. Emphasis is on the identification and control of plant parasitic nematodes and on lab techniques used in their study. Two hrs. lecture, one 2-hr. lab a week. Pr.: An introductory course in Plant Pathology.

**PLPTH 735. Plant Virology.** (3) I, in odd-numbered years. A study of the classification, etiology, epidemiology, molecular biology, genetics, and evolution of plant-infecting viruses, with emphasis on viruses and viral diseases of importance to Kansas. The laboratory will emphasize general research techniques and equipment usage, particularly transmission, symptomatology, serology, centrifugation, nucleic acid extraction, and electrophoresis of plant viruses. Two hrs lecture, one 4-hr. lab a week. Pr.: Genetics, General Biochemistry and lab, and an introductory course in plant pathology; or consent of instructor.

**PLPTH 740. Plant Pathogenic Bacteria.** (3) II, in even-numbered years. The etiology, epidemiology, dissemination and survival, taxonomy, mechanisms of pathogenicity, serology, host-parasite relations, control measures, and principles and methods of identifying plant pathogenic bacteria. Lab sessions will be devoted to use of general lab equipment and research techniques. Six hrs combined lecture lab a week. Pr.: General Biochemistry or an introductory course in plant pathology. Enrollment limited to 12 students.

**PLPTH 745. Plant Pathogenic Fungi.** (3) I, in even-numbered years. The isolation, handling, storage, inoculation, terminology, and taxonomy of fungal pathogens of plants. Particular attention will be given to techniques used to study fungi and to the genus and species concepts for important plant pathogenic fungal genera. Two hrs lecture, one 3-hr. lab a week. Pr.: PLPTH 500 and BIOL. 640.

**PLPTH 750. Problems in Plant Pathology.** (1–3) I, II, S. Work is offered in general plant pathology, plant virology, plant nematology, disease physiology, epidemiology, and disease diagnosis. Pr.: background of courses needed for the problem undertaken.

**PLPTH 760. Plant Pathology Methods.** (3) I, in even-numbered years. Practical laboratory methods in manipulating plant pathogens with emphasis on the isolation, culture, identification, inoculation, and preservation of plant pathogenic bacteria and fungi. One hr. lecture and 5 hrs lab a week. Pr.: PLPTH 500 or equivalent. Enrollment limited to 12 students.

**PLPTH 860. Host Plant Resistance to Disease.** (2) II, in odd-numbered years. A consideration of basic and applied aspects of controlling plant disease through host plant resistance. The relationships of disease components are elucidated, and types and characteristics of plant disease resistance are considered. Methods of using disease resistance in crop production are developed. Two hrs. lecture discussion a week. Pr.: PLPTH 500 and ASI 500.

**PLPTH 870. Seminar in Plant Pathology.** (1) I, II. Reports in the field of plant pathology. Pr.: consent of instructor.

**PLPTH 898. Master's Report.** (2) I, II, S. Pr.: background of courses needed for the topic undertaken.

**PLPTH 899. Research in Plant Pathology for the M.S. degree.** (Var.) I, II, S. Work is offered in each of the major pathogen groups, genetics of plant-microbe interactions, disease physiology, ecology, and epidemiology. Pr.: sufficient background to conduct the line of research undertaken.

**PLPTH 905. Ecology and Epidemiology of Plant Pathogens.** (3) II, in even-numbered years. This course deals with the ecological relationships of soilborne and foliar pathogens, as well as the biological and environmental factors which influence the spread of plant diseases. Three hrs lecture a week. Pr.: PLPTH 500 and one of the following: PLPTH 735, PLPTH 740, PLPTH 745, or BIOL 704.

**PLPTH 910. Plant Disease Physiology.** (3) I, in odd-numbered years. A discussion of molecular and genetic perspectives of resistant and susceptible interactions between plants and bacterial, viral, and fungal pathogens. Current hypotheses on the nature of disease resistance will be evaluated. Three hrs lecture a week. Pr.: PLPTH 500, BIOCH 521, and BIOL 500; BIOL 540 or ASI 500; and one of BIOL 800, PLPTH 735, PLPTH 740, or PLPTH 745.

**PLPTH 911. Plant Tissue Culture and Regeneration.** (3) II, in odd-numbered years. Plant tissue culture principles, techniques, and applications, with emphasis on plant regeneration from protoplasts and the use and potential of this procedure for crop improvement through genetic engineering. Research-level skills in this area will be taught. Two hrs lecture and 3 hrs lab a week. Pr.: ASI 500, BIOL 500, and one of BIOCH 521, 525, or 755. Enrollment limited to 18 students.

**PLPTH 912. Molecular Approaches in Plant Pathology.** (4) I, in even-numbered years. The use of molecular techniques in research in the plant sciences, with an emphasis on plant pathology. Techniques will include DNA cloning, DNA sequencing, polymerase chain reaction, and plant transformation. Eight hrs lecture lab a week. Pr.: BIOCH 521 and BIOL 675.

**PLPTH 915. Advanced Techniques in Cytogenetics.** (3) I, in odd-numbered years. An advanced course in research techniques in genome analysis, especially of higher plants emphasizing genetic mapping by use of various cytogenetic stocks. Laboratory and greenhouse experiments are performed. Pr.: AGRON 770 or BIOL 615 or equivalent.

**PLPTH 920. Topics in Plant Pathology.** (Var.) I, II, S. Discussions and lectures on important areas and contributions in the field of plant pathology. Pr.: Graduate standing.

**PLPTH 927. Fungal Genetics.** (3) II, in odd-numbered years. A study of the classical, molecular, and population aspects of fungal genetics in both model and commercially important systems. Topics to be discussed include genetic analysis via mitosis and meiosis, models of recombination, genetic control of fungal development, basic molecular genetics of fungi, and genetic factors affecting fungal population structure and stability. Three hrs lecture discussion a week. Pr.: BIOCH 521, ASI 500; recommended: BIOL 640 and a 600-level or higher course in genetics.

**PLPTH 930. Genome Analysis.** (3) II, in odd-numbered years. A discussion of the organization and evolution of genetic material in eukaryotic organisms. Methods of genetic and molecular analysis will also be discussed. Three hrs lecture a week. Pr.: ASI 500; BIOL 540 or BIOCH 765.

**PLPTH 999. Research in Plant Pathology for the Ph.D. degree.** (Var) I, II, S. Work is offered in each of the major pathogen groups, genetics of plant-microbe interactions, disease physiology, ecology, and epidemiology. Pr.: sufficient background to conduct the line of research undertaken.

# Architecture and Design

## Architecture

Wayne M. Charney, Associate Professor of Architecture. BSc 1973, MArch 1975, Univ. of Illinois; PhD 1985, Northwestern Univ. Specialization: Architectural History, Preservation Planning/Design, Social/Cultural Factors.

David W. Clarke, Assistant Professor of Architecture, BArch 1984, Univ. of Oregon; MA 1990, Univ. of Calif. at Los Angeles. Registered Architect. Specialization: Building Construction, Venacular Architecture, Design.

Gary J. Coates, Professor of Architecture. BED 1969, MArch 1971, North Carolina State Univ. Specialization: Rural and Sustainable Communities, Architecture of Erik Asmussen, Microclimatology, Energy–Conscious Design, Building Technology/Systems, Housing/Shelter.

Robert J. Condia, Associate Professor of Architecture. BArch 1980, Cal. Poly-San Luis Obispo, MS 1983, Columbia Univ. Registered Architect. Specialization: Architectural Theory and Design.

Bernd Foerster, Professor Emeritus of Architecture and Planning. BS in Arch. 1954, Univ. of Cincinnati; MArch 1957, Rensselaer Polytechnic Institute. Specialization: Preservation Planning/Design, Adaptive Use, Design.

Richard Hoag, Professor of Architecture. BA 1969, MArch 1977, Univ. of Washington. Specialization: Environment-Behavior, Mass Media and the Physical Environment.

William R. Jahnke, Professor of Architecture. BSME 1948, Duke Univ. Registered Professional Engineer. Specialization: Building Technology/Systems.

Eugene R. Kremer, Professor of Architecture. BArch 1960, Rensselaer Polytechnic Institute; MArch 1967, Univ. of Calif. at Berkeley. Registered Architect. Specialization: Professional Ethics, Design, Housing/Shelter, Building Technology/Systems.

Vladimir Krstic, Assistant Professor of Architecture. Dipl. 1979, Univ. of Sarajevo, Yugoslavia; MEng/Arch 1985, Kyoto Univ., Japan. Specialization: Architectural Theory, Japanese Architecture, Design.

Michael McNamara, Associate Professor of Architecture. BArch 1969, North Carolina State Univ.; MArch 1974, Univ. of California at Los Angeles. Registered Architect. Specialization: Development Economics and Feasibility Analysis, Programming, Design, Correctional Facilities, Housing/Shelter.

Lyn Norris–Baker, Associate Professor of Architecture and Director, Center for Aging. BA 1971, BArch 1972, Rice Univ.; MA 1978, PhD 1980, Univ. of Houston. Specialization: Environment-Behavior, Special Populations: Elderly and Handicapped, Programming, Post-Occupancy Evaluation.

Gwen Owens–Wilson, Associate Professor of Architecture. BA 1959, Univ. of Oklahoma; BArch 1972, Howard Univ.; MS 1980, PhD 1982, Univ. of Tennessee. Registered Architect. Specialization: Design, Visual Perception Communication.

David M. Sachs, Associate Professor of Architecture. BS 1974, Stetson Univ., MArch 1977, Rice Univ.; PhD 1986, Univ. of Michigan. Registered Architect. Specialization: Architectural Theory, Design, Housing/Shelter. (Kansas City Program)

David R. Seamon, Associate Professor of Architecture. BA 1970, SUNY; MA 1974, PhD 1977, Clark Univ. Specialization: Social/Cultural Factors, Phenomenology, Visual Perception/Communication, Housing/Shelter.

John Selfridge, Associate Professor of Architecture. BA 1959, Univ. of Kansas; MCP 1964, Yale Univ. Specialization: Environmental Health, Building Pathology, Facilities Planning/Management, Programming, Post-Occupancy Evaluation, Building Technology/Systems.

Suzanne Siepl–Coates, Associate Professor. Dipl. Ing. 1979, Univ. of Hannover, West Germany; MArch 1982, Univ. of California at Berkeley. Specialization: Design, Architecture of Erik Asmussen, Social/Cultural Factors, Pattern Language.

Sidney D. Stotesbury, Professor of Architecture. BS 1957, Florida State Univ., MA 1970, PhD 1975, Univ. of California at Berkeley. Specialization: Design Methods, Structural Systems, Environmental Systems.

Carol Watts, Associate Professor of Architecture. BA 1971, Mount Holyoke; MArch 1975, Univ. of Washington; PhD 1987, Univ. of Texas at Austin. Specialization: Architectural History, Preservation Planning/Design, Adaptive Use.

Donald Watts, Associate Professor of Architecture. BArch 1970, Univ. of Nebraska; MArch 1971, Univ. of California at Berkeley. Registered Architect. Specialization: Architecture of the Middle East, Design.

### Overview of programs

The master of architecture program at Kansas State University is a post-professional program of study requiring a minimum of 30 semester credit hours and a thesis for the completion of the degree. The program requires one and one half to two years in residence, and is designed to enable students to pursue specialized study in specific topics related to design, strengthening their preparation for professional roles and for generating creative responses to society's increasingly complex physical and social environment. The programs of study permit specialization in environment-behavior and place studies, project planning and programming, or community design/preservation.

These areas of specialized study in the master of architecture program accommodate graduates of five or six year programs in architecture, interior architecture, or landscape architecture, and certain four-year baccalaureate degrees. Applicants are considered upon the merits of their academic backgrounds and proposed programs of study. Entrance requirements established by the Graduate School include a bachelor's degree from an accredited university and a grade point average of B (3.0) or better in the last two years of the program. Approximately 10 to 15 students matriculate each year, so that the total enrollment in the graduate program is 25 to 30 students.

Kansas State University does not offer a first professional (accredited) degree in architecture at the master's level, since the areas of emphasis are not intended to provide all the educational credentials needed to attain professional registration. This status does not reflect any lack of rigor or quality in our program, but rather its focus on specialized academic topics. Many graduates of our program go on to careers in teaching, professional practice, government agencies, or related fields. A number have sought doctoral degrees at other institutions.

Paul Weigel Library, located in the College of Architecture and Design, is a professionally staffed branch of the university's main facility. It includes more than 36,000 bound volumes and approximately 200 periodical subscriptions. Among other facilities supporting instruction and research in the college are the computer laboratory (containing a variety of microcomputers and larger computer systems), an extensive technical information collection, the Krider Visual Resource and Learning Center, the Center for Community Services and Research, a heliodon, and a wind tunnel. Students in the college also enjoy a diverse range of lectures, seminars, exhibits, and guest critics throughout the academic year.

### I. Environment-behavior and place studies

Environment-behavior and place studies focus on the behavioral and experiential aspects of person-environment relationships and their implications for environmental design and research. The program seeks to provide varying philosophic and methodological approaches to issues in environment-behavior and place experience. Approaches to these issues range from more quantitative, explanatory styles of research, emphasizing pragmatic strategies and solutions, to more qualitative, descriptive styles emphasizing more philosophical concerns. Within this framework, students' programs of study and research are individualized to meet particular interests and needs. After completing an introductory core curriculum, students may choose to concentrate on a specific environmental problem or approach, or to work to creatively combine varying approaches and issues. Within environment-behavior and place studies, areas of focus can include community and facility design for special populations, experience of place and landscape, or a special focus designed to meet the particular education and career goals of an individual student. Students, in consultation with the advisor, combine elective courses within and outside the college to meet the needs of their specific areas of focus.

#### Required curriculum

| | | |
|---|---|---|
| ARCH 720 | Environment and Behavior | 3 |
| ARCH 725 | Research Methods in Architecture | 3 |
| ARCH 704 | Environmental Seminar: Post-Occupancy Evaluation | 3 |
| ARCH 830 | Advanced Architectural Design | 2 |
| ARCH 704 | Environmental Seminar: Thesis Proposal Preparation | 2 |
| ARCH 899 | Thesis | 6 |
| Electives | | 11 |

#### Recommended electives

| | |
|---|---|
| ARCH 680 | Development Analysis |
| ARCH 703 | Environmental Aesthetics |
| ARCH 710 | Topics in Architectural Design Methods: Computer Applications |
| ARCH 715 | Theory of Design: Qualitative Approaches to Place, Architecture, and Environmental Experience |
| ARCH 730 | Environmental Design and the Aging Process |
| IAR 730 | Facility Management |
| STAT 702 | Statistical Methods for Social Sciences |

### Thesis

The thesis may take one of two forms: (1) an applied or theoretical research-oriented thesis that involves a qualitative and/or quantitative approach to the problem, or (2) a design-oriented thesis that examines a physical design problem in depth from a number of points of view, including but not limited to theoretical, behavioral, economic, social, and cultural issues. Recent theses completed in this area of emphasis addressed issues in design methods, educational environments for children, work environments, residential environments for people with dementia, plaza design, an interpretation of three religious buildings based on Thiis-Evensen's *Theory of Archetypes in Architecture*, and interpretations of the sense of home.

## II. Project planning and programming

Almost all institutional or governmental and many large commercial projects go through separate planning/programming phases today because of the size and complexity of the projects and the number of organizations involved in approvals for any single project. These services are provided by specialized consulting firms, in-house programmers, or architectural firms. The project planning and programming area of emphasis provides opportunities for the student to gain knowledge and skills in the range of tasks required to plan and program major building projects, including development analysis, site considerations, programming and information management/analysis techniques, architectural research methods, and evaluation methods. In addition to completing the core curriculum, students may choose electives to enhance their programming-related skills, or to gain some expertise in a particular user group or facility type.

### Proficiency requirements

Students are expected to have acquired basic (undergraduate-level) knowledge in site planning/design and architectural programming prior to entering the graduate program. If a student does not have background in one or both of these areas, the necessary knowledge may be obtained by taking LAR 500 Site Planning and Design and/or ARCH 650 Architectural Programming as part of the first semester of study, postponing two required courses in the graduate curriculum until a later semester. If the student must take one or both of these courses for proficiency, the credits will not count toward the 30 credits required for the degree.

### Required curriculum

| | | |
|---|---|---|
| ARCH 680 | Development Analysis | 3 |
| ARCH 720 | Environment and Behavior | 3 |
| ARCH 725 | Research Methods in Architecture | 3 |
| ARCH 704 | Environmental Seminar: Post-Occupancy Evaluation | 3 |
| ARCH 704 | Environmental Seminar: Siting Major Facilities | 3 |
| ARCH 830 | Advanced Architectural Design: Advanced Program Techniques | 3 |
| ARCH 704 | Environmental Seminar: Thesis Proposal Preparation | 2 |
| STAT 702 | Statistical Methods for Social Sciences | 3 |
| ARCH 899 | Thesis | 6 |
| Elective(s) | | 3 or more |

### Recommended electives

Students in this area of emphasis will take a minimum of 3 hours of electives, selected on the basis of their program of study and intended career goals. Some students may wish to take more than 3 elective hours. Electives must be selected from a recommended list identifying courses that enhance programming-related skills, or from a list enabling the student to gain some expertise in a particular user group or facility type.

For students in this option, the required thesis must (a) demonstrate the student's ability to organize and carry out all the pre-design activities required for a single architectural project, and (b) involve research or design activities that meet the scholarly standards for a thesis (this part might focus on one of the activities completed in a).

## III. Community design/preservation

The graduate program in community design/preservation affords opportunities for students to gain knowledge required in making effective decisions about the designs of towns and cities, and to relate the role of designer to other disciplines and to the concepts and policies of community development within a historical perspective. Students elect a program of study that centers on a preservation studio and supporting courses, or a community design studio and courses that are related to concerns of developing nations and issues of sustainable communities. Supporting electives are available in the departments of the college and in sociology, geography, political science, and other related disciplines. Students also may enroll in K-State's summer program as a part of their programs of study. Students may choose to take courses in both programs of study, as long as they complete all core requirements for one of the curricula.

### Proficiency requirements

Students are expected to have acquired basic (undergraduate-level) knowledge in architectural programming prior to entering the graduate program. If a student does not have background in this area, the student is expected to enroll in ARCH 650 Architectural Programming or ARCH 704 Environmental Seminar in Post-Occupancy Evaluation as part of their first year of study. Students focusing on preservation also are expected to have taken at least one year of architectural history prior to their admission to the program.

### Community design: required curriculum

| | | |
|---|---|---|
| ARCH 725 | Research Methods in Architecture | 3 |
| PLAN 745 | Urban Design Seminar | 3 |
| ARCH 846 | Community Design Studio | 4 |
| ARCH 704 | Environmental Seminar: Thesis Proposal Preparation | 2 |
| ARCH 899 | Thesis | 6 |
| Distribution electives | | 6 |
| Electives | | 6 |

### Community design: distribution electives

Students must select at least 6 hours of courses from the following list. Students are expected to consult with their advisors to select courses that match each student's educational and research objectives.

| | |
|---|---|
| ARCH 715 | Theory of Design: Sustainable Futures |
| ARCH 715 | Theory of Design: Middle Eastern Architecture and Urbanism |
| ARCH 715 | Theory of Design: Issues in Japanese Contemporary Architecture |
| ARCH 715 | Theory of Design: Qualitative Approaches to Place, Architecture and Environmental Experience |
| PLAN 780 | Planning in Developing Areas |

### Community design: recommended electives

| | |
|---|---|
| ARCH 651 | Preservation Principles and Methods |
| ARCH 670 | History of American Architecture and Allied Design I |
| ARCH 671 | History of American Architecture and Allied Design II |
| ARCH 680 | Development Analysis |
| ARCH 710 | Topics in Architectural Design Methods: Computer Applications |
| PLAN 710 | Urban Visual Analysis |
| PLAN 715 | Planning Principles |
| PLAN 770 | Planning Law |
| PLAN 815 | Preservation Planning |

### Preservation: required curriculum

| | | |
|---|---|---|
| ARCH 651 | Preservation Principles and Methods | 3 |
| ARCH 680 | Development Analysis | 3 |
| ARCH 725 | Research Methods in Architecture | 3 |
| ARCH 830 | Advanced Architectural Design: Preservation Methods | 3 |
| ARCH 704 | Environmental Seminar: Thesis Proposal Preparation | 2 |
| ARCH 899 | Thesis | 6 |
| Distribution electives | | 6 |
| Electives | | 4 |

### Preservation: distribution electives

Students must select at least 6 hours of distribution electives in history. History courses specific to areas other than the U.S. may be selected if appropriate to the student's objectives. PLAN 745 Urban Design Seminar, also is acceptable as a distribution elective. Students are expected to consult with their advisors to select specific courses that match each student's educational and research objectives. Some of the courses that may be used for distribution electives are listed below.

| | |
|---|---|
| PLAN 745 | Urban Design Seminar |
| ARCH 670 | History of American Architecture and Allied Design I |
| ARCH 671 | History of American Architecture and Allied Design II |

### Preservation: recommended electives

| | |
|---|---|
| PLAN 715 | Planning Principles |
| PLAN 770 | Planning Law |
| PLAN 815 | Preservation Planning |
| ART 305 | Introduction to Museum Planning (Note: May not be part of the graduate program of study) |

### Preservation: summer studies

The program highly recommends summer professional work experience and/or specialized summer workshops or short courses to supplement the on-campus experiences at K-State.

### Thesis

The thesis may take one of two forms: (1) a design-oriented thesis that examines a physi-

cal design problem in depth from a number of points of view, including but not limited to theoretical, behavioral, economic, social, and cultural issues, or (2) an applied or theoretical research-oriented thesis that involves qualitative and/or quantitative approaches to the problem. Recent theses completed in this area of emphasis addressed issues in community design such as architectural materiality and sense of place, use of geometric proportions and symmetry in Islamic architecture, urban redevelopment/revitalization projects in the U.S., Asia, and the Middle East, and housing. Recent theses in this area addressed issues in preservation such as neighborhood preservation and conservation, guidelines for developing and conserving various sites, ranging from small towns in the U.S. to historic sites in the Middle East and South Asia, a pattern language for an area of Nantucket, and the relation of archeology, syncretism, and historic preservation.

### Application procedures

In addition to the application form and transcripts required by the Graduate School, the following materials are required to apply to the master of architecture program:

1. Application fee of $15.
2. Statement of educational and career objectives.
3. Three letters of recommendation.
4. Samples of academic/professional work, such as a portfolio of design work, including a description of each project, its objectives, and your role and responsibilities.

The applicant should obtain the detailed instructions regarding these additional application materials from the chair of the Graduate Program Committee, Master of Architecture Program, Department of Architecture, Seaton Hall, Kansas State University, Manhattan, KS 66506. To be assured consideration, applications for fall semester should be complete by March 1, and applications for the spring semester should be complete by October 1.

### Graduate teaching assistantships

Graduate teaching assistantships are available in limited amounts for students of exceptional qualifications. Appointment as a teaching assistant requires excellent skills in the subject matter required for a particular class, human relation skills, and excellent skills in spoken and written English. Appointment to a GTA is made by the heads of the departments in which a specific course is taught. Appointment to a GTA does not guarantee the award of successive appointments. Obtain specific instructions and application forms from the chair of the Graduate Program Committee.

### Scholarships

One scholarship may be awarded to an incoming graduate student each year. The amount of this scholarship ranges between $500 and $1,000. In order to enhance the quality of thesis research conducted by students in its graduate program, the Department of Architecture has set aside a portion of its scholarship funds to support thesis research. The intent of the award is to encourage students to conduct more ambitious or extensive research projects than would be possible otherwise.

### Architecture courses

#### Undergraduate and graduate credit in minor field

**ARCH 514 and ARCH 515. Environmental Systems in Architecture II and III.** (3 each) Criteria for selection and application of natural and mechanical environmental control systems in architecture. Focus on the integration of thermal, illumination, sanitary, movement, and acoustical systems with the building fabric and the natural environment. Contemporary and developing approaches are explored. Three hours lec. a week.

**ARCH 514. Environmental Systems in Architecture II.** (3) II. Pr. ARCH 413.

**ARCH 515. Environmental Systems in Architecture III.** (3) I. Pr.: ARCH 413.

**ARCH 566. Problems in Architectural Design.** (Var.) S. Study of specific design problems under the direct supervision of a member of the architectural faculty.

**ARCH 650. Architectural Programming.** (3) I, II. An introductory course surveying the basic philosophies and methodologies for architectural programming; emphasis on the comparative evaluation of different strategies and their integration within the process of design. Pr.: Senior standing or permission of the instructor.

**ARCH 650. Preservation Documentation.** (3) I, II. Investigation of existing buildings and their settings; documenting design qualities, history, materials, systems, construction techniques, landscape, and physical and functional changes over time, using Historical building Survey Standards. Pr.: Senior standing and proficiency in drafting.

**ARCH 657. Preservation Principles.** (3) I. Examination of theoretical and practical aspects of preservation; background and current issues; design considerations. Pr.: Senior or permission of instructor.

**ARCH 670. History of American Architecture and Allied Design I.** (3) I. The history of American architecture, including some aspects of interior architecture, urban planning, landscape architecture, and preservation. This course investigates how the built forms of various colonial settlers in America responded to a new environment and, consequently, how a distinct American culture eventually took shape by the end of the 1800s. Pr.: ENVD 250 and 251 or approval of instructor.

**ARCH 671. History of American Architecture and Allied Design II.** (3) I. The history of American architecture, including some aspects of interior architecture, urban planning, landscape architecture, and preservation. This course surveys those distinctly American styles of design which originated in the late 1800's and traces their impact on world architecture and how outside influences shaped American design from that time period up to the present. Particular emphasis is placed upon the interplay of formal and functional concerns in architectural design. Pr.: ENVD 250 and 251 or approval of instructor.

**ARCH 680. Development Analysis.** (3) I, II. An examination of various development characteristics and components and their crucial interactive nature which leads toward success or failure of building and land developments. Development factors investigated include: market analysis, location uses and users, cost/benefits, nonmonetary benefits, financial returns expected and needed, financial incentives for investors, and feedback into the design process. Pr.: Admission to the professional program.

**ARCH 703. Environmental Aesthetics.** (3) I, II. Problems involving aesthetics in areas related to student's major field. Three hours a week. Pr.: Senior standing.

**ARCH 704. Environmental Seminar.** (Var.) I, II. Environmental systems related to human perception, reaction, and behavior. Pr.: Senior standing.

**ARCH 710. Topics in Architectural Design Methods.** (3) I, II. Intensive review of selected design methodologies, including systematic and computer-based approaches to problem definition and project design; emphasis upon the comparative evaluation of problem-solving strategies within the architectural design process. Pr.: Advanced undergraduate or graduate standing.

**ARCH 715. Theory of Design.** (3) I, II. Analysis of theories and philosophies in the design professions, including those in related societal and technological fields.

**ARCH 720. Environment and Behavior.** (3) I, II. An introductory course investigating the relationship between human behavior and the design of the physical environment, identifying those basic psychological and social concepts which influence and are influenced by the built environment. Three hours lecture-recitation a week. Pr.: Senior standing or permission of instructor.

**ARCH 725. Architecture Research Methods.** (3) I, II. An introductory course surveying the basic philosophies and methodologies of science and research as they apply to the field of architecture. Special emphasis will be placed on those methods appropriate for investigating human response to the built environment. Three hours lecture/seminar a week. Pr.: Senior standing.

**ARCH 730. Environment and Aging.** (3) I, II. An exploration of the aging process related to those factors in the architecturally designed environment that hinder and facilitate successful adaptation by the aging individual. Three hours lecture/seminar a week. Pr.: Senior or graduate standing.

**ARCH 735. Topics in Building Construction Systems in Architecture.** (1-4) I, II. Advanced study of the relationship of conceptual and/or technological factors of building construction to architecture. Pr.: ARCH 434; or graduate standing and consent of instructor.

**ARCH 746. Urban Design Studio I.** (4) I. An interdisciplinary design studio involving large scale design; projects with extensive time implementation sequence, responses to socio-economic, cultural, environmental, and technical needs, and implementation strategies. Design methods are applied to selected urban areas of the Midwest.

**ARCH 752. Structural Systems in Architecture III.** (Var.) I, II. Study of the relationship of conceptual and/or technological factors of structure to architectural design in more depth, or in a broader context of form-determining interactions than that presented in ARCH 450 and ARCH 451. Pr.: ARCH 450, ARCH 451.

**ARCH 765. Problems in Architecture.** (Var.) I, II. S. A study of specific architectural problems under the direction of a member of the department staff. Pr.: Approval of instructor.

**ARCH 830. Advanced Architectural Design.** (Var.) I, II, S. Studies related to a comprehensive program in architecture.

**ARCH 846. Urban Design Studio II.** (4) II. Continuation of ARCH 746.

**ARCH 847. Urban Design Field Study.** (3) I, II, S. A field investigation of varied large scale institutions, CBD, and other mixed use developments. Pr.: PLAN 745 and PLAN 746.

**ARCH 899. Thesis.** (Var.) I, II, S. Study in architecture and related fields leading to thesis. Pr.: Approval of instructor.

# Landscape Architecture

**Professors**

**Alton A. Barnes, Jr.,** (Head) GF, BLA (University of Georgia), MLA (University of Illinois), RLA, ASLA. Market issues; community design; professional practice; site planning.

**Kenneth R. Brooks** (Graduate Director), GF, BS (Colorado State University), MLA (Utah State University), RLA, ASLA. Community and regional planning; ecological planning; visual resource management; computer applications; design education.

**Dennis J. Day,** GF, BSLA (Michigan State University), MLA (University of Michigan), RLA, ASLA. Construction management; urban design; design/build; land development; community design; retirement communities.

**Richard H. Forsyth** (Director of the Center for Research and Community Services), GF, BSLA (Michigan State University), MLA (Harvard University), RLA, ASLA. Urban design; site planning; visual and graphic communication; history.

**Dennis L. Law,** GF, BS (Texas Tech University), MLA (Kansas State University), RLA, ASLA. Mined-land reclamation; urban design/development; subdivision design; energy conservation; economic development; environmental ethics.

**Lane Marshall** (Dean), GF, BLA (University of Florida), MLA (University of Illinois), RLA, FASLA. Urban futures; understanding cities; design and behavior.

**Robert L. Page,** GF, BSLA (Kansas State University), MLA (Harvard University), RLA, ASLA. Urban design; botanic gardens; development economics; recreational developments; waterfronts and marinas.

**Associate Professors**

**Laurence A. Clement, Jr.,** GF, BS, BLA (State University of New York, College of Environmental Science and Forestry), MLA (Kansas State University), JD (University of Kansas) Attorney at Law, ABA; RLA, ASLA. Basic design; natural resource law, planning law, alternative dispute resolution.

**Timothy D. Keane,** GF, BSLA (Iowa State University), MLA and PhD (University of Michigan). Ecosystem restoration; environmental perception; prairie ecology.

**William P. Winslow, III,** GF, BLA (Kansas State University), MLA (University of Michigan), RLA, ASLA. Golf course design; professional practice; land development; site construction; arboretum/botanic garden design.

**Assistant Professors**

**Richard Hansen,** GF, BA (William and Mary), MLA (University of Colorado, Denver), RLA. Public art that celebrates natural systems; the poetics of materials; drawing and visual thinking.

**Stephanie A. Rolley,** GF, BLA (Kansas State University), MCP (Massachusetts Institute of Technology), RLA, ASLA, AICP. Suburban design and development; negotiated design; writing in the design professions.

**LaBarbara James Wigfall,** GF, BArch (Howard University), MCRP (Harvard University). Urban design; comprehensive planning; cultural and historic landscape preservation; programming; graphic design.

## Programs

The department offers professional bachelor and master of landscape architecture degrees (BLA and MLA). The programs are fully accredited by the Landscape Architecture Accrediting Board of the American Society of Landscape Architects. Graduates of the programs are in demand throughout the country in private practice, governmental service, and academic settings. Landscape planning and design have been part of the curriculum at Kansas State University since 1871, being part of the required curriculum of all students in early days of the institution. Graduates of both the undergraduate and graduate programs have been quite successful in passing examinations for licensing as a registered landscape architect.

## Program structure

Applicants to the master of landscape architecture program have undergraduate degrees in many different fields. For this reason the faculty evaluate all applicants on an individual basis to determine the applicant's level of ability. Students may be required to undertake basic proficiency courses to ensure they have the knowledge and skills in history and theory, design, construction, planting design, and professional practice that are equivalent to that of our BLA program. The basic proficiency courses will vary with each individual, from none for a student with an accredited BLA degree up to 34 credits for a student with no design background. Students taking basic proficiency courses will be able to take some of their graduate program courses simultaneously.

The actual MLA program requires all students to take several core courses and then to develop an individual concentration in one of the following three areas: community and urban design, professional practice and land development, or resource analysis and planning. Some concentration course work is offered jointly with the Departments of Architecture and Regional and Community Planning.

## Curriculum

The MLA curriculum is organized to provide students the opportunity to develop an understanding and appreciation of the philosophies, technologies, history, and theories appropriate to the practice and advancement of landscape architecture. It is structured to enhance basic professional competency, develop specializations, encourage interdisciplinary activity, and expose students to the application of research as a means of advancing professional development. The student's course work concentrates on advanced theoretical and practical aspects of traditional landscape architecture.

With basic professional competency as a foundation students focus their attention on the development of a specialization. The department has organized three areas of concentration, and students have freedom to design their program of study to meet individual interests and needs. Specialization is developed through a series of emphasis courses, support electives, and a thesis that should support the interest area. The identified areas of concentration reflect not only the interests, experience, capabilities, and resources of the Department of Landscape Architecture but also those of the College of Architecture and Design and of the university. Areas of concentration can vary somewhat with changes in resources and interests. These concentrations are often organized with other departments that have similar concentrations within their graduate programs. Students in these departments take the concentration course work together and share their disciplinary perspectives and expertise much as interdisciplinary teams do in professional settings. Such interaction between the students and faculties of the various departments provides cross-fertilization, respect, and appreciation of complementary abilities and perspectives.

Applied research plays a role in the development of candidates for the master of landscape architecture degree and is a part of the portion of the curriculum taken by all students. The department takes the philosophical position that students at the master's level need to understand the aims, techniques, methodologies, and environment appropriate to the intelligent application of research results to the professional practice and development of the discipline of landscape architecture. We believe that research is a realm of professional activity that refines and advances the discipline of landscape architecture, and that the methods and findings of research can serve the useful purpose to strengthen traditional practice in providing innovative services or dealing with complex design and planning issues. It is our intent to cultivate appreciation of research activity as a core learning experience. Students who might like to consider research activity as a career path are encouraged to enrich their educational experience with additional research theory and practice course work.

To this end the seminar series of courses exposes the students to systematic evaluation of potential research opportunities and introduces them to the basic procedures of research project development and elementary proposal writing. (The seminars are not limited to research only, but also look at the scope, intent, and context of the profession of landscape architecture.) Part of the intent of the seminar series is to introduce research project development and to explore the relationships between potential research projects and the areas of concentration within the department, and the special interests and capabilities of each student. This is accomplished through exercises, lectures, readings, and discussions.

After the completion of the seminars, students take a formal research methods course before initiating their own independent research projects, and take a proposal writing class to further develop their research preparation. This proposal writing class is the first 2 hours of the 6-hour thesis requirement, and at completion of this course students will have selected their committee and completed their proposal. Students are encouraged to relate the topic and focus of the thesis to their specialized area of concentration, coordinating it with required and elective courses. The primary goal of the thesis is to provide the students with the opportunity to demonstrate competence in the process of detailed definition of a problem or opportunity area, rigorous examination of existing and new information relating to potential applications of the student's new understanding.

The curriculum for the master of landscape architecture program is organized into three parts: the basic proficiency series of courses, the common courses, and the areas of concentration. The curriculum is designed to meet the needs of students entering from either landscape architectural or non-landscape architectural undergraduate backgrounds. It is intended to give all graduate students a broad exposure to traditional and emerging forms of practice and professional opportunities. The content of proficiency and common courses assures that all candidates will have studied the history, theory, philosophy, practice, and technology common to the discipline of landscape architecture. The areas of concentration allow and encourage students to pursue and develop individual and specialized interests. The curriculum is designed so that it can be completed in two years by students with an accredited BLA degree; however, to finish within that period, thesis research will need to be conducted concurrent with course work. Students with a nondesign background taking proficiency courses may take as much as a year and a half additional time to complete the degree requirements. Some of the graduate program courses may be taken before all of the proficiency courses have been completed. Early development of a program of study, selection of a research topic, and thesis committee selection promote quicker completion of the degree program. Students should consult with the graduate director and informally with other members of the faculty for assistance in the selection of an area of concentration and the development of thesis ideas.

Examples of recent thesis topics include urban water fronts, mixed land use development, ecology of mined-land reclamation, visual perception of the landscape, visual aspects in mined-land reclamation, developers' perceptions of landscape architects, resort development (variety of types), effect of play equipment on child development, recreational trails, small community downtown redevelopment, restoration of historic parks, political aspects of design practice, computer applications to design and planning, natural resource modeling, improving learning opportunities in zoos, and public participation in the design process.

## Professional proficiency courses

The basic proficiency courses are for students who have not completed an accredited professional degree in landscape architecture. The courses help students learn the common body of knowledge typical of traditional landscape architecture and to prepare them for advanced study in the discipline. The proficiency courses required will vary with the academic and practical experience of the student. Specific course requirements and course sequence are determined by the graduate director in consultation with the student and the instructor. These courses are considered by the K-State Graduate School as undergraduate deficiencies. They will appear on the transcript but not in the graduate program of study. The proficiency courses are:

| | | |
|---|---|---|
| LAR 433 | History and Theory of Landscape Design I | 3 |
| LAR 731 | Landscape Plant Field Studies I | 1 |
| LAR 732 | Landscape Plant Field Studies II | 1 |
| LAR 748 | Composite Planting Design I | 1–4 |
| LAR 749 | Composite Planting Design II | 1–4 |
| LAR 753 | Professional Practice | 2 |
| LAR 760 | Composite Landscape Architecture Design Studio I | 1–4 |
| LAR 761 | Composite Landscape Architecture Design Studio II | 1–4 |
| LAR 762 | Composite Landscape Architecture Design Studio III | 1–4 |
| LAR 763 | Composite Landscape Architecture Construction I | 1–4 |
| LAR 764 | Composite Landscape Architecture Construction II | 1–4 |

## Common courses

The common courses are required of all graduate students in the MLA curriculum. These courses consist of the following classes:

| | | |
|---|---|---|
| LAR 750 | Graduate Seminar in Landscape Architecture I | 2 |
| LAR 751 | Graduate Seminar in Landscape Architecture II | 2 |
| ARCH 725 | Architectural Research Methods | 3 |
| | or | |
| PLAN 800 | Research Methods | 3 |
| | or | |
| EDCEP 816 | Research Methods and Treatment of Data | 3 |
| LAR | Advanced Design Elective | 3–4 |
| LAR 898 | Thesis Proposal Writing | 2 |
| LAR 899 | Research in Landscape Architecture (thesis) | 4 |
| | | 16 |

The courses have been designed to fulfill several purposes. The series provides an overview of the profession of landscape architecture, and explores the scope, context, and opportunities of the profession. One focus of the core courses is to introduce students to research as a principal tool of advancement of the profession and the application of research in a practice setting.

## Areas of concentration

The MLA program has three general areas of concentration. These areas have been developed around the experiences, interests, and strengths of the faculty and the resources of the department and the College of Architecture and Design. Each candidate selects one of these three interest areas for development as a personal specialization. The areas of concentration are: community and urban design, professional practice and land development, and resource analysis and planning.

Although not listed as named specializations some students have organized a concentration of courses around such topics as historic preservation, golf course development, land reclamation, or computer applications under one of the general specializations. The student should select between 15 to 18 credit hours of graduate-level course work from the Department of Landscape Architecture and other departments that support the development of a specialization in one of these concentration areas. These courses should be selected in consultation with the graduate director and/or major professor. The courses will need to be approved by the student's graduate committee and the department head at the time the program of study is reviewed. Suggested courses are listed at the end of the description of each concentration area. Students are encouraged to select their concentration electives in a way that strengthens and makes connections between their past academic experience, their future professional interests, their thesis research interests, and their advanced design experience with their concentration electives. Students who anticipate further education (such as a degree in planning or a Ph.D.) may propose making connections to that future area of study that may be preparatory or complementary to that endeavor as long as they show its supportive relationship to at least one of the areas of concentration.

## Certificate in planning

Some of the MLA students pursue a certificate in the Department of Regional and Community Planning while working on their MLA program. Most of the 15-credit certificate can be part of the area of concentration credits for the MLA. Some students take an extra semester for this additional credential. Some students have organized their studies to earn both master of landscape architecture and master of community and regional planning degrees. Arranging both programs collaboratively at the beginning usually means that they can be completed in less time and credits than if they are completed one after the other.

## Admission requirements and procedures

An application for admission implies that the applicant has (or will soon have) a bachelor's degree from an accredited institution, an adequate undergraduate preparation in the proposed major field, or equivalent evidence of an appropriate background for undertaking an advanced degree program, and an undergraduate average of B or better in the junior and senior years.

Application materials should be submitted for review by the Department of Landscape Architecture and the K-State Graduate School. Send completed application materials to:

Prof. Kenneth R. Brooks
Graduate Director
Department of Landscape Architecture
Seaton Hall
Kansas State University
Manhattan, Kansas 66506–2909
Phone: 913-532-5961
Fax: 913-532-6722
Bitmail: KBROOKS@KSUVM.KSU.EDU

Applications should be submitted by March 1 for the following academic year. Although preference will be given to students applying by this time, we will continue to receive appli-

cations for admission until enrollment time in August for fall semester or the middle of December for spring semester enrollment. A few students are admitted to begin their studies in spring semester; however, this approach usually adds an additional semester to the time necessary to complete the program since many of the required spring semester courses have prerequisite courses that are taught in fall only.

The application package should contain the following materials:

1. Completed K-State Graduate School application form.

2. Proof of having a bachelor's degree (may be noted on transcript).

3. Two official transcripts of all previous courses and grades at junior colleges, colleges, or universities. Send these directly from the registrar of the college or university to this department to the attention of the graduate director. They become part of the student's file and may not be returned.

4. A personal letter addressed to the landscape architecture faculty, stating academic and professional objectives and reasons for desiring to enter the K-State MLA program.

5. A portfolio or collection of previous design work, landscape plans, sketches, project photos, samples of academic, or professional writing, etc. The collection of works may be presented with photocopies, diazo prints, or other similar formats. A portfolio is not mandatory, but encouraged when the applicant's previous academic or professional experience might include such products. The portfolio will be used in conjunction with the transcripts to determine what basic professional courses might be required.

6. Three reference evaluations from previous professors or employers, relative to the applicant's ability to handle graduate level work. The names and addresses of these reference evaluators should be listed on the application form. Copies of the evaluation form are distributed with the application form. The applicant should fill out the top portion and then give the form to the evaluator to complete and forward on to the graduate director.

7. A nonrefundable application fee of $15. Please make check or money orders payable to the Department of Landscape Architecture.

8. The Graduate Record Examination is not required for application, however, if the applicant has taken the GRE exam, a report of that exam is requested.

International applicants must submit the following additional materials:

9. Report of TOEFL Examination Score (Test of English as a Foreign Language). Foreign students with a bachelor's degree from an American university are exempt from this requirement. Students may be required to complete Intensive English Program before being allowed to enroll in MLA courses.

10. Completed financial statement.

Evaluation of the applicant will not begin until all application materials and fee have been received.

## Landscape architecture courses

Listed below are the courses taught in the Department that are available for graduate-level credit or may be taken by MLA students as prerequisite courses.

**LAR 433. History and Theory of Landscape Design I.** (3) I. The influences of social, political, economic, and climactic factors on historic landscape styles; theory of landscape design. Three hours lecture a week. Pr.: first-year classification in professional LAR program.

**LAR 500. Site Planning and Design.** (3) I, II. Theory, principles, and elements of site planning and design. Lectures, readings, short problems, and site visits dealing with site analysis, ecological consideration, grading drainage, circulation and parking, lighting, planting design, materials and details, management and maintenance, and cost factors. Pr.: ARCH 401 or concurrent with ARCH 401.

**LAR 501. Landscape Architecture Seminar.** (2) I, II. Required of all fourth-and fifth-year landscape architecture majors. Discussion of current trends in landscape architecture and related fields by students, faculty, and invited speakers. (Two 2-credit-hour seminars are required for a total of four hours for the BLA program.)

**LAR 634. History and Theory of Landscape Architecture II.** (3) I. American landscape architecture. Exploring the natural, cultural and aesthetic forces that shape the American landscape. Three hours lecture a week. Pr.: LAR 433.

**LAR 635. Golf Course Planning and Design.** (2) I, II, S. Fundamentals of golf course planning and design, including: history, management, design, facilities, aesthetics, and technical development. One hour of lecture and three hours of lab a week. Pr.: Junior standing.

**LAR 641 and LAR 642. Landscape Architectural Design Studio V and VI.** Design of the outdoor environment for human needs and activities; ecological considerations; project program, site selection, analysis concept, design communication, specification, construction, planting, and maintenance.

**LAR 641. Landscape Architectural Design Studio V.** (4) I. Twelve hours design studio a week. Pr.: LAR 432.

**LAR 642. Landscape Architectural Design Studio VI.** (4) II. Twelve hours design studio a week Pr.: LAR 641.

**LAR 645. Professional Internship.** (V) I, II, S. Confirmed employment in a professional physical planning office, subject to the approval of the departmental faculty, for a period of eight weeks, documented by the employer and written and oral reports by the students. Pr.: LAR 444.

**LAR 647. Landscape Construction. III.** (3) I. Continuation of LAR 437 to include large scale site design, road alignment, large area grading, soils and excavation methods, storm drainage, and utilities routing. Three hours lecture and five hours studio a week. Pr.: LAR 437.

**LAR 652. The Small Community in the Plains States.** (3) I, II, S. An overview of the diverse nature of small communities in the Plains states, with an emphasis on the forms and patterns in the existing physical environment. Instruction in various methods of survey and analysis at the regional and community-specific scales, and application of these techniques to a different community each semester. Pr.: Fourth-year standing.

**LAR 660. Landscape Rehabilitation of Disturbed Lands.** (3) I. Planning rehabilitation of lands disturbed by mining and construction. Review of mining procedures, ecological systems, slope rehabilitation, and revegetation techniques. Three hours lecture a week. Pr.: Junior standing.

**LAR 701 and LAR 702. Landscape Architectural Design Studio VII and VIII.** Design of the outdoor environment for human needs and activities; ecological considerations; project program, site selection, analysis concept, design communication, specification, construction, planting, and maintenance.

**LAR 701. Landscape Architectural Design Studio VII.** (5) I. Fifteen hours design studio a week. Pr.: LAR 642 and LAR 647.

**LAR 702. Landscape Architectural Design Studio VIII.** (5) II. Fifteen hours design studio a week. Pr.: LAR 701 and LAR 647.

**LAR 710. Microcomputer Applications in Landscape Architecture.** (3) I, II. Examination of the application of microcomputer technology in the decision-making processes in the advanced practice and research of landscape architecture. Two hours lecture and two hours lab a week. Pr.: LAR 460.

**LAR 731. Landscape Plant Field Studies I.** (1) I. The study of introduced and indigenous deciduous woody trees, shrubs, vines, and herbaceous plants adapted to the northeastern Kansas region with emphasis on the identification and selection of plant materials for use in landscape design. One hour lecture and two hours outdoor lab a week. Pr.: Graduate standing.

**LAR 732. Landscape Plant Field Studies II.** (1) II. A continuation of LAR 731: including the study of introduced and indigenous wood conifers and broadleaf evergreens, deciduous flowering trees and shrubs, and native grasses and forbs adapted to the northeastern Kansas region with emphasis on the identification and selection of plant material for use in landscape design. One hour lecture and two hours outdoor lab a week. Pr.: LAR 731.

**LAR 735. Advanced Golf Course Planning and Design.** (2) I, II, S. Advanced methods and strategies of golf course and resort planning and design. One hour of lecture and three hours of lab a week. Pr.: LAR 635.

**LAR 741. Problems in Landscape Architecture.** (Var.) I, II, S. Specific problems and-or reports in the area of landscape architecture. Pr.: Advanced undergraduate or graduate standing.

**LAR 744. Community Site Planning.** (4) II. Growth and development of cities and towns; land division. Two hours lecture and six hours studio a week. Pr.: PLAN 315.

**LAR 746. Urban Design Studio I.** (4) I. An interdisciplinary design studio involving large-scale design; projects with extensive time implementation sequence; responses to socioeconomic, cultural, environmental, and technical needs; and implementation strategies. Design methods are applied to selected urban areas of the Midwest. Pr.: PLAN 315 or equivalent; and concurrent enrollment in PLAN 745.

**LAR 747. Urban Design Studio II.** (4) II. Continuation of LAR 746. Pr.: LAR 746 and concurrent enrollment in PLAN 845. LAR 845.

**LAR 748. Composite Planting Design I.** (1-4) I. Plant characteristics and their application in landscape architectural design; ecological considerations of site adaptation; natural systems; comprehensive site analysis; variety in scale and scope of projects. Two hours lecture and seven hours studio a week. Pr.: Graduate standing.

**LAR 749. Composite Planning Design II.** (1-4) II. Preparation of planting plans and supplementary materials design to fit a variety of sites; emphasis on planting design elements, and principles. Two hours lecture and seven hours studio a week. Pr.: LAR 748.

**LAR 750. Graduate Seminar in Landscape Architecture I.** (2) I. Discussion of the scope of the profession and the nature of graduate study in landscape architecture. Pr.: Graduate standing in the department.

**LAR 751. Graduate Seminar in Landscape Architecture II.** (2) II. Readings and discussion of current issues in practice and research in landscape architecture. Pr.: LAR 750.

**LAR 753. Professional Practice.** (3) I. Studies of conventional and newly developing methods of professional design practice. Instruction in the relationships of architects, landscape architects, interior architects, and other profes-

sionals to users, clients, construction industry, society, government, and one another. Two hours lecture and one hour recitation. Pr.: 5th-year standing.

**LAR 756. Design of Parks and Recreation Areas.** (3) I. Site Planning of national, state, municipal, and private parks, and specialized recreation areas. Three hours lecture a week. Pr.: Junior standing.

**LAR 757. Design for Special Populations.** (3) II. Design of exterior environment to accommodate the handicapped and disadvantaged individual. Pr.: Advanced undergraduate or graduate standing.

**LAR 758. Land Resource Information Systems.** (3) I. The understand, collection, and application of land resource data to land planning and design. Current methods of resource inventory, ecologically oriented site analysis, and environmental impact assessment. Review of common sources for necessary information in each resource category. Two hours lecture and two hours studio a week. Pr.: Advanced undergraduate or graduate standing.

**LAR 759. Landscape Resource Evaluation.** (3) II. The determination of the impact of physical project design upon the natural and manmade environment. Studies of existing site conditions and projections of the effect of such projects upon the site and vicinity. Pr.: Senior or graduate standing.

**LAR 760. Composite Landscape Architecture Design Studio I.** (1–4) I. Landscape design including delineation, design process, design elements, small-scale design, urban design. Pr.: Graduate standing.

**LAR 761. Composite Landscape Architecture Design Studio II.** (1–4) II. Continuation of LAR 760: including topics such as community design, resource analysis, park and recreation design, historic preservation with consideration of aesthetic and sensory issues. Pr.: LAR 760.

**LAR 762. Composite Landscape Architecture Design Studio III.** (1–4) I. Continuation of LAR 761: including topics such as community design, resource analysis, park and recreation design, historic preservation with consideration of aesthetic, technical, and economic issues. Pr.: LAR 761.

**LAR 763. Composite Landscape Architecture Construction I.** (1–4) II. Landscape construction including topography, site planning, site layout, grading, earthwork estimating, lighting, irrigation, construction detailing, cost estimating. Pr.: LAR 762.

**LAR 764. Composite Landscape Architecture Construction II.** (1–4) I. A continuation of LAR 763; large area grading, road alignment, storm drainage, utilities layout and specifications, contract. Pr.: LAR 763.

**LAR 860. Advanced Planting Design.** (1–4). I, II, S. Special studies in advanced planting design. Pr.: LAR 749.

**LAR 870. Advanced Landscape Architecture.** (3) I, II, S. Special studies and design in advanced landscape architecture. Pr.: LAR 702.

**LAR 880. Advanced Landscape Architecture Construction.** (1–4) I, II, S. Specialized study of large-scale landscape planning involving landscape construction and grading. Pr.: LAR 647.

**LAR 898. Thesis Proposal Writing.** (2) I, II, Exploration of procedures of planning, design, scheduling, organization, and management of a landscape architecture research project. Two hours lecture a week. Pr.: ARCH 725 or EDCEP 816.

**LAR 899. Research in Landscape Architecture.** (Var.) I, II, S. Investigations in landscape architecture and related areas, of such caliber as to form the basis for a graduate thesis. Pr.: Graduate standing in landscape architecture.

# Regional and Community Planning

**Department Head**
**Claude A. Keithley,** AICP. MRCP and MArch, Kansas State University. Teaching Emphasis: Quantitative Analytical Techniques and Microcomputer Applications, Transportation Planning.

**Professors**
**Vernon P. Deines,** AICP and PE. Ph.D. University of Pittsburgh. Teaching Emphasis: Urbanization, Infrastructure Planning, Solid Waste Management, Small Town Planning.

**John W. Keller,** AICP. Ph.D. Rutgers State University of New Jersey. Teaching Emphasis: Rural Planning and Economic Development, Physical Planning Practice, Environmental and Land Use Regulation, Transportation and Emergency Management, Planning and Siting of Hazardous Facilities, Small Town Planning.

**Ray B. Weisenburger.** MRP Cornell University. Teaching Emphasis: Urban Design, Preservation, Housing, Commercial Area Development, Urban Development Issues.

**Associate Professor**
**Gary A. Mattson,** AICP. Ph.D. University of Delaware, MCP University of Rhode Island. Teaching Emphasis: Administration and Community Development.

**Assistant Professor**
**Robert E. Burns,** AICP. Ph.D. Michigan State University. Teaching Emphasis: Community Development, Economic Development, Professional Practice, Public Administration, Natural Resources Planning, Political Aspects of Planning, Strategic Planning, Housing.

## The planning profession

Many social, physical, economic, technical, and political issues in our society cry out for definition and resolution, including such issues as the decline in central cities, deterioration of neighborhoods, inefficient and inequitable taxing and regulation policies, congestion and other problems of accessibility, the impact of growth and change, an erosion of natural resources (water, land, air), inefficient or absent human services, and issues relating to the quality of life on planet Earth. The planning profession is one of society's means for addressing these problems and the forces that influence the quality of life in the neighborhood, city, region, state, and nation in both short and long term. According to the American Planning Association, about 60 percent of working planners are employed by either federal, state, regional or local government, with the remaining 40 percent employed in the private sector (consulting firms) or in other closely related professions such as real estate/development, law, natural resources, economic development corporations, housing, social services, etc., depending upon individual specialties and areas of interest.

Planning encompasses an understanding of the physical environment, as well as the recognition of the economic, social and political forces at work in society today. The graduate program in regional and community planning is designed to prepare its graduates for careers as planners for cities, regions, small communities and states. Other career options, however, are supported on an individual basis.

## Master of regional and community planning

The Kansas State University Graduate School and the Department of Regional and Community Planning offer a 51-credit- hour program leading to the master of regional and community planning. The program can be completed with four semesters of course work and a summer internship between the first and second years. The program is fully accredited by the Planning Accreditation Board of the American Institute of Certified Planners and the Association of Collegiate Schools of Planning.

The primary objective of the MRCP program is to educate women and men to become directors or managers of community development, planning, economic development, housing, or related departments and agencies in cities, small communities, counties, and regions. Some graduates may use the same educational background to become directors of planning or related activities in private consulting firms and research organizations while others may enter the field of real estate development.

The second major objective of the program is to integrate the concept of comprehensive community development planning in an environmental context with considerations for social, economic, cultural, and political issues in the community while recognizing the importance of financial management, private enterprise-government relations, and citizen participation in community decision making. Core courses reflect the impact of these key concerns on traditional planning activities while exploring related ethical issues in depth.

With a firm educational foundation in basic planning and analytical techniques, management, human relations, and ethics, today's MRCP graduate will have the skills and judgement to become tomorrow's successful practicing planner.

## Program requirements

Study leading to the two-year professional graduate degree, master of regional and community planning, requires a minimum of 51 graduate credit hours, and includes an internship in planning. Support courses are offered by the Departments of Architecture, Civil Engineering, Economics, Geography, Landscape Architecture, Political Science, and Sociology, and the Colleges of Agriculture, Business Administration, and Human Ecology.

Applicants with undergraduate degrees in administration, agriculture, architecture, business, construction science, economics, ecology, education, engineering, geology, geography, government, human ecology, landscape architecture, pre-law, planning, political science, and sociology, who meet the requirements of the Graduate School for admission, are fully acceptable for graduate study in planning. Applicants with other academic backgrounds may be accepted upon approval of the department and subject to such conditions as it may impose. Prerequisites for admission include satisfactory completion of an elementary statistics course or equivalent.

The master of regional and community planning degree requires 30 core credit hours and

21 specialization credit hours. An internship in planning usually taken between the first and second year of course work is required. The core course work is noted below:

| | | |
|---|---|---|
| PLAN 630 | Computer Applications in Planning | 2 |
| PLAN 700 | Planning Analysis | 3 |
| PLAN 715 | Planning Principles | 3 |
| PLAN 725 | Planning Theory | 3 |
| PLAN 735 | Community Plan Preparation | 3 |
| PLAN 736 | Community Plan Implementation | 4 |
| PLAN 770 | Planning Law | 3 |
| PLAN 800 | Research Methods in Planning | 3 |
| PLAN 805 | Internship in Planning | 3 |
| PLAN 820 | Planning Administration | 3 |

During the last two semesters of study, students will be required to complete either a 2-credit-hour master's report or a 6- credit-hour thesis involving research in their areas of specialization, and to discuss their work with their designated committee. Work on this element of the program of study usually begins in the third semester to ensure timely completion. At various times throughout the program, students will be given mini-components of a traditional comprehensive exam to determine progress in synthesizing concepts and methods.

The 21 hours of specialized course work may be in any one of four regular specializations or, in the case of uniquely qualified students, a larger range of independent specializations. The specialization strengths in the department are as follows, with recommended courses listed for consideration:

### Rural and small town planning

| | | |
|---|---|---|
| PLAN 721 | Infrastructure Planning and Finance | 3 |
| PLAN 740 | Small Community and Rural Area Planning | 3 |
| PLAN 755 | State and Regional Planning | 3 |
| | or | |
| ECON 555 | Urban and Regional Economics | 3 |
| PLAN 780 | Planning in Developing Areas | 3 |
| SOCIO 533 | Rural Society | 2–3 |
| PLAN 815 | Seminar in Site Plan Review | 2–3 |
| | or | |
| PLAN 815 | Seminar: Planning Municipal Services | 3 |
| | or | |
| LAR 744 | Community Site Planning | 3 |
| Approved graduate electives (minimum) | | 2–3 |
| | | 21 |

### Resource planning

| | | |
|---|---|---|
| PLAN 755 | State and Regional Planning | |
| | or | |
| ECON 555 | Urban and Regional Economics | 3 |
| LAR 758 | Land Resource Information Systems | 3 |
| LAR 759 | Landscape Resource Evaluation | 3 |
| BIOL 529 | Fundamentals of Ecology | 3 |
| | or | |
| GEOG 760 | Human Impact on the Environment | 3 |
| | or | |
| GEOG 720 | Geography of Land Use | 3 |
| GEOG 705 | Remote Sensing of the Environment | 3 |
| | or | |
| GEOG 708 | Geographic Information Systems | 3 |
| An approved graduate course in resource economics | | 2–3 |
| Approved graduate electives (minimum) | | 2–3 |
| | | 21 |

### Community design and preservation

*Community design option*

| | | |
|---|---|---|
| PLAN 710 | Urban Visual Analysis | 3 |
| PLAN 721 | Infrastructure Planning and Finance | 3 |
| PLAN 745 | Urban Design | 3 |
| PLAN 746 | Urban Design Studio I | 4 |
| ENVD 651 | Preservation Principles and Methods | 3 |
| ARCH 680 | Development Analysis | 3 |
| Approved graduate electives (minimum) | | 2 |
| | | 21 |

*Preservation option*

| | | |
|---|---|---|
| ENVD 651 | Preservation Principles and Methods | 3 |
| ARCH 680 | Development Analysis | 3 |
| PLAN 721 | Infrastructure Planning and Finance | 3 |
| PLAN 710 | Urban Visual Analysis | 3 |
| | or | |
| PLAN 745 | Urban Design | 3 |
| PLAN 746 | Urban Design Studio I | 4 |
| PLAN 815 | Seminar in Preservation Planning | 1–3 |
| Approved graduate electives (minimum) | | 4 |
| | | 21 |

### Community planning and development

*Community planning option (physical resources concentration)*

| | | |
|---|---|---|
| PLAN 750 | Housing Policies and Programs | 3 |
| PLAN 755 | State and Regional Planning | 3 |
| | or | |
| ECON 555 | Urban and Regional Economics | 3 |
| GEOG 750 | Urban Geography | 2–3 |
| POLSC 618 | Urban Politics | 2–3 |
| GEOG 708 | Geographic Information Systems | 2–3 |
| PLAN 721 | Infrastructure Planning and Finance | 3 |
| PLAN 815 | Seminar in Site Plan Review | 2–3 |
| | or | |
| PLAN 815 | Seminar: Planning Municipal Services | 3 |
| | or | |
| LAR 744 | Community Site Planning | 3 |
| Approved graduate electives (minimum) | | 2–3 |
| | | 21 |

*Community development option (human resources concentration)*

| | | |
|---|---|---|
| PLAN 750 | Housing Policies and Programs | 3 |
| PLAN 760 | Community Development Planning | 3 |
| PLAN 761 | Community Development Workshop | Var |
| PLAN 815 | Seminar in Site Plan Review | 2–3 |
| | or | |
| PLAN 815 | Seminar: Planning Municipal Services | 3 |
| | or | |
| LAR 744 | Community Site Planning | 3 |
| SOCIO 532 | Community Organization and Leadership | 3 |
| SOCIO 531 | Urban Sociology | 2–3 |
| POLSC 618 | Urban Politics | 2–3 |
| Approved graduate electives (minimum) | | 2–3 |
| | | 21 |

Other specializations are negotiable, using tracks within the university.

Consistent with the interdisciplinary objectives of the faculty, uniquely qualified students are free to create independent specializations. The faculty is careful to limit this option to those students who have demonstrated a prior professional, career, or academic interest and capacity in the independent specialization they wish to pursue. Independent specializations require formal coordination with one or more programs or colleges outside of the department (indicated in parentheses below) and may include, but are not limited to:

- Agricultural land planning (College of Agriculture)
- Economic development planning (Economics)
- Educational planning (College of Education)
- Environmental planning (Biology and/or College of Agriculture)
- Forest and range management planning (Forestry and Agronomy)
- Infrastructure planning (Civil Engineering)
- Health planning (College of Human Ecology)
- Housing planning (Architecture, College of Business, and/or College of Human Ecology)
- Planning and the aged (Secondary Major in Gerontology Program: Graduate Emphasis in Gerontology)
- Urban management or international management (Political Science and/or College of Business Administration)
- Recreation planning (Landscape Architecture, Forestry, and/or Physical Education, Dance, and Leisure Studies)
- Site development planning (Landscape Architecture and/or Architecture)
- Sustainable communities planning (Architecture)
- Third world rural and regional development planning (Sociology,
- Economics, Political Science, and/or Geography)
- Transportation planning (Civil Engineering)
- Water resources planning (Biology, Geography, and/or Forestry)

Some courses in the core and specialization curricula may be waived by the faculty based upon case by case review of a student's upper-division undergraduate work, prior graduate work, and professional practice. Waiver is not a routine occurrence, however, and it does not reduce the total amount of course work required for the MRCP degree unless advance standing is also granted. Advance standing will not normally exceed 10 semester credit hours and must be approved by the faculty and the Graduate School. Requests for consideration of award of advanced standing must be fully documented in a request by the student and must accompany the student's application for admission to the program.

## Research facilities

Students are encouraged to become involved in collaborative efforts with the College of Architecture and Design. A major research center for planning students is the college's Paul Weigel Library. The College of Architecture and Design also provides access to a microcomputer laboratory for students in the college. Other academic units within the university with which students may work include the Center for Aging, the Institute for Environmental Research, Kansas Center for Rural Initiatives, and the Housing Research Laboratory. The varied character of Kansas, including rural regions, small town environments, and metropolitan cities, provides a rich and supportive context within which graduate research may be effectively pursued.

## Financial support

Teaching and research assistantships at various levels of support are generally available for qualified applicants each year. Interested students should contact the Department of Regional and Community Planning for further details.

Additional financial aid (loans, scholarships, employment) is also available through the Office of Student Financial Assistance, located in Fairchild Hall, the Dean's Office of the College of Architecture and Design, and from departmental resources on a limited basis.

## Admission

Applications should be submitted by November 15 for spring admission and by June 1 for fall admission. International students should apply by April 1 to insure adequate time for processing applications. Applicants should submit an official application form, three letters of reference, two copies of transcripts, a statement of academic and professional objectives, and a $15 application fee.International applicants, in addition, must submit TOEFL scores and financial status forms. Applicants are urged to request detailed program information from:

Department of Regional and Community Planning
302 Seaton Hall
Kansas State University
Manhattan, KS 66502
Telephone (913) 532-5958

## Regional and community planning courses

### Undergraduate and graduate credit

**PLAN 590. Problems in Planning.** (1–3) I, II, S. Specific planning problems, including process, theory, method and implementation, under direction of department staff. Pr.: Introduction to Planning.

**PLAN 630. Computer Application in Planning and Design.** (1–3) I, II, S. The application of computer concepts to problem solving and data analysis in the planning and design professions, including the development of user skills in the application of various software packages for data analysis, mapping, and computer-assisted design. Pr.: CMPSC 110 and junior standing.

**PLAN 700. Planning Analysis.** (3) I, II. Introduction to quantitative methods in planning to measure change in the socio-economic-political-physical environment and to analyze the interrelations that guide formulation of comprehensive planning. Pr.: PLAN 315.

**PLAN 705. Planning Communications.** (1–4) I. Study and application of communication concepts and media utilized in regional and community planning, topics to be selected from: (A) graphics, (B) physical models, (C) professional reports, and (D) public hearings. Pr.: Senior status and PLAN 315.

**PLAN 710. Urban Visual Analysis.** (3) 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 745.

**PLAN 715. 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.

**PLAN 721. Institutional Planning and Development.** (3) II. Examination of infrastructure systems, standards and costs; consideration of policy options and strategies; review of infrastructure finance methods; and implementation of community development with infrastructure planning and finance process. Pr.: PLAN 715 and 9 additional credit hours in planning and/or administration courses.

**PLAN 725. Planning Theory.** (3) I. Review of the 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.

**PLAN 735. Community Plan Preparation.** (3), II. 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 715 or 725.

**PLAN 736. Community Plan Implementation.** (V) I. Introduction to legislation and interpretation of codes related to planning, design, and construction. Pr.: PLAN 715.

**PLAN 740. Small Community and Rural Area Planning.** (3) II. Synthesis of small community and rural area change, including socio-economic-political determinants as bases for community design and planning. Pr.: PLAN 315, plus 9 credit hours in economics, political science, and sociology.

**PLAN 745. Urban Design.** (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 315 or graduate status.

**PLAN 746. Urban Design Studio I.** (4) I. An interdisciplinary design studio involving large-scale design; projects with extensive time implementation sequence; responses to socio-economic, cultural, environmental, and technical needs; and implementation strategies. Design methods are applied to selected urban areas of the Midwest. Pr.: PLAN 315 and conc. enrollment in PLAN 745.

**PLAN 750. Housing Policies and Programs.** (3) II. Review and valuation of historical and current housing issues, production, and financial systems. Examination of federal, state, and local policies and programs for community development. Pr.: PLAN 315.

**PLAN 755. State and Regional Planning.** (3) I. 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 715 or conc. enrollment.

**PLAN 760. Community Development Planning.** (3) II. Examination of past and present approaches to community development planning in the United States. Review and assessment of community development planning policies, programs, and practices. Pr.: PLAN 715 or conc. enrollment, and 9 semester credit hours in the social sciences.

**PLAN 761. Community Development Workshop.** (Var) I, II, S. The organization, planning, design, development, and evaluation of community development projects with real clients and actual locations. Pr.:PLAN 715 and PLAN 760 or conc. enrollment.

**PLAN 770. Planning Law.** (3) I. Examination of evolution and current state of land use regulation within constitutional limits. Introduction to zoning, subdivision, and other police power controls within a comprehensive planning process. Pr.: PLAN 715.

**PLAN 780. Planning in Developing Areas.** (3) I, II. Examination of comparative regional and community systems of development, consideration of alternative approaches to planning, with emphasis on developing countries and underdeveloped areas in the rural United States. Pr.: PLAN 715, plus 9 credit hours from the social sciences.

### Graduate credit

**PLAN 800. Research Methods in Planning.** (1–4) II. Considerations in the selection, collection, analysis, and interpretation of regional and community planning data, topics to be selected from: (A) network analysis, (B) computer mapping, (C) statistical analysis programs (SPSS and related, (D) remote sensing, (E) visual analysis, (F) linear programming/modeling, (G) policy and program analysis. Pr.: PLAN 700 and 715, plus one course in statistics. PLAN-800-1-0206.

**PLAN 805. Internship in Planning.** (1–4) 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.

**PLAN 810. Practicum in Planning and Development.** (Var) I, II, S. Supervised experience in professional planning and development, including internships, field research, public service, and professional workshops. Pr.: PLAN 715 and 725 or conc. enrollment.

**PLAN 815. Seminar in Planning.** (1–3) 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.

**PLAN 820. Planning Administration.** (3) I. Considerations for the planning director in the administration and management of planning. Pr.: PLAN 715 and completion of 9 credit hours of graduate study in planning.

**PLAN 835. Community Growth Management.** (3) II. Synthesis of city growth and change in relation to planning theory and socioeconomic-political determinants. Criteria and methodology for the growth management are reviewed and applied to the contemporary city. Pr.: PLAN 715 and 755.

**PLAN 845. Advanced Urban Design.** (3) II. Synthesis of urban form and space in relation to aesthetic theories and values and socioeconomic-political determinants. Criteria and methodology for urban design and planning are reviewed and applied to contemporary urban form and space. Pr.: PLAN 745.

**PLAN 846. Urban Design Studio II.** (4) II. Continuation of PLAN 746. Pr.: PLAN 746 and conc. enrollment in PLAN 845.

**PLAN 847. Urban Design Field Study.** (3) I, II, and Intersession. A field investigation of varied large-scale institutions, central business districts, and other mixed-use developments. Pr.: PLAN 745 and PLAN 746.

**PLAN 855. Regional Planning II.** (3) II. Synthesis of regional growth and change in relation to regional landscape, resource and environmental determinants. Criteria and methodology for regional analysis and planning are reviewed and applied to the elements of the contemporary region. Pr.: PLAN 715.

**PLAN 880. Topics in Planning.** (Var.) I, II, S. The study of selected concepts and trends in regional and community planning and development. Pr.: PLAN 715 or graduate standing.

**PLAN 899. Research in Planning.** (Var.) 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.

# Arts and Sciences

## Art

**Woodward, Gary L.** Head and Assoc. Prof. of Art. AB, Northern Colorado University; MA, University of Iowa; MFA, University of Washington.

**Culley, LouAnn Faris.** Assoc. Prof. of Art History; Women's Studies Faculty. BFA, MA, University of New Mexico; Ph.D., Stanford University.

**Harmes, David L.** Assoc. Prof. of Art. BA, Kansas City Art Institute; MFA, Kansas State University.

**Hower, Robert.** Assoc. Prof. of Art. BFA, University of Nebraska; MFA, Cranbrook.

**Ikeda, Yoshiro.** Prof. of Art. BS, Portland State University; Research Art Certificate, Kyota University of Fine Arts; MFA, University of California, Santa Barbara.

**Kren, Margo.** Assoc. Prof. of Art. BS, University of Wisconsin; MA, Kansas State University; MFA, University of Iowa.

**Love, Judith.** Asst. Prof. of Art. AA, Cottey College; BFA, Kansas City Art Institute; MFA, University of Nebraska.

**Munce, James C.** Assoc. Prof. of Art. BFA, Minneapolis School of Art; MFA, Indiana University.

**Noblett, Duane P.** Assoc. Prof. of Art. BFA, Minneapolis College of Art and Design; MA, MFA, University of Iowa.

**O'Shea, John William.** Asst. Prof. of Art. BFA, Denver University; MFA, State University of Iowa.

**Pujol, Elliot.** Prof. of Art. BA, MFA, Southern Illinois University.

**Replogle, Rex.** Assoc. Prof. of Art. BFA, MFA, University of Kansas.

**Routson, Roger.** Asst. Prof. of Art. BFA, Cleveland Institute of Art; MFA, University of Illinois.

**Schmidt, Teresa Tempero.** Asst. Prof. of Art. BA, MA, Central Washington State College; MFA, Washington State University.

**Stroh, Charles.** Prof. of Art. BFA, Minnesota School of Art; MS, MFA, University of Wisconsin-Milwaukee.

**Sturr, Edward.** Prof. of Education and Art. BA, St. Ambrose College; MS, Illinois Institute of Technology; Ed.D., Illinois State University.

**Swiler, James P.** Asst. Prof. of Art. BSE, Emporia State University; MFA, Wichita State University.

**Emeriti:**

**Garzio, Angelo C.** Prof. Emeritus of Art. BA, BS, Syracuse University; Diploma di Profitto, University of Florence, Italy; MA, MFA, State University of Iowa.

**Larmer, Oscar Vance.** Prof. Emeritus of Art. BFA, University of Kansas; MFA, Wichita University.

**Vogt, John L.** Prof. Emeritus of Art. BFA, Kansas City Art Institute; MFA, University of Illinois.

### Master of fine arts

As established by the College Art Association and accepted by all accredited universities, the master of fine arts degree is the terminal degree in visual arts education and is equivalent to terminal degrees in other fields, such as the Ph.D. or Ed.D. It is a graduate program wherein the emphasis is placed upon the studio practice of art, with the intent of educating students for professional careers as artists and designers or as university teachers of the visual arts.

First and foremost, the profession demands from the recipient of the M.F.A. a certifiable level of technical proficiency and the ability to make art. When work toward the M.F.A. has been concentrated in a particular medium, there should be complete professional mastery of that medium. The generalist, whose preparation has been broader and less specialized, must still meet the critical demands of the profession by convincingly demonstrating expertise and knowledge in a number of areas. In any case, the need for thorough training of the mind, the eye, and the hand is self-evident.

The Department of Art offers a 60-hour graduate program leading to the master of fine arts degree in the fields of painting, drawing, sculpture, ceramics, printmaking, metalsmithing and jewelry, and graphic design and computer imaging. There are 17 full-time graduate faculty members who, in addition to their teaching, are active in exhibiting or publishing.

The department has fully equipped workshop facilities and also provides individual studios for graduate students. Graduate teaching assistantships are available, with the added benefit of 100 percent tuition remission for full-time GTAs.

The university provides a variety of experiences for learning and development through a stimulating series of exhibitions, lectures, theatre presentations, concerts and recitals. Additionally, the art department sponsors its own regular series of visiting lecturers, artists, and critics-including, during the past several years, Garo Antresian, Lynda Benglis, Michael Fried, Lucy Lippard, Robert Morris, Rudy Pozzatti, Miriam Schapiro, Alan Schields, Nathan Goldstein, Ruth Duckworth, Brent Kington, Ken Ferguson, Arline Fisch, and Dale Eldred.

### Admission procedures

Correspondence regarding admission to the M.F.A. program should be addressed to:
LouAnn Faris Culley, Ph.D.
Director of Graduate Studies
Department of Art, Art Building
Kansas State University
Manhattan, KS 66506–0601

Upon receipt of a request, the department will supply application blanks and such supplementary information as may be needed to complete the application.

A complete application file must be received in the Department of Art on or before the following deadlines:

Fall admission: the deadline is February 15, preceding the first fall semester the applicant wishes to attend.

Spring admission: the deadline is October 15, preceding the first spring semester the applicant wishes to attend.

The application file must include all of the following. Absence of any one of the requirements will constitute an incomplete application and will not be processed by the graduate studies committee of the department:

1. A completed application form, with an indication of a major area of concentration.

2. Two official copies of transcripts from all colleges or universities attended (transcripts, bearing an official seal, must be sent from each institution directly to the Department of Art).

3. Three letters of recommendation (preferably from former art instructors).

4. A statement of purpose, outlining why the applicant wishes to pursue graduate work in the visual arts.

5. A portfolio of 15 slides of recent work, along with a list of those works by title, date, medium, and size.

6. An international applicant whose native language is not English must submit his/her TOEFL score.

7. The Graduate School requires that a signed statement of financial responsibility accompany the application of an international student.

8. If the applicant wishes to apply for a graduate teaching assistantship, a statement to that effect, along with an explanation of any teaching experience the applicant might have had, should be included.

### Entrance requirements

To be admitted as a graduate student in the M.F.A. program, the applicant must have a B.A., B.S., or B.F.A. degree from an accredited institution, adequate undergraduate education in the visual arts, and an undergraduate average of B (3.0) or better in the junior and senior years. The applicant should have at least 60 undergraduate semester credit hours in visual arts, with a minimum of 20 semester hours in the area of concentration.

All international students applying to the M.F.A. program must meet the same level of achievement as U.S. students.

### M.F.A. requirements

The graduate course requirements for the M.F.A. of 60 semester credit hours would normally be distributed over six semesters of a three-year program. In any case, the student will be required to spend a minimum of three semesters in the M.F.A. program with one academic year in residency as a full-time student. The 60 semester credits of course work include courses in art history and cognate areas of study. These required credits may not include course work that is required as make-up for undergraduate deficiencies.

Course requirements:

| | |
|---|---|
| Area of concentration | 35–40 semester credit hours |
| Supporting studio course | 3–10 semester credit hours |
| Art history | 9 semester credit hours |
| Free electives | 11 semester credit hours |

Courses outside the area of concentration (supporting and free electives) should be taken from faculty other than the major professor, in order to get as much experience as possible with others on the graduate faculty. Students are also encouraged to take a portion of their free electives outside the art department.

Each student's program of study is subject to the approval of the major professor and the supervisory committee. It is emphasized that this is a committee/departmental option and not a student's option.

The thesis requirement for the M.F.A. degree consists of the following:

The graduate exhibition: a substantial body of original works of art to be exhibited on campus during the final semester of the student's program.

A written document in which the candidate demonstrates proficiency in conducting research and in analyzing, interpreting, and organizing material, as well as evidencing the ability to communicate perceptions, insights, and conclusions.

A slide portfolio of the graduate exhibition is required and will be kept by the Department of Art for the record.

Satisfactory completion of both the visual and written portions of the thesis is required for the awarding of the M.F.A. degree.

The final oral examination for the M.F.A. degree will be taken when the student has completed the program of study, has hung his or her graduate exhibition, and has delivered a copy of the written document to each member of the supervisory committee.

### Applicants with the M.A. degree

Students with an M.A. degree from an accredited institution who wish to apply for the M.F.A. program at Kansas State University should follow the same general application procedures outlined above.

Students who hold an M.A. degree may apply up to 20 hours of that degree toward an M.F.A. The number of hours to be accepted will depend on the relevance of the course work to the M.F.A. After the applicant has been accepted into the M.F.A. program, the director of graduate studies will meet with the graduate studies committee, the proposed major professor and the coordinator of the student's studio area to evaluate the student's transcript and to determine the number of credits which may be applied to the M.F.A. degree.

## Art courses

### Undergraduate and graduate credit in minor field

**ART. 545 Twentieth Century Art History I.** (3) I. Origins and development of twentieth century art from 1980 to 1914. Pr.: ART 195 or 196.

**ART 550. Twentieth Century Art History II.** (3) II. Origins and development of twentieth century art from 1914 to 1950. Pr.: ART 195 or 196.

**ART 560. Art for the Exceptional Individual.** (3) I, II. Using art concepts and activities to meet the needs of the mentally retarded, physically impaired, emotionally disturbed, or gifted. Three hours lec. Pr.: PSYCH 110. Same as EDCI 560.

**ART 565. Ceramics II.** (3) I, II. Advanced work on potter's wheel combined with hand-built forms. Consideration of simple kiln design, firing techniques, and procedures using various fuel burning kilns. Six hours lb. May be taken for four semesters. Pr.: ART 265.

**ART 570. Painting II.** (3) I, II. Continuation of Painting I. Emphasis on a more extensive understanding of concepts about painting which will lead to the development of a wider range of personal experience and expression. Six hours lab. Pr.: ART 245.

**ART 575. Graphic Design and Illustration.** (3–4) I, II, S. Problems in layout design and illustration for newspapers, magazines, and general advertising. Six hours lab. May be taken for four semesters. Final semester will include a portfolio project. Pr.: ART 205.

**ART 590. Studies in Art Therapy.** (3) I, II, S. Supervised studies in research relating to the art therapy profession, its current developments, and goals. Pr.: ART 560 or junior standing in a program that emphasizes work with special population groups and consent of instructor.

**ART 595. Independent Study in Art Therapy.** (1–5) I, II, S. This course offers students who have fulfilled the full sequence of art therapy course work an opportunity for individual advanced study. Area of research to be selected by the student under the advisement of the instructor. Pr.: ART 560, 590 and consent of instructor.

**ART 602. Art from 1950 to 1980.** (3) I, II, S. Art movements beginning with abstract expressions and continuing through pop, op, minimal, and conceptual art movements up to 1980. Pr.: ART 195 or 196.

**ART 603. Art of the 1980s and Beyond.** (3) I, II, S. The art movements of the 1980s beginning with photo-realism and continuing through pattern and decoration, new image art, neo-expressionisms, and neo-abstraction. Pr.: ART 195 or 196.

**ART 604. Greek Art History.** (3) I, II. The art of classical Greece, from its Aegean origins through the Hellenistic period. Pr.: ART 195 or 196.

**ART 612. Renaissance Art History.** (3) I, II. Renaissance art of northern and southern Europe in the fifteenth and sixteenth centuries, with a brief discussion of its fourteenth century origins. Pr.: ART 195 or ART 196.

**ART 622. Baroque Art History.** (3) I, II. The development of the baroque period in northern and southern Europe, from its beginnings in the early seventeenth century to the rococo style of the eighteenth century. Pr.: ART 195 or 196.

**ART 632. The Development of American Art.** (3) I, II. American art from the Colonial period to the beginnings of abstract expressionism in the early 1940s, with major emphasis on the late nineteenth and early twentieth century developments. Pr.: ART 195 or 196.

**ART 634. History of Modern Sculpture.** (3) I, II. Directions in sculpture since the time of Rodin. Pr.: ART 195 or 196.

**ART 642. Nineteenth Century Art History.** (3) I, II. Painting, sculpture, and architecture of the late eighteenth and nineteenth centuries, with emphasis on the art of France. Pr.: ART 195 or 196.

**ART 654. Women in Art.** (3) I, II. The work of women artists from early Middle Ages to the twentieth century, with emphasis on the contemporary period. Pr.: ART 195 or 196.

**ART 662. Southwestern Indian Arts and Culture.** (3) I, II. The development of southwestern Indian silversmithing, weaving, pottery, basketry, and painting from the prehistoric period through the twentieth century. Pr.: ART 195 or 196.

### Undergraduate and graduate credit

**ART 600. Advanced Drawing.** (1–5. Credits over 3 hours must be approved by the instructor.) I, II. Upper-level drawing, development, and personal motivation. Lectures and problems directed toward an understanding of the historical development of drawing as well as investigations of contemporary studies. May be taken for four semesters. Pr.: ART 225, 240.

**ART 610. Figure Drawing II.** (3) I, II. Continuation of Figure Drawing I, with emphasis on individual expression. Six hours lab. May be taken for four semesters. Pr.: ART 225.

**ART 615. Figure Painting.** (3) I, II. Painting from the human figure with oil and plastic media. Six hours lab. May be taken for two semesters. Pr.: ART 245, 610.

**ART 620. Water Color II.** (3) I, II. Continuation of Water Color I. Emphasis on individual expression within limitations of medium. Six hours of lab. May be taken for two semesters. Pr.: ART 220.

**ART 623. Advanced Concepts in Computer Art and Design.** (3) I, II, S. Advanced level studio exploration of computers as a tool/medium for art disciplines. Two hours lec., four hours lab. a week. Pr.: ART 200, 400, and instructor permission.

**ART 625. Independent Study—Art Education.** (1–5) I, II, S. Work offered in art education after competency has been achieved. Personal development is emphasized. Pr.: Full sequence of courses related to art education subject matter.

**ART 635. Printmaking II.** (3) I, II. Advanced work in blockprints, serigraphy, lithography, and intaglio. Six hours lab. May be taken for four semesters. Pr.: ART 235.

**ART 645. Sculpture II.** (3) I, II. Emphasis on artistic development through exploratory experiences in the various media. Introduction to foundry techniques and welding processes. Nine hour lab. May be taken for four semesters. Pr.: ART 230.

**ART 650. Painting III.** (1–5) I, II. Continuation of Painting II. Emphasis on individual directions in painting to attain personal expression and competency. Primarily for undergraduate painting majors. May be taken for four semesters. Pr.: ART 570.

**ART 655. Metalsmithing Techniques.** (3) I, II. Surface embellishment, container construction of various techniques, linkage, and mechanical problems will be explored in addition to stone setting. NIne hours lab. May be taken for three semesters. Pr.: ART 270.

**ART 660. Sculpture III.** (1–5) I, II. Continuation of Sculpture II. Further exploration of media and technique, emphasizing the development of individual direction and expression. Primarily for undergraduate sculpture majors. May be taken for four semesters. Pr..: ART 645.

**ART 665. Ceramics III.** (1–5) I, II. Individual exploration and further development of ceramic design and glaze technology; continuation of kiln design and construction. Six hours lab. May be taken for three semesters. Pr.: ART 565.

**ART 675. History of Ceramics.** (3) I, II. History and development of ceramics; study of the use of pottery and other aspects of ceramics from earliest known records to present day. Use of slides and other visual materials. Pr.: ART 195 or 196.

**ART 680. Metals Workshop.** (1–5) I, II. A number of metalsmithing techniques will be explored by the upper division student with emphasis on experimental problems and

possibilities. The development of an individual point of view will predominate throughout the course. May be repeated twice. Pr.: ART 655.

**ART 685. Advanced Independent Study Design.** (Var.) I, II, S. Advanced work in design-related subjects. Pr.: Full sequence of courses related to problem subject matter.

**ART 690. Techniques in Teaching Art.** (Var.) I. Lectures and class discussion of methods, consideration of suitable laboratory equipment, use of illustrative material, and preparation of courses of study. Pr.: Twelve hours in art or consent of instructor.

**ART 695. Topics in Art History.** (Var.) I, II, S. Independent exploration in selected problems in art history. Pr.: Twelve hours art history.

### Graduate credit

**ART 825. Seminar in Art.** (2) Selected topics dealing with historical, conceptual, or philosophical issues in the visual arts. May be repeated. Pr. : Graduate standing.

**ART 830. Graduate Sculpture Studies.** (Var.) I, II, S. Advanced creative work with emphasis on technical and visual research.

**ART 835. Graduate Drawing Studies.** (Var.) I, II, S. Advanced creative work with emphasis on technical and visual research.

**ART 845. Graduate Painting Studies.** (Var.) I, II, S. Advanced creative work with emphasis on technical and visual research.

**ART 855. Graduate Printmaking Studies.** (Var.) I, II, S. Advanced creative work with emphasis on technical and visual research.

**ART 865. Graduate Ceramics Studies.** (Var.) I, II, S. Advanced creative work with emphasis on technical and visual research.

**ART 875. Graduate Metalsmithing and Jewelry Studies.** (Var.) I, II, S. Advanced creative work with emphasis on technical and visual research.

**ART 885. Graduate Independent Studies.** (1–5) I, II, S. Advanced individual work offered in studio areas of ceramics, graphic design, drawing, painting, printmaking, sculpture, and metalsmithing and jewelry.

**ART 899. Research in Art.** (Var.) I, II, S. Research which may form the basis for the master's of fine art thesis or report.

# Biochemistry

**Laura Andersson**
Heme proteins, molecular spectroscopy
Assistant Professor of Biochemistry; B.S. 1978, Auburn University; Ph.D., 1982, University of South Carolina. Exploring the effects of sulfur drugs, environmental pollution, and biologically active compounds on the functional and structural properties of hemeproteins and enzymes; spectroscopic studies of normal and modified biological heme systems.

**Lawrence C. Davis**
Nitrogen fixation mutants, natural insecticides, polymerase chain reaction
Professor of Biochemistry; B.S., 1966, Haverford College; Ph.D., 1970, Albert Einstein College of Medicine. Nitrogen fixation; associating macromolecules; structure-function relationships in nitrogenase.

**Robin E. Denell**
Insect developmental genetics and molecular biology
Professor of Biology; B.S., 1965, University of California, Riverside; Ph.D., 1969, University of Texas, Austin. Developmental genetic and molecular studies of insects.

**Charles Hedgcoth**
tRNA; wheat storage protein genes; wheat cytoplasmic male sterility
Professor of Biochemistry; B.S., 1961, University of Texas; Ph.D., 1965, University of Texas. Biosynthesis and function of tRNA from eukaryotic cells. Characterization of genes for plant storage proteins and the biochemical basis of wheat cytoplasmic male sterility.

**John J. Iandolo**
Molecular biology of bacterial toxins and secreted proteins
Professor of Microbiology, Department of Pathology. B.S. 1961, Loyola University, Chicago; M.S. 1963, University of Illinois; PhD, 1965, University of Illinois. The identification and regulation of expression of extracellular proteins and their genes.

**Michael R. Kanost**
Insect hemolymph proteins: biochemistry and molecular biology
Assistant Professor of Biochemistry; B.S. 1979, Colorado State University; Ph.D. 1983, Purdue University. Structure and function of serine proteinase inhibitors and antibacterial response proteins from insect hemolymph, regulation of gene expression.

**Karl Kramer**
Insect molting and digestion, cuticle chemistry, insect control
Research Chemist, U.S. Grain Marketing research Laboratory and Adjunct Professor of Biochemistry; B.S., 1964, Purdue University; Ph.D., 1971, University of Arizona. Biochemistry of insect growth and development; cuticle chemistry; insect hormones, enzymes, metabolites and growth regulators.

**Ramaswamy Krishnamoorthi**
Protein NMR: inhibitor proteins, blood clotting, nitrite reductase
Associate Professor of Biochemistry: B. Sc., 1973, University of Madras, India; M. Sc., 1975, University of Madras, India; Ph.D., 1983, University of California, Davis. One-and two-dimensional NMR spectroscopy on biological macromolecules; structure-function relationships of iron-sulfur proteins and complex flavoproteins; structure dynamics and effect of amino acid replacement in small proteins.

**George L. Marchin**
Parasites and water purification
Associate Professor of Biology; A.B., 1962, Rockhurst College; Ph.D., 1967, University of Kansas Medical Center. Environmental microbiology; antimicrobial resistance; polyiodide demand release disinfectants; molecular biology of bacteriophage T4.

**Delbert D. Mueller**
CO2-fixation, NMR spectroscopy of biological molecules
Associate Professor of Biochemistry; B.S., 1962, University of Oklahoma; Ph.D. 1966, University of Oklahoma. Structure-function studies and molecular interaction studies of biological molecules by NMR.

**S. Muthukrishnan**
Molecular biology of plant gene-expression
Professor of Biochemistry; B.S., 1963, Madras University, India; M.S., 1965, Madras University, India; Ph.D., 1970, Indian Institute of Science, Bangalore, India. Hormonal control of gene expression in plants; antifungal defenses of plants.

**Frederick W. Oehme**
Toxins and their biotransformation
Professor of Toxicology, Medicine and Physiology; B.S., 1957, Cornell University; DVM, 1958, Cornell University; M.S., 1962, Kansas State University; Dr. med. vet., 1965, Justus Liebig University, Giessen, Germany; Ph.D., 1969, University of Missouri–Columbia. Biochemical action and transformation of toxicants; metabolic, environmental, and clinical-diagnostic toxicology in man and animals.

**Gerald R. Reeck**
Proteins, proteins, proteins
Professor of Biochemistry; B.A., 1967, Seattle Pacific College; Ph.D., 1971, University of Washington. Structure and function of nonhistone chromosomal proteins; the proteins (and their genes) of plant seeds.

**David A. Rintoul**
Lipids, glycolipids and membrane signal transduction
Associate Professor of Biology; B.A., 1972, University of Kansas; PhD., 1978, Stanford University. Motion and distribution of glycosphingolipids in model and biological membranes; lipid-protein interactions in lens fiber cell plasma membranes.

**Thomas E. Roche**
Multienzyme machines, monoclonal antibodies, site-directed mutagenesis
Professor and Head of Biochemistry; B.S., 1966, Regis College; Ph.D., 1970, Washington State University. Function and regulation of multienzyme complexes from mammalian tissues: pyruvate dehydrogenase complex and α-ketoglutarate complex.

**Donald J. Roufa**
Somatic cell genetics, molecular biology, ribosomal proteins
Professor of Biology; A.B., 1965, Amherst College; Ph.D., 1970, The Johns Hopkins University. Molecular genetics of somatic animal cells. Structure, function and regulation of mammalian ribosomal protein genes.

**Paul A. Seib**
Cereals nutrition and vitamin C
Professor of Grain Science and Industry; B.S., 1958, Purdue University; Ph.D., 1965, Purdue University. Improving the nutritional value of cereal-based foods and feeds; chemical and biological properties of vitamin C.

**Dolores J. Takemoto**
Mechanism of visual photoactivation and retinal degeneration
Professor of Biochemistry; B.S., 1971, Ball State University; M.S., 1973, Colorado State University; Ph.D., 1979, University of Southern California. Biochemistry of membrane proteins in the retina of the eye; changes in structure in retina degeneration.

**Larry J. Takemoto**
Lens membrane protein and cataract development
Professor of Biology; B.A., 1967, Hartwick College; M.S., 1968, Yale University; Ph.D., 1974, Colorado State University. Changes in the composition and structure of lens membrane proteins during cataract formation.

**John M. Tomich**
Models for the pore-forming structure of ionic channels
Associate Professor of Biochemistry; B.A., 1974, University of Connecticut; M.S., 1976, Purdue University; Ph.D., 1980, Guelph–Waterloo (Canada) Center for Graduate Work in Chemistry. Structure and properties of ionic channel models of pore-forming structures formed from synthetic amphipathic peptides.

**Emin T. Ulug**
Cell killing and oncogenic cell transformation by animal viruses
Assistant Professor of Biology; B.A., 1977, University of Texas at Austin; Ph.D., 1984, University of Texas at Austin. Biochemical and physiological consequences of viral protein interactions with host cell membrane components.

**Xuemin (Sam) Wang**
Transmembrane signaling and lipid metabolism
Assistant Professor of Biochemistry; B.S., 1982, Huazhong Agricultural University, China; M.S., 1984, Ohio State University; Ph.D., 1987, University of Kentucky. Regulation and cellular function of plant lipid metabolism; biochemical and molecular characterization of phospholipases.

**Ruth Welti**
Membrane lipid domains, hormone-induced lipid transitions.
Assistant Professor of Biology; B.S., 1976, University of Connecticut, Storrs; Ph.D., 1982, Washington University. Characterization of membrane lipid domains; relationship of membrane lipid structure to function; metabolically "active" lipids, and the cellular functions of these lipids.

## Field

Biochemistry explores the molecular basis for life processes through chemical and physical studies on the structure and behavior of complex molecules found in biological materials. Biochemistry has emerged as a highly creative and successful discipline that has developed many new technologies and broadly applies the technological advances of other disciplines. Through characterizing the structure, function, assembly, and dynamic changes of macromolecules, biochemists seek to answer fundamental questions about living processes (basic research) and to bring to fruition significant improvements in the quality of life and medical care (applied research). Diverse advances have converged to allow the develop-

ment of recombinant DNA technology, and a revolution is under way toward understanding how plants and animals regulate their metabolic processes and expression of genetic information. The great complexity and endless variety of biological systems, together with the need for broad explorations, assure that imaginative research will continue in the field of biochemistry for the foreseeable future.

### Approach and goals of graduate studies

Both M.S. and Ph.D. degrees are available through the biochemistry program, which seeks to achieve excellence in teaching and research through a program tailored to the development of the individual student. The core curriculum is deliberately broad in order to build a framework of fundamental information so that new findings and concepts can be assimilated as they arise in the rapidly changing field of biochemistry. In graduate courses, faculty teach in their areas of expertise. A strong seminar program involves presentations by eminent visiting scholars from around the world, presentations of recent research by local researchers from throughout the campus, and seminars by graduate students based on recent literature. These opportunities afford insight both into new developments and into the process of problem solving. Breadth is added to the biochemistry program by complementary course work and by the strong group of researchers with biochemical interests in other departments.

Research environment in biochemistry is exciting and vigorous due to the diverse but interactive programs conducted in excellent research facilities by a dedicated, research-oriented faculty. Research is a cooperative effort in which graduate students learn to design and execute significant experiments by interaction with faculty, postdoctoral research associates, and fellow graduate students. While the growth of each graduate student is supported by this team effort, the goal is to achieve the self-sustaining capability and independence needed to continue in the learning and the researching of biochemical topics. Success in achieving that goal is apparent in the activities of our graduates.

Our graduates compete favorably with those from the very best programs in the country because they are trained and examined up to the state of the art in biochemical literature and technique.

Success in biochemistry requires dedication and hard work. As with any worthwhile endeavor, the reward of answering a meaningful question often requires tenacity of purpose. One can be almost assured in biochemistry that the answer will be, at least to some degree, unexpected and will open up new questions. Sharing in this adventure with other professionals makes biochemistry a satisfying career.

### Student background

Most incoming students have degrees in biology, biochemistry, or chemistry, but some have degrees in pharmacology, genetics, food science, physics, or microbiology. The most important considerations for applicants are an interest in continued study and intensive research in some areas of biochemistry along with the minimum prerequisites for admission to the program. Sufficient biology and a strong background in chemistry are the most important requirements.

### Entrance requirements

Applicants must have a bachelor's degree from an accredited institution, appropriate and adequate course work, and an average of B or better in the junior and senior years or an excellent postgraduate record at another institution. Provisional admission may occur when there are limited deficiencies in undergraduate course work that can be removed by course work taken at Kansas State University or when there is uncertainty in evaluation of transcripts, as may occur in the case of international students. In the latter case, removal of the provisional status occurs upon the accumulation of 9 hours of course work with a B or better average.

Undergraduate and postgraduate credits should include analytical, organic, and physical chemistry, calculus, physics, and a semester of biology including a laboratory. Physical chemistry may be completed as part of an M.S. or Ph.D. program, but all other deficiencies must be completed without graduate credit. No foreign language is required.

All applicants are required to take the Graduate Record Exam.

### International students

The Graduate School requires that students whose national language is not English demonstrate facility in the English language by making a minimum score of 550 on the Test of English as a Foreign Language. This test is required for assurance that a student's progress toward a degree is not likely to be jeopardized by language difficulties. The TOEFL test is offered several times a year in the student's home country through the Education Testing Service, Princeton, New Jersey. Further information is available through the Graduate School. International students are advised to take the TOEFL as early as possible to avoid delays in processing their applications for admission.

Because beginning graduate students in biochemistry are appointed as combined teaching/research assistants, the beginning student must be able to instruct laboratory students. Thus, a score of 240 on the Test of Spoken English also is required. While this test may be taken at the university, a TSE score of 240 submitted at the time of application greatly improves the student's possibility of acceptance. Due to this requirement, students accepted into the biochemistry program usually have TOEFL scores above 620.

### Program description

The study of biochemistry is conducted under a versatile arrangement through which faculty of the Department of Biochemistry and faculty of other departments cooperate in a graduate biochemistry group. The program of study is very flexible, accommodating students with a relatively wide range of backgrounds and interests. To make students broadly aware of the research being conducted within the program and to aid them in choosing a major professor, entering students visit with faculty members in the group during their first semester in the program.

The graduate biochemistry group administers the granting of Ph.D. and M.S. degrees in biochemistry whether the research is conducted within the Department of Biochemistry or in other cooperating departments. A student entering the graduate biochemistry program may pursue an M.S. or a Ph.D. degree depending on the student's qualifications. A recommendation for the degree program of each entering graduate student will be made by the executive committee based on the student's undergraduate or graduate record, any program deficiencies, and reference letters. Graduate students are expected to be excellent students (at least a B+ undergraduate average is generally expected, although a lower grade average may be considered if a student shows other signs of promise).

In biochemistry, both the Ph.D. and the M.S. degrees are considered research degrees. Thus, in addition to specific course requirements, there is a requirement for writing a thesis based on independent and original research conducted in the laboratory of one of the participating faculty members. The research is expected to be of a quality and an importance to merit publication in a refereed journal.

### Master of science and doctor of philosophy degrees in biochemistry

Students in either degree program take the two-semester, comprehensive, core biochemistry courses Biochemistry I and II and Biochemistry I and II Laboratories. Allowance is made for a student entering the program with a strong academic background in current biochemistry or in laboratory technique. All students are expected to attend the weekly graduate student seminar.

In addition to research requirements leading to an acceptable thesis, M.S. students must complete 22 to 24 credit hours of course work including Physical Biochemistry.

Admission to candidacy for a Ph.D. requires adequate performance in the core (two-semester) biochemistry courses, and early in the second year, the preparation and defense of a research proposal on a topic selected by the stu-

dent. This defense serves as the preliminary examination for admission to candidacy for the Ph.D. In addition, Physical Biochemistry and 10 hours of biology are required as part of the 30 to 40 credit hours of course work.

### Financial support of program

Members of the graduate biochemistry group currently receive more than $1 million a year in outside research funds. These funds support technicians, postdoctoral fellows, and some graduate research assistants and are used to provide up-to-date research equipment and supplies. Within the Department of Biochemistry, support for graduate teaching assistants is through the College of Arts and Sciences, and graduate research assistants are supported through the Agricultural Experiment Station.

### Financial support of graduate students

Usually a student is admitted into the graduate program in biochemistry only if university funds are available for salary support or if the student has another source of financial support (for example, a fellowship or stipend from his or her national government). U.S. citizens with strong undergraduate records and good GRE scores can compete for NSF predoctoral fellowships. The department encourages and has successfully supported such fellowship applications. The department-based support is administered in a manner that aids in the development of teaching skills as well as research. Initially students receive half their support in the form of teaching assistantships (requiring six contact hours per week) and half in the form of research assistantships. After the first year, teaching assistant support is often replaced by extramural support, with this being expected for Ph.D. students beyond their third year of study. The level of support in 1992–1993 is $11,700 for 12 months; this is expected to increase by at least $500 in subsequent academic years.

U.S. students are eligible for university graduate fellowships that provide a stipend and tuition waiver (see appropriate section of this catalog); the Department of Biochemistry supplements the stipend to provide a total stipend of $15,000 for 1992–1993. Graduate fellowships of $2,000 to $6,000 to supplement graduate teaching or research assistantships also are available on a competitive basis from the dean of the Graduate School. It is important that students interested in these awards complete their applications by early spring.

### Fees

Student fees are assessed at the in-state level for graduate teaching assistants and graduate research assistants, and students receiving support are required to enroll in 10 credit hours. Our combined graduate teaching and graduate research assistants receive a waiver of almost half of the tuition cost.

### Facilities

The Department of Biochemistry has 14 large research suites. Seven are located in Phase One of the new Chemistry-Biochemistry Building, which was completed in 1988. That building also houses the department's teaching laboratories. The department is well equipped for advanced research in a wide range of areas. Biophysical studies are conducted with a Bruker 400 MHz NMR (with superconducting magnet, multinuclear capability and advanced data analysis), magnetic or nonmagnetic circular dichroism, analytical Model E ultracentrifuges (U.V. Scanning, Schlieren, Yphantis methods), fluorescence spectroscopy with fluorescence polarization capability, UV-Visible differential scanning spectroscopy, and Iris molecular graphics computer with stereo viewing.

The department has needed equipment and technical know-how to conduct gene cloning experiments (supported by polymerase-chain reaction capabilities), preparation of monoclonal antibodies, amino acid analysis, peptide synthesis, and all varieties of electrophoresis experiments. For preparative procedures the department has multiple ultracentrifuges, high pressure liquid chromatographs, and facilities for making anaerobic enzyme preparations and large scale preparations of subcellular organelles. The department has several cold rooms, animal cell culture facilities, instrument rooms, and dark rooms. Facilities are available for housing animals and growing plants year-round. Analytical instruments include several scintillation counters, gamma counters, scanning spectrophotometers, and absorbance, fluorescence, and electrochemical detection for analysis of samples separated by HPLC.

The following facilities are also available on campus: oligonucleotide synthesis, gas-phase peptide sequencing, fluorescence-activated cell sorter, electron microscopy (transmission and scanning), quasi-elastic light scattering, Bruker ESR machine, GLC-mass spectrometer, emission spectrometry, Fourier-transform infrared spectrometers, atomic absorption and stopped flow kinetic system. The mainframe computer is an IBM 3084, and several Sparc stations (operate on UNIX system) and both bitnet and internet networks are available throughout the campus. The Agricultural Experiment Station provides support for facilities in electronics, machining, and glass blowing so that specialized apparatus can be constructed as needed.

### Career opportunities

Graduate study in biochemistry provides training for a number of varied academic and technological careers. Due to the breadth of the field of biochemistry, which directly involves or can impinge on an array of basic and applied problems, opportunities in biochemistry are expanding, and this expansion is expected to continue. Ph.D. and postdoctoral graduates find academic positions not only in departments of biochemistry, biophysics, and molecular biology but also in departments of biology, chemistry, pharmacology, physiology, medicinal chemistry, nutrition, and medicine. Doctoral graduates find positions requiring independent work in a wide range of industrial areas such as biotechnology, chemistry, pharmacology, biomedicine, and food technology. M.S. graduates generally occupy skilled technical positions in industry, government, or academic research laboratories, and many continue with doctoral work. Additional careers include government regulatory agencies, management, journalism, sales, and with further education, medicine and law.

For additional information, please contact: Chair, Graduate Biochemistry Group, Department of Biochemistry, Willard Hall, Kansas State University, Manhattan, KS 66506–3702.

## Biochemistry courses

### Undergraduate and graduate credit in minor field

**BIOCH 521. 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 BIOCH 365. Pr.: CHM 350.

**BIOCH 522. 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.: CHM 351 and BIOCH 521 or conc. enrollment, or BIOCH 765 or conc. enrollment.

### Undergraduate and graduate credit

**BIOCH 700. Advanced Topics in Plant Biochemistry.** (3) I, Fall 1992 and alternate years or on sufficient demand. An advanced treatment of topics of current interest in plant biochemistry, including photosynthesis and carbon metabolism, nitrogen fixation and nitrogen metabolism, structure and function of the higher plant genome, and production of material of economic interest. Pr.: *BIOCH 510 or 521 or 765.

**BIOCH 755. 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. BIOCH 755 and 765 are for students interested in a two-semester comprehensive coverage of biochemistry. For a one-semester course, enroll in BIOCH 521. Pr.: *Chemical analysis, one year of organic chemistry, differential and integral calculus.

**BIOCH 756. Biochemistry I Laboratory.** (2) I. An intensive laboratory course to accompany BIOCH 755. BIOCH 756 and 766 are sequential courses for students interested in a two-semester comprehensive coverage of experiments in biochemistry. For a one-semester laboratory course, enroll in BIOCH 522. Six hours lab a week. Pr.: *BIOCH 755 or conc. enrollment.

**BIOCH 765. Biochemistry II.** (3) II. Continuation of BIOCH 755; lipid chemistry and metabolism, amino acid metabolism, nutrition, nucleic acid chemistry and metabolism, integration of biochemical pathways and metabolic control mechanisms. Pr.: *BIOCH 755.

**BIOCH 766. Biochemistry II Laboratory.** (2) II. A continuation of BIOCH 756. Six hours lab a week. Pr.: *BIOCH 756 and 765 or conc. enrollment.

**BIOCH 790. Physical Biochemistry.** (3) I. A survey of biophysical methods most frequently encountered in biochemistry and related disciplines. The course emphasizes principles underlying methods used to determine the mole-

cular weight and shape of biopolymers, and techniques used to detect conformational changes in polynucleotides, proteins, and polysaccharides. Pr.: *Calculus, a course in physical chemistry, BIOCH 755, 756, 765, and 766.

**BIOCH 799. Problems in Biochemistry.** (Var.) 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

**BIOCH 806. Biochemistry Seminar.** (0–1) I, II. Seminar for graduate students in biochemistry.

**BIOCH 840. Intermediary Metabolism.** (3) On sufficient demand. Metabolic role of carbohydrates, lipids, proteins and amino acids, purines, pyrimidines, vitamins, and hormones; biological oxidations; mechanisms of energy production and utilization. Pr.: *BIOCH 755 and 765.

**BIOCH 845. Hormones.** (3) I, 1992–93 and alternate years or on sufficient demand. The structure, biosynthesis, biochemical role, metabolism, and interrelations of hormones in vertebrates and invertebrates. Pr.: BIOCH 765.

**BIOCH 890. Advanced Topics in Biochemistry.** (1–3) I, II, S. Course to present timely topics in Biochemistry. Pr.: Consent of instructor.

**BIOCH 899. Research in Biochemistry I.** (Var.) I, II, S. Research in biochemistry which may be used for preparation of the M.S. thesis. Pr.: Sufficient training for research undertaken.

**BIOCH 910. Lipids.** (2) II, 1993–94 and alternate years. Chemistry of plant and animal lipids, their occurrence, metabolism, and industrial uses. Pr.: *BIOCH 765.

**BIOCH 920. Nucleic Acids.** (2) II, 1993–94 and alternate years. Structure and function of nucleic acids: structures and properties of DNA, RNA, and chromatin; recombinant DNA techniques; mutagenesis and carcinogenesis; protein-nucleic acid interactions; structural influences on replication, transcription, translation, and regulation. Pr.: BIOCH 765.

**BIOCH 930. Proteins.** (2) I, 1993–94 and alternate years. Lectures and readings on the chemical nature of proteins; fractionation; purification, structure, chemical and physical properties of proteins and amino acids. Pr.: *BIOCH 755 and 765.

**BIOCH 940. Chemistry of Carbohydrates.** (2) I, on sufficient demand. Lectures and readings on structural chemistry of carbohydrates, their general properties, biological and chemical reactions, and the methods of characterization. Pr.: *BIOCH 755 and 765.

**BIOCH 950. Enzyme Chemistry.** (3) II, 1992–93 and alternate years. The following properties of enzymes are considered: structure, specificity, catalytic power, mechanism of action, multienzyme complexes, kinetics, regulation, and pacemaker properties in multienzyme systems. Pr.: *BIOCH 765.

**BIOCH 997. Postdoctoral Research in Biochemistry.** (1–12) I, II, S. Advanced level research in collaboration with a faculty member, involving projects in any area of biochemistry. Post-graduate training in first three years beyond doctorate. Pr.: Ph.D. or equivalent.

**BIOCH 999. Research in Biochemistry II.** (Var.) I, II, S. Research in biochemistry which may be used for preparation of the Ph.D. thesis. Pr.: Sufficient training for research undertaken

*Nonmajors lacking these prerequisites should obtain consent of instructor before enrollment.

# Biology

**Interim Director**
**Jerry S. Weis,** Ph.D. 1964, University of Kansas. Bioethics.

**Professors**
**Theodore M. Barkley,** Ph.D. 1960, Columbia University. Plant taxonomy and systematics;

**Melvin S. Center,** Ph.D. 1967, Medical College of Georgia. Oncology and cell biology;

**Gary W. Conrad,** Ph.D. 1968, Yale University. Cellular and developmental biology;

**Richard A. Consigli,** Ph.D. 1960, University of Kansas. Virology and oncology;

**Robin E. Denell,** Ph.D. 1969, University of Texas–Austin. Developmental genetics;

**Charles Hedgcoth** (Professor of Biochemistry), Ph.D. 1965, University of Texas–Austin. Biochemistry and molecular biology;

**John J. Iandolo** (Professor of Pathology), Ph.D. 1965, University of Illinois. Microbiology and molecular biology;

**Terry C. Johnson,** Ph.D. 1964, University of Minnesota. Virology and oncology;

**Donald W. Kaufman,** Ph.D. 1972, University of Georgia. Animal behavior and ecology;

**Charles L. Kramer,** Ph.D. 1957, University of Kansas. Mycology;

**Thomas R. Manney** (Professor of Physics), Ph.D. 1964, University of California–Berkeley. Biophysics, genetics and molecular biology;

**Harish C. Minocha** (Professor of Laboratory Medicine), Ph.D. 1967, Kansas State University. Virology;

**Raja F. Nassar** (Professor of Statistics), Ph.D. 1964, University of California–Davis. Biometrics;

**Gerald R. Reeck** (Professor of Biochemistry), Ph.D. 1971, University of Washington. Biochemistry and molecular biology;

**O. James Reichman,** Ph.D. 1974, Northern Arizona University. Animal behavioral ecology;

**Robert J. Robel,** Ph.D. 1961, Utah State University. Wildlife biology;

**Donald J. Roufa,** Ph.D. 1970, The Johns Hopkins University. Cellular and molecular biology;

**Christopher C. Smith,** Ph.D. 1965, University of Washington. Evolutionary ecology;

**Brian S. Spooner,** Ph.D. 1969, Temple University. Cellular and developmental biology;

**Larry J. Takemoto,** Ph.D. 1974, Colorado State University. Cell and membrane biology;

**Ronald West** (Professor of Geology), Ph.D. 1970, University of Oklahoma. Plant geography;

**Fred E. Wilson,** Ph.D. 1965, Washington State University. Animal physiology;

**Peter P. Wong,** Ph.D. 1971, Oregon State University. Plant physiology;

**John L. Zimmerman,** Ph.D. 1963, University of Illinois. Avian ecology.

**Associate professors**
**Stephen Keith Chapes,** Ph.D. 1981, University of Illinois. Immunology;

**James A. Guikema,** Ph.D. 1978, University of Michigan. Plant cellular and molecular biology;

**David C. Hartnett,** Ph.D. 1983, University of Illinois. Plant community ecology;

**Barbara A.D. Hetrick** (Associate Professor of Plant Pathology), Ph.D. 1978, Oregon State University. Mycorrhizal symbiosis;

**Harold E. Klaassen,** Ph.D. 1967, University of Washington. Fisheries biology and aquaculture;

**Alan K. Knapp,** Ph.D. 1988, University of Wyoming. Plant physiological ecology;

**George L. Marchin,** Ph.D. 1967, University of Kansas Medical School. Microbiology and virology;

**Jean-Pierre Perchellet,** Ph.D. 1974, University of Paris VI. Virology and oncology;

**David A. Rintoul,** Ph.D. 1978, Stanford University. Cellular and molecular biology;

**A. Paul Schwab** (Associate Professor of Agronomy), Ph.D. 1981, Colorado State University. Soil ecology and nutrient cycling;

**Delores J. Takemoto** (Associate Professor of Biochemistry), Ph.D. 1978, University of Southern California. Biochemistry and molecular biology;

**A. Spencer Tomb,** Ph.D. 1970, University of Texas–Austin. Cytogenetics;

**Steve J. Upton,** Ph.D. 1983, Auburn University. Cellular and molecular parasitology;

**James E. Urban,** Ph.D. 1968, University of Texas–Austin. Microbiology;

**Ruth Welti,** Ph.D. 1982, Washington University in St. Louis. Cell biology of biological membranes;

**Larry G. Williams,** Ph.D. 1967, California Institute of Technology. Molecular biology.

**Assistant professors**
**Donald B. Bechtel** (Adjunct Assistant Professor of Biology), Ph.D. 1982, Kansas State University. Plant developmental biology;

**John M. Blair,** Ph.D. 1987, University of Georgia. Soil Ecology;

**Ted T. Cable,** (Associate Professor of Horticulture, Forestry and Recreation Resources), Ph.D. 1984, Purdue University. Forestry;

**Parag R. Chitnis,** Ph.D. 1987, University of California–Los Angeles. Plant cellular and molecular biology;

**Walter K. Dodds,** Ph.D. 1986, University of Oregon. Aquatic ecology;

**Monica J. Justice,** Ph.D. 1987, Kansas State University. Cell and developmental biology;

**Charles Layne** (Assistant Professor of Kinesiology), Ph.D. University of Texas–Austin. Biology of movement;

**Beth A. Montelone,** Ph.D. 1982, University of Rochester. Molecular genetics;

**Joseph S. Murray,** Ph.D. 1987, University of Kansas. Cellular and molecular immunology;

**Charles W. Rice** (Assistant Professor of Agronomy), Ph.D. 1983, University of Kentucky. Soil microbial ecology and nutrient cycling;

**Emin T. Ulug,** Ph.D. 1984, University of Texas–Austin. Cellular and molecular virology.

**Instructors**
**E. Dale Kennedy,** Ph.D. 1989, Rutgers University. Ecology;

**Avelina Q. Paulsen,** Ph.D. 1967, University of Wisconsin. Cellular and developmental biology.

### Program overview

The Division of Biology offers master of science and doctor of philosophy degrees in two areas: biology and microbiology. To support this effort, the graduate faculty is committed to a vigorous research and instructional program.

Since biology and microbiology are very broad disciplines, and to provide a structural profile of our faculty research interests, we have formed the following areas of interest:

**Genetic, developmental, and cellular biology**
Bechtel, Chitnis, Conrad, Denell, Justine, Manney, Montelone, Rintoul, Roufa, Spooner, L. Takemoto, Welti, Williams

**Microbiology and immunology**
Chapes, Chitnis, Consigli, Dodds, Iandolo, Johnson, Kramer, Marchin, Montelone, Murray, Ulug, Upton, Urban, Wong

**Systematics and Ecology**
Barkley, Blair, Cable, Dodds, Hartnett, Hetrick, Kaufman, Kennedy, Klaassen, Knapp, Nassar, Reichman, Rice, Robel, Schwab, Smith, Tomb, West, Zimmerman

**Plant and animal physiology**
Chitnis, Guikema, Kennedy, Layne, Weis, Wilson, Wong

**Virology and oncology**
Center, Chapes, Consigli, Denell, Hedgcoth, Johnson, Justine, Minocha, Paulsen, Perchellet, Reeck, Rintoul, Roufa, D. Takemoto, L. Takemoto, Ulug

## Programs

Biology and microbiology are exceedingly broad disciplines, and the graduate program exploits this exciting diversity. The graduate faculty of the Division of Biology strongly believes that research is the preeminent feature of our training responsibilities. Our faculty is a coalition of scientists who focus a wide diversity of experimental expertise on graduate education—ranging from the study of virus assembly and the biology of a cancer cell, to the interaction of grazing bison with plant growth on our expansive tall grass prairie. Graduate opportunities are available, in all areas of biology, including developmental biology, ecology, wildlife biology, cancer biology, virology, physiology, immunology, parasitology, and molecular genetics.

In partnership with a major advisor and a supervisory committee, each graduate student formulates a mixture of course work and research to comprise an individualized program of study. This partnership tailors the program to the needs of each student, and selects from a set of available courses those which present recent and exciting developments in the student's area of interest. A minimum of 30 hours past the bachelor's degree is required for a master of science; a minimum of 90 hours for a doctor of philosophy. We require that each student write a thesis based on original research, of sufficient quality and importance to merit publication in a refereed journal.

**Facilities**
The research-oriented graduate training activities of the biology graduate faculty are performed in three on-campus sites—Ackert Hall, Bushnell Hall, and Leasure Hall—as well as at off-campus sites like the Konza Prairie Research Natural Area, the Lyndon B. Johnson Space Center, and the Kennedy Space Center.

**Ackert Hall**
With some 130,000 square feet, this building is the main biology facility. Named after James Ackert, long-time professor of parasitology and the first dean of the Graduate School, Ackert Hall provides modern well-equipped laboratories for teaching and research. In addition to the research laboratories, Ackert Hall contains the division offices, a three-section rooftop greenhouse, an electronics shop, a research supply storeroom, and small animal rooms. Equipment available for research includes ultracentrifuges, beta and gamma counting systems, high performance liquid chromatography systems, growth chambers, an electron microscopy facility, and glassware cleaning and sterilizing facilities.

**Bushnell Hall**
Graduate faculty members with an interest in environmentally oriented studies have offices and laboratory space in Bushnell Hall. Included in this building are the herbarium, three environmental chambers, dark rooms, and tanks for fish culture ranging from 100- to 2,000-liter capacity.

**Leasure Hall**
Leasure Hall is used to house the Kansas Cooperative Fisheries and Wildlife Research Unit. This unit is a partnership of the U.S. Department of the Interior, Kansas State University, the Kansas Department of Wildlife and Parks, and the Wildlife Management Institute. Three U.S. Department of the Interior employees, as Division of Biology adjunct graduate faculty members, coordinate fisheries and wildlife research programs with state and university participation.

**Konza Prairie Research Natural Area**
Approximately 8,616 acres of native tall grass prairie has been set aside as a unique outdoor laboratory for long-term research. This land was purchased by the Nature Conservancy with funds provided by Katharine Ordway. Land management is designed to provide experimental manipulations, in order to understand patterns and processes in maintaining the prairie ecology.

**Research strengths**
The biology graduate faculty has a proven track record in scientific achievement, and continues to excel in competition for extramural research funding. Our programs are funded by the state, through the Kansas Agricultural Experiment Station, and by direct grants to our faculty members from the National Science Foundation, National Institutes of Health, National Aeronautics and Space Administration, Wesley Foundation, American Heart Association, and the American Cancer Society. Areas of strength, which provide research opportunities for our graduate students, can be illustrated by collaborative research funding in such areas as:

**Long-term ecological research**
The National Science Foundation has continued to support research on the Konza Prairie since 1980. The study is designed to investigate gradual and subtle changes that influence plant and animal populations on the tall grass prairie, the impact of human activities on ecosystem productivity, and variations in ecological processes caused by burning and grazing.

**Center for Basic Cancer Research**
An interdisciplinary approach to cancer biology includes faculty scientists in the Division of Biology; the Departments of Biochemistry, Chemistry, Psychology, Laboratory Medicine, Foods and Nutrition; and the Kansas Agricultural Experiment Station.

**Wesley Foundation Scholar Program in Cancer Research**
Investigators in the Division of Biology, in cooperation with the University of Kansas Medical Center and the University of Kansas, lead a predoctoral and postdoctoral training program in cancer biology.

**NASA Specialized Center of Research and Training in Gravitational Biology**
Research and training focuses on space life science, with an emphasis on the role that gravity plays in influencing cellular development. Center trainees benefit from unique collaborative opportunities with the University of Colorado, the Alberta (Canada) Research Council, Mount Desert Island Biological Laboratory, and residency programs at NASA Research Field Centers.

**Virology and tumor biology training program**
This predoctoral program provides many of the essential experimental skills necessary for solving research problems in modern virology and tumor biology.

**BioServe Space Technologies**
In cooperation with Aerospace Engineering Sciences at the University of Colorado, the Division of Biology leads this NASA Center for the Commercial Development of Space. Projects are focused on applications of the space environment in areas of significant impact, including biotechnology, pharmaceuticals, and agrigenetic materials.

## Admission

Incoming students generally have degrees in biology, biochemistry, wildlife biology, or a comparable field. However, the overwhelming considerations are an intensive interest in biology or microbiology, and minimum prerequisites for admission into our programs. Application procedures require (1) a completed application form, (2) a statement of professional goals and objectives, (3) transcripts from all colleges and universities attended, (4) three letters of recommendation, and (5) GRE scores. Additional Graduate School regulations apply to applicants from outside of the United States.

**Financial support**
Because of the strength of our faculty efforts in obtaining research funding, we normally provide 12-month financial assistance to the graduate students we accept into our program. This level of assistance is competitive with that offered by other midwestern universities. Students receiving support (as well as their spouses and dependents) are eligible for in-state tuition and fees.

**Contact**
For additional information, interested students should contact any faculty member, or write to:

Graduate Selection Committee
Kansas State University
Division of Biology
Ackert Hall
Manhattan, KS 66506–4901
(913) 532-6615 (Office)
(913) 532-6653 (Fax)

## Biology courses

### Undergraduate and graduate credit in minor field

**BIOL 500. Plant Physiology.** (4) I. Detailed consideration of physiological processes of higher plants. Three hours lec. and three hours lab a week. Pr.: BIOL 201 or BIOL 210; and a course in organic chemistry.

**BIOL 505. Comparative Anatomy of Vertebrates.** (4) I. Interpretation of vertebrate structure with emphasis on function and phylogeny. Two hours lec. and six hours lab a week. Pr.: BIOL 198.

**BIOL 510. Embryology.** (3) II. Developmental anatomy and physiology of reproduction of birds and mammals. Three hours lec. a week. Pr.: BIOL 198.

**BIOL 511. Embryology Laboratory.** (1) II. One three-hour lab a week. Pr.: BIOL 510 or conc. enrollment.

**BIOL 513. Physiological Adaptations of Animals.** (3) I. Integration of physiological mechanisms as the basis for adaptive responses of animals to different environments. Pr.: BIOL 201; and a course in organic chemistry or biochemistry.

**BIOL 514. Physiological Adaptations of Animals Laboratory.** (1) I. One three-hour lab a week. Pr.: Conc. enrollment in BIOL 513.

**BIOL 526. Human Physiology.** (3) II. Functions of various organ systems of mammals, primarily humans. Three hours lec. a week. Pr.: BIOL 198; and a course in biochemistry or organic chemistry.

**BIOL 529. Fundamentals of Ecology.** (3) I. Ecosystem structure and function including energy flow; biogeochemical cycling; effect of climate, soil, fire, succession; application to land management practices. Three hours lec. a week and optional field trips. Pr.: BIOL 201 or 210; and CHM 210.

**BIOL 530. Pathogenic Microbiology.** (3) I. Etiology and descriptions of major infectious diseases of humans within the perspective of host defenses. Two hours lecture and one hour laboratory-demonstration a week. Pr.: BIOL 455.

**BIOL 540. Molecular Biology.** (3) I. An introduction to the synthesis and regulation of DNA, RNA, and protein. Mutation and the chromosome are studied at the molecular level. Emphasis is placed on recombinant DNA technology and on the handling of biological information in both higher and lower organisms. Pr.: BIOL 201 and CHM 350.

**BIOL 541. Cell Biology.** (3) II. Structure and function of cells and subcellular components. A molecular understanding of membranes and cellular physiology will be emphasized. Three hours lec. Pr.: BIOL 540 and CHM 350.

**BIOL 542. Ichthyology.** (3) II, in even years. Classification, morphology, physiology, distribution, and natural history of fishes. Two hours lec. and three hours lab a week. Pr.: BIOL 201.

**BIOL 543. Ornithology.** (3) II. Classification, morphology, physiology, distribution, and natural history of birds. Two hours lec. and three hours lab a week. Pr.: BIOL 201.

**BIOL 544. Mammalogy.** (3) I. Characteristics, evolution, life histories, and ecology of mammals, especially North American game species. Two hours lec. and three hours lab a week. Pr.: BIOL 201.

**BIOL 545. Human Parasitology.** (3) II. Protozoan and helminth parasites of man with lesser emphasis on ectoparasitic arthropods. Emphasis on life cycles, control, and laboratory diagnosis. Three hours lec. a week. Pr.: BIOL 201.

**BIOL 546. Human Parasitology Laboratory.** (1) II. Examination of prepared materials and identification of internal parasites of man. Two hours lab a week. Pr.: Conc. enrollment in BIOL 545.

**BIOL 547. Herpetology.** (2) II, in odd years. Classification morphology, physiology, distribution, and natural history of amphibians and reptiles. One hour lec. and three hours lab a week. Pr.: BIOL 201.

**BIOL 550. Lower Plants.** (3) II, in odd years. Morphology, adaptive mechanisms, and evolutionary relationships of the cellular and vascular cryptograms. Two hours lec. and one three-hour lab a week. Pr.: BIOL 201 or 210.

**BIOL 551. Taxonomy of Flowering Plants.** (4) I. Morphology, taxonomy, and biogeography of the vascular plants. Two hours lec. and two three-hour labs a week. Pr.: BIOL 201 or 210.

### Undergraduate and graduate credit

**BIOL 604. Biology of the Fungi.** (3) I. An introduction to fungal structure, function, physiology, ecology, and genetics. Importance of fungi as disease organisms, as saprotrophs, and in industry. Techniques of isolation, cultivation, and as experimental organisms. Two hours lec. and two hours lab a week. Pr.: BIOL 198 or 210.

**BIOL 612. Limnology.** (4) I, in even years. Basic ecological principles of aquatic environments. Plants and animals of local streams, rivers, ponds, and reservoirs are used to demonstrate the interaction of biological processes with the chemical and physical features of natural aquatic environments. Three hours lec., three hours lab a week; two optional weekend field trips. Pr.: BIOL 201 and CHEM 110 or 210.

**BIOL 615. Cytogenetics.** (4) I, in even years. Chromosome structure and mechanics, cytotaxonomy, and karyotypic analysis in eukaryotes. Two hours lec. and six hours lab a week. Field trips. Pr.: BIOL 430 or a course in genetics.

**BIOL 620. Evolution.** (3) II, in even years. A study of the theory of evolution including its historical and social implications. Three hours lec. a week. Pr.: BIOL 430 or a course in genetics.

**BIOL 625. Animal Parasitology.** (4) I, in odd years. Biology and pathology of the principal protozoan, helminth, and arthropod parasites of domestic animals and wildlife. Three hours lec. and two hours lab a week. Pr.: BIOL 198 and junior standing.

**BIOL 632. Ecology Laboratory.** (1) II. Laboratory nd field experiences with ecological problems. Pr.: STAT 340 or equiv.

**BIOL 645. Advanced Field Studies.** (1-2) Offered in intersession only. Different ecosystems and the opportunity to apply classroom knowledge to field biology situations under the guidance of experienced biologists. Pr.: One course in field biology at or above the 400 level.

**BIOL 655. Genetics Laboratory.** (3) II. Basic genetic principles of prokaryotic and eukaryotic organisms will be demonstrated through isolation and analysis of gene mutations. Two hours lec. and four hours of lab a week. Pr.: BIOL 430 or a course in genetics.

**BIOL 670. Immunology.** (4) II. Chemical, genetic, and biological properties of the immune response, acquired immunity, and antibody production. Pr.: Two courses in biology; and a course in biochemistry or equiv.

**BIOL 671. Immunology Lab.** (2) II. Laboratory exercises in immunology. Pr.: BIOL 670 or conc. enrollment. Three-hour lab a week plus one hour rec.

**BIOL 675. Genetics of Microorganisms.** (3) I. The genetics of bacteria, viruses, and other microorganisms. Both the use of genetics in microbiological studies and the use of microbial systems to investigate basic genetic problems will be covered. Pr.: BIOL 455 and BIOL 540.

**BIOL 680. Aquaculture.** (3) I, in odd years. Principles and methods of culturing fishes for commercial purposes. Topics of study include: species of fishes used in production; breeding; feeds and feeding of fishes; fish parasites and diseases; environmental requirements; facilities; and potential markets. Two hours lec. and three hours lab a week. Pr.: Two courses in biology, two courses in chemistry, and junior standing.

**BIOL 684. Wildlife Management.** (3) II. Concepts of managing wildlife with emphasis on North American game species. Applied population dynamics as they relate to management, historical, and recent developments in wildlife management, habitat improvement, and related material. Three hours lec. a week. Pr.: BIOL 430 and 433.

**BIOL 685. Wildlife Management Techniques.** (3) I. Ecology and management techniques. Two hours lec. and three hours lab a week. Pr.: BIOL 430 and 433.

**BIOL 687. Microbial Ecology.** (3) II, in even years. The ecology of aquatic and terrestrial microorganisms in their natural environment. Pr.: BIOL 455.

**BIOL 690. Microbial Physiology and Metabolism.** (2) II. The study of structure, function, regulation, and intermediary metabolism of bacteria. Pr.: BIOL 455; and BIOCH 521 or 765.

**BIOL 691. Microbial Genetics Laboratory.** (3) II. Examination of the genetic processes of bacteria. A self-paced experimental regimen emphasizing current methodology employed in mutagenesis, selection, gene transfer, gene analysis, plasmid manipulation, and recombinant DNA technology. Pr.: BIOL 540 and 675. Enrollment limited to 12 students.

**BIOL 696. Fisheries Management.** (4) I, in even years. Methods of managing fisheries resources; physical and biological survey methods; methods of aquatic environment improvement; fish population manipulation; management of streams, ponds, and lakes. Three hours lec. and three hours lab a week. Pr.: BIOL 433.

**BIOL 697. Topics in Biology.** (1–6) I, II, S. Pr.: Consent of instructor.

**BIOL 698. Problems in Biology.** (1–8) I, II, S. Pr.: Consent of instructor.

**BIOL 699. Undergraduate Seminar in Biology.** (1) I, II. Pr.: Consent of instructor.

**BIOL 702. Radiation Safety in the Research Laboratory.** (1) I. Principles of radioactive safety and radioisotope handling, licensing procedures, and laboratory techniques. Pr.: BIOL 198 or 555; and CHM 210 or PHYS 113.

**BIOL 710. Endocrinology.** (3) II, in even years. A survey of the glands of internal secretion in vertebrates with emphasis on mechanisms of control of hormone secretion and mechanisms of hormone action. Pr.: BIOL 198; and a course in organic chemistry or biochemistry.

**BIOL 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 BIOL 455 or 540; and BIOCH 521 or equiv.; consent of instructor.

**BIOL 735. Human Oncology.** (3) II, in even years. Etiology and pathogenesis of human cancer, with emphasis on the biology and biochemistry of the neoplastic process; host-tumor relationships; mechanism of action of anti-cancer drugs; and the clinical polychemotherapy of cancer. Pr.: BIOL 540 and BIOCH 521 or equiv.

**BIOL 736. Cancer Therapy.** (3) II, in odd years. Current methods of cancer management with emphasis on the kinetic principles of chemotherapy and radiation therapy; diagnosis; surgical oncology; oncologic emergencies; adverse effects of cancer therapy; and the new therapies; Pr.: BIOL 540 and BIOCH 521 or equiv.

**BIOL 740. Anatomy of Higher Plants.** (3) II. Structure and development of the various tissues and organs of seed plants. Two hours lec. and one two-hour lab a week. Pr.: BIOL 201 or 210.

**BIOL 755. Specialized Cell Functions.** (3) I, in even years. In vitro cell and organ culture techniques as tools for differentiation and specialization studies. Emphasis on mammalian cell culture systems with some study of plant cell culture. Pr.: BIOL 541.

**BIOL 760. Genetic Engineering.** (2) I. An in-depth coverage of techniques and approaches currently used in gene cloning. Recent papers which describe the application of gene cloning to basic research will be read and discussed. Pr.: BIOL 540.

### Graduate credit

**BIOL 800. Advanced Plant Physiology I.** (3) II, in even years. Modern concepts and research in plant physiology. Respiration, photosynthesis, and water relations of plants. Pr.: An introductory plant physiology course or general biochemistry.

**BIOL 801. Advanced Plant Physiology II.** (3) II, in odd years. Modern concepts and research in plant physiology. Mineral nutrition, translocation, growth, and development of plants. Pr.: An introductory plant physiology course or general biochemistry. Previous enrollment in BIOL 800 is not required.

**BIOL 805. Advanced Mycology.** (3) II, in even years. Study of fungi, with emphasis on structure, identification, classification, phylogeny, and economic importance. One hour lec. and six hours lab a week. Pr.: BIOL 704.

**BIOL 810. Growth Regulation in Prokaryotes.** (2) I, in even years. The nature, dynamics, and regulation of cell growth and the cell cycle in prokaryotes. Pr.: BIOL 455; and BIOCH 755 or equiv.

**BIOL 815. Plasmid Biology.** (2) II, in odd years. The current status of extrachromosomal inheritance in prokaryotic cells. Pr.: BIOL 455; and BIOCH 755 or equiv.

**BIOL 820. The Lytic Bacteriophages.** (2) II, in even years. The regulation of gene expression as revealed through genetic and Bacillus subtilis. Pr.: BIOL 455; and BIOCH 755 or equiv.

**BIOL 825. Evolution of Animal Behavior.** (4) II, in even years. The study of mechanisms, ontogeny, and evolution of behavior stressing the adaptive nature of behavior. Two hours lec., one hour of discussion on assigned readings, and two to three hours lab a week. Lab format will be individual research projects requiring independent research skills. Pr.: BIOL 430 or equiv.

**BIOL 826. Nutrient Dynamics.** (3) II, in odd years. The cycling of elements in ecosystems with emphasis on macronutrients such as nitrogen, phosphorous, and major cations, and the influence of variables such as acid rain on nutrient dynamics. Two hours lec. and two hours lab a week. Pr.: BIOL 529 and CHM 210.

**BIOL 830. Advanced Virology.** (4) I, in even years. Application of current biochemical, biophysical, and biological techniques to the study of viruses, including bacterial viruses (bacteriophage), animal viruses, and plant viruses. Pr.: BIOL 730 and consent of instructor.

**BIOL 835. Cellular and Modecular Parasitoloyg.** (3) I, in even years. Biochemistry, immunology, and molecular biology of medically important eukaryotic parasites. Three hours lec. Pr.: BIOCH 521 or equivalent.

**BIOL 840. Molecular and Cellular Immunology.** (3) I, in even years. Discussions and readings covering the molecular and cellular interactions during various phases of the immune response. Pr.: BIOL 670.

**BIOL 850. Advanced Topics in Immunology.** (1–2) I, II. Current research in immunology. Pr.: BIOL 670 and consent of instructor.

**BIOL 855. Molecular Biology of Cellular Membranes.** (3) I. A general coverage of membranes with respect to theories of structure, chemical and physical methods of study, methods of isolation, transport mechanisms, assembly and function of components, and receptors. Some specific membrane systems will be covered in detail including a review of recent references. Pr.: BIOL 541 and BIOCH 521.

**BIOL 860. Molecular and Cellular Biology.** (3) I, in odd years. A study of the molecular biology of the cell. Regulation, organization, and synthesis of cellular constituents in both prokaryotic and eukaryotic cells will be studied in a comparative manner. Pr.: BIOL 540, BIOCH 765 or equiv.; and consent of instructor.

**BIOL 864. Plant Responses to the Environment.** (3) I, in odd years. Modern concepts and techniques for measuring the environment and plant ecophysiological responses. Instrument/sensor theory and operation, leaf energy balance, measurement and interpretation of plant carbon and water relations in the field. Pr.: a course in ecology, a course in plant physiology.

**BIOL 865. Advanced Plant Ecology.** (4) I, in even years. Advanced study of theory in population and community ecology as applied to higher plants. Emphasis on current research in plant population ecology, species interactions, community structure, and succession. Four hours lecture/rec. per week. Pr.: BIOL 430 or a plant ecology course.

**BIOL 868. Advanced Cellular and Developmental Biology.** (3) I, in odd years. Chemistry, structure, and function of cellular systems in growth, development, and reproduction. Pr.: BIOCH 755 or equiv.

**BIOL 870. Advanced Systematic Botany.** (4) I, in odd years. Classification, nomenclature, and taxonomic theory of vascular plants. Two hours rec. and six hours lab a week. Pr.: BIOL 551.

**BIOL 875. Evolutionary Ecology.** (3) I, in even years. A study of the evolution of population, community, and ecosystem structure. Two hours lec. and one hour rec. a week. Pr.: BIOL 529.

**BIOL 885. Modeling in Biology.** (3) II, in even years. Conceptualization, construction, and interpretation of descriptive and predictive mathematical models used in biology, especially ecology. Pr.: A calculus (MATH 220) and statistics (STAT 702) course.

**BIOL 888. Electron Microscopy Techniques.** (3) II. Theory and techniques involved in using the transmission electron microscope for the study of biological materials. Includes individualized instruction on the operation of the Philips 201 electron microscope and techniques for processing biological samples. Pr.: Current participation in research requiring electron microscope and consent of instructor.

**BIOL 890. Advanced Topics in Biology.** (1–6) I, II, S. Pr.: Consent of instructor.

**BIOL 891. Advanced Problems in Biology.** (1–8) I, II, S. Pr.: Consent of instructor.

**BIOL 895. Graduate Seminar in Biology.** (1) I, II. Pr.: Consent of instructor.

**BIOL 898. Master's Research in Biology.** (1–9) I, II, S.

**BIOL 899. Master's Research in Microbiology.** (1–9) I, II, S.

**BIOL 997. Postdoctoral Research in Biology.** (1–12) I, II, S. Advanced-level research in collaboration with a faculty member, involving projects in any area of biology. Pr.: Ph.D. degree or equivalent.

**BIOL 998. Research in Biology.** (Var.) I, II, S.

**BIOL 999. Research in Microbiology.** (Var.) I, II, S

# Chemistry

**Chairman**

**M. Dale Hawley,** Ph.D. University of Kansas, Analytical Chemistry, Electrochemistry. Electrogeneration of reactive intermediates; development of new electrochemical methodologies; study of strong electrogenerated bases, unstable radicals and anion radicals

**Professors**

**James L. Copeland,** Ph.D. Indiana University, Physical Chemistry. Thermodynamics; high temperature physical chemistry, chemical education

**William G. Fateley,** Ph.D. Kansas State University, Analytical Chemistry, Environmental Chemistry. Development of Hadamard transform spectrometry; detection of volatile organic compounds using Fourier transform infrared spectrometry

**Robert M. Hammaker,** Ph.D. Northwestern University, Physical Chemistry. Molecular spectroscopy (IR/FT-IR, Raman); instrument development; Hadamard transform spectroscopy (UV/VIS, Raman, IR); atmospheric pollutants

**Duy H. Hua,** Ph.D. Southern Illinois University at Carbondale, Organic Chemistry, Natural Product Synthesis. Design of highly efficient asymmetric synthesis; development of stereoselective reactions; synthesis of biologically active compounds

**Thomas L. Isenhour,** Ph.D. Cornell University, Analytical Chemistry, Laboratory Automation. Robotics; expert systems and artificial intelligence; use of computer methods to interpret analytical data; instrument development; Fourier transform infrared spectroscopy; environmental analysis

**Kenneth J. Klabunde,** Ph.D. University of Iowa, Inorganic Chemistry, Materials Chemistry, Organometallics Chemistry of free metal atoms, metal clusters, and molecular fragments; materials chemistry; surface chemistry; thin films; organometallic synthesis

**Eric A. Maatta,** Ph.D. Indiana University, Inorganic Chemistry, Materials Chemistry, Organometallics. Transition metal complexes with multiply bonded ligands; synthetic inorganic and organometallic chemistry; catalysis; novel conducting materials

**Richard N. McDonald,** Ph.D. University of Washington, Physical-Organic Chemistry, Laser Chemistry. Photochemistry of gas-phase ions; ion-molecule gas phase reactions; chemistry of coordinatively unsaturated organometallic negative ions

**Clifton E. Meloan,** Ph.D. Purdue University, Analytical Chemistry, Environmental Chemistry. Insect receptor sites; specific chemical detection methodology; extraction mechanisms; polymers for selective anion removal; criminalistics

**Joseph V. Paukstelis,** Ph.D. University of Illinois, Organic Chemistry, NMR Spectroscopy. Synthesis of strained compounds; synthesis of novel analytical reagents; Nuclear Magnetic Resonance spectroscopy

**Keith F. Purcell,** Ph.D. University of Illinois, Inorganic Chemistry; Electrical, magnetic, and optical properties of transition metal solids; electron transfer reactions in solids and solution; molecular orbital study of electron transfer

**Donald W. Setser,** Ph.D. University of Washington, Physical Chemistry, Laser Chemistry. State-to-state chemical kinetics and collision dynamics; laser-induced selective reactivity; molecular energy transfer; spectroscopy of small molecules

**Peter M.A. Sherwood,** Ph.D. Cambridge University, Analytical Chemistry, Surface Chemistry, Materials Chemistry. Surface science; x-ray photoelectron spectroscopy of inorganic solids and surfaces; electrode surfaces; corrosion systems; carbon fiber surfaces; material surface properties

**Assistant professors**

**Andrew S. Borovik,** Ph.D. University of North Carolina, Inorganic Chemistry. Structure and function of biologically relevant metal complexes

**Keith R. Buszek,** Ph.D. UCLA, Organic Chemistry, Natural Product Synthesis. Synthetic organic chemistry; total synthesis of complex natural products of biological interest; development of new synthetic methods; bio-organic chemistry

**Csilla Duneczky,** Ph.D. University of Pennsylvania, Physical Chemistry, Theoretical Chemistry. Theoretical chemistry; development of semiclassical methods; quantum reactive scattering; laser-molecule interaction; computational techniques

**Charles G. Riordan,** Ph.D. Texas A & M University, Inorganic Chemistry. Synthesis, spectroscopy, and reactivity of bioinorganic and organometallic macrocycles

**Adjunct faculty**

**Christopher M. Sorensen,** Professor of Physics, Ph.D. University of Colorado, Physical Chemistry, Magnetic Materials. Synthesis and properties of ultrafine magnetic materials; gelation of polymer solutions; critical phenomena and phase transitions; supercooled water

## Facilities

Kansas State University is committed to providing its students and faculty with an excellent and stimulating atmosphere in which to conduct research. This commitment is reflected by the over two million dollars of new instrumentation added to the department in the last several years and by the construction of our new Chemistry-Biochemistry building. As a medium-sized chemistry department, K-State is large enough to ensure that our students are provided access to a variety of first-rate equipment, yet small enough to assure our students of a close personal interaction with faculty. We recognize that our students are individuals, and our programs are structured so as to allow each student to reach his or her potential at an appropriate pace.

The department possesses a full complement of first-rate instrumentation ranging from the familiar and routine to the complex and highly specialized. It is the policy of the department to provide our students with unrestricted ac-

cess to our instruments and to provide instruction to become proficient in their use. The laser laboratory is a central facility that provides the capability for research requiring modern laser technology, and includes pulsed, high-power, rare gas-halide excimer lasers; argon-ion lasers; excimer-pumped dye lasers with frequency doubling capability; and pulsed $CO_2$ lasers. The departmental surface science facility contains two X-ray photoelectron spectrometers, and a full range of sample preparation technique is used, including argon ion etching, surface scraping, and sample fracture. A special chamber for anaerobic electrochemical surface studies is also available. The department possesses outstanding capabilities in the area of molecular spectroscopy. The NMR laboratory features a superconducting Bruker WM-400 NMR spectrometer, which provides easy data acquisition and excellent resolution and sensitivity. Computer systems pervade the department, ranging from personal computers to Sun workstations, and access to the university mainframe and off-campus networks is readily available. All of these instruments and facilities are housed in a complex of three buildings, including our new Chemistry-Biochemistry building, which has been designed to accommodate all aspects of modern chemical research and teaching with a primary emphasis on safety. The department maintains an extensive chemistry library. In keeping with the departmental policy of openness, all graduate students are provided with keys to the Chemistry Library, which allows access to its resources at all times. Outstanding glassblowing, machine, and electronics shops offer expert fabrication of specialized equipment, and a well-provisioned chemistry storeroom maintains a large inventory of research chemicals and equipment.

## Programs of study

The Department of Chemistry offers programs leading to the M.S. and Ph.D. degrees in analytical, inorganic, organic, and physical chemistry, as well as a Ph.D. in chemistry with emphasis on college teaching. Strong interdisciplinary programs at the Ph.D. level are also offered through the Center for Molecular and Solid State Energetics, which comprises research efforts of faculty from the Departments of Chemistry, Physics, and Chemical, Nuclear, Electrical, and Computer Engineering.

Entering students are administered placement exams in order to assess their preparations for graduate studies. Outstanding students are encouraged to take advanced standing exams that allow course work to be bypassed. A minimum grade of C must be obtained in all courses in order to earn credit and a minimum overall grade point average of 3.0 (out of a possible 4.0) is necessary. Original research is the most important part of the graduate program, and selection of a thesis advisor is made during the first semester in residence in order to allow students to start work on their research projects at an early date.

### Ph.D. degree

A program of study will include 30–40 hours of graduate course work, including courses from the four divisions: 3 hours at the 700 level or higher from the analytical division; CHM 710 and 697 or 698 from the inorganic division, Advanced Organic Chemistry, and Theoretical Chemistry 1; and 2 hours of credit in the graduate seminar appropriate to the major division. A total of 90 semester hours is required, including at least 50 hours of research for students entering with a bachelor's degree and 36 hours for students entering with a master's degree.

The preliminary exam for the Ph.D. degree consists of a series of written cumulative exams beginning in the second semester of residence on topics within the student's area of specialization, and an oral research proposition examination that the student must prepare and defend before his or her supervisory committee by the end of the third year. Completion of the Ph.D. degree requires the submission of a written thesis and its oral defense before one's supervisory committee.

### M.S. degree

A minimum of 30 semester hours of graduate credit is required for this degree program, of which no less than 22 hours will be earned in course work. The program of study for the master's degree will normally include up to 15 hours in the student's major area of study, 6 to 12 hours in related areas, and one hour of graduate seminar. At least two semester hours of credit must be earned at the 700 level or higher in each of three of the following areas of study: analytical, inorganic, organic, and physical chemistry. A master's thesis that is based on 6 to 8 semester hours of original research must also be defended before one's supervisory committee.

## Admission procedures

Application forms for graduate admission may be obtained by writing or calling:

Chairman, Graduate Admissions Committee
Department of Chemistry
Willard Hall
Kansas State University
Manhattan, KS 66506–3701
(913) 532-6665

Undergraduate transcripts are required as are letters of recommendation from persons familiar with your chemistry background. Applicants are strongly encouraged to take the GRE, including both the general test and the subject test in chemistry. Students considering graduate work at Kansas State are encouraged to visit the department, to meet with members of the faculty and with other students, and to observe our facilities and educational environment.

We welcome applications from well-qualified international students. Two requirements must be satisfied in order to demonstrate proficiency in English: a score of 550 or higher on the TOEFL and a score of 240 or higher on the TSE. International applicants must also submit the results of the Graduate Record Examinations, including the chemistry subject test.

## Financial support

Most graduate students are supported for the duration of their studies by various teaching assistantships, research assistantships, and fellowships. Incoming students are generally awarded teaching assistantships; summer support also is provided if performance in course work and teaching duties during the academic year is satisfactory. Students with excellent undergraduate credentials frequently receive supplemental departmental fellowships and are considered for graduate fellowships on a university-wide competitive basis. Outstanding graduate students are recognized annually through teaching and research awards.

## Analytical chemistry courses

### Undergraduate and graduate credit in minor field

**CHM 545. Chemical Separations.** (2) II. Principles of modern separation techniques. One hour lec. and three hours lab a week. Pr.: CHM 250 or CHM 271.

### Undergraduate and graduate credit

**CHM 666. Instrumental Analysis.** (3) I. Three hours lec. a week.

**CHM 667. Instrumental Analysis Laboratory.** (1) I. Three hours lab a week.

**CHM 668. Chemical Equilibria.** (1) I. One hour lec. a week.

### Graduate credit

**CHM 901. Graduate Seminar in Analytical Chemistry.** (0–1) I, II, S.

**CHM 921. Advanced Separations.** (2) I, in even years. Two hours lec. a week.

**CHM 922. Advanced Separations Laboratory.** (1) I, in even years. Three hours lab a week.

**CHM 937. Applications of Surface Science to Chemistry.** (2) I, in odd years. Chemical bonding in the solid state. Surface science and related techniques as applied to chemical problems. Special topics including data analysis and corrosion studies. Pr.: CHM 697 and 710.

**CHM 942. Advanced Analytical Chemistry.** (3) I, in odd years. Elemental and functional group analyses, nonaqueous solvent systems, gas analysis, kinetics, and thermal methods of analysis.

**CHM 944. Electroanalytical Chemistry.** (2–3) II, in even years. Theory and applications of electrochemical methods; chronoamperometry, chronopotentiometry, cyclic voltammetry, coulometry, polarography, potentiometry, and instrumentation.

**CHM 946. Principles and Techniques of Analytical Chemistry I.** (1–5) II, in odd-numbered years. A lecture and laboratory course on emission spectroscopy, flame photometry, atomic absorption, and x-ray methods.

**CHM 947. Principles and Techniques of Analytical Chemistry II.** (1–4) II, in even-numbered years. A lecture and laboratory course on ultraviolet and visible absorption, infrared and Raman methods, fluorescence, phosphorescence, polarimetry, and refractometry.

**CHM 948. Computer Control of Chemical Instruments.** (3) The technique and use of a minicomputer in the laboratory, including interface hardware and software for digital and analog data acquisition and display and instrument control. Two hours lec. and three hours lab a week. Pr.: CHM 725.

## Inorganic chemistry courses

### Undergraduate and graduate credit

**CHM 650. History of Chemistry.** (2) II, in even years. Traces the beginnings of chemistry from 3500 B.C. to 1920 A.D. Early metallurgy, Greek thought about atoms, alchemy, atomic theory, discovery of gases; definition of elements, chemical bonds, organic, inorganic, and physical chemistry. Pr.: CHM 585.

**CHM 657. Inorganic Techniques.** (2) II. The preparation, characterization, and study of transition metal, main group, and organometallic compounds of unusual interest, using techniques commonly encountered in industrial and academic research. Six hours lab a week. Pr.: CHM 585.

**CHM 697. Structure and Bonding.** (2) I. Atomic and molecular structure, bonding concepts used in the practice of inorganic chemistry. This material forms a foundation for higher level courses in inorganic chemistry. Pr.: CHM 550, 595.

**CHM 698. Inorganic Chemistry.** (3) II. Aspects of the structures, reactions, reaction mechanisms, and spectral properties of transition metal and non-metal compounds. Three hours lec. a week. Pr.: CHM 697.

**CHM 710. Chemical Applications of Group Theory.** (1) I. Applications of group theory to molecular structure, bonding, and spectra. One hour lec. a week.

### Graduate credit

**CHM 800. Chemistry in Outer Space and in the Laboratory.** (2) II, in odd years. The generation of reactive atoms and molecules in outer space and in the laboratory is covered, as well as their chemical reactions and spectroscopy. Extreme conditions of high and low temperatures, synthesis using atoms, and matrix isolation are discussed. Pr.: CHM 698.

**CHM 902. Graduate Seminar in Inorganic Chemistry.** (0–1) I, II, S.

**CHM 929. 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.: CHM 697, 710.

**CHM 930. Homogeneous Catalysis.** (2) II, in even years. The study of industrially important and synthetically useful catalysis of organic reactions by soluble metal complexes. Two hours lec. a week. Pr.: CHM 698 or consent of instructor.

**CHM 935. Selected Topics in Inorganic Chemistry.** (1–3) I, II. 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.

**CHM 936. Electronic Structure of Molecules and Solids.** (2) I, in even years. Electronic structure calculations and interpretations of results using the instructor's software. Pr.: CHM 697 and CHM 710.

## Organic chemistry

### Undergraduate and graduate credit in minor field

**CHM 531. Organic Chemistry I.** (3) I, II. 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 curricula and for entrance to medical schools. Three hours lec. a week. Pr.: CHM 230 or 250.

**CHM 532. Organic Chemistry Laboratory.** (2) I, II. One five-hour lab and one hour of lec. a week. Pr.: CHM 531.

**CHM 550. Organic Chemistry II.** (3) I, II. Continuation of CHM 531, including additional aromatic chemistry, condensation reactions, and introduction to some advanced topics, such as dyes, polymers, and heterocyclic chemistry. Three hours lec. a week. Pr.: CHM 531.

**CHM 551. Advanced Organic Laboratory.** (2) I, II. One five-hour lab and one hour of lec. a week. Pr.: CHM 550 and CHM 532.

### Graduate credit

**CHM 852. Advanced Organic Chemistry.** (3) I. Advanced study of organic compounds and fundamental types of reactions. Three hours lec. a week.

**CHM 860. Synthetic Organic Chemistry.** (4) II. Conditions, scope, and applications of reactions useful in synthetic organic chemistry. Four hours lec. a week.

**CHM 862. Organic Spectroscopy.** (3) II. The principles of IR, UV-VIS, mass, and NMR spectroscopies applied to the problem of structure determination. Three hours lec. a week.

**CHM 903. Graduate Seminar in Organic Chemistry.** (0–1) I, II, S.

**CHM 965. Physical Organic Chemistry.** (3) I. Principles of orbital symmetry, thermochemistry, kinetics, and other topics applied to the understanding of reaction mechanisms. Three hours lec. a week.

**CHM 970. Selected Topics in Organic Chemistry.** (1–3) 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.

## Physical chemistry

### Undergraduate and graduate credit in minor field

**CHM 500. General Physical Chemistry.** (3) II. Elementary principles of physical chemistry. Three hours lec. a week. Pr.: CHM 230 or CHM 250 and MATH 210 or MATH 220.

**CHM 585. Physical Chemistry I.** (3) I. Elementary chemical thermodynamics and kinetic theory of gases. Three hours lec. a week. Pr.: CHM 230 or CHM 250, MATH 222, PHYS 214.

**CHM 595. Physical Chemistry II.** (3) II. Elementary quantum chemistry, spectroscopy, statistical thermodynamics, and chemical kinetics. Three hours lec. a week. Pr.: CHM 585.

**CHM 598. Physical Chemistry II Laboratory.** (2) II. Six hours lab a week. Pr.: CHM 250 or CHM 271 and CHM 595 or conc. enrollment.

### Graduate credit

**CHM 801. Chemical Thermodynamics.** (3) II, in alternate years. The laws, principles, and methods of thermodynamics and their applications to chemical systems. Statistical-molecular approach emphasized. Three hours lec. a week.

**CHM 854. Theoretical Chemistry I.** (3) I. Introduction to quantum mechanics and atomic and molecular spectroscopy. Three hours lec. a week.

**CHM 856. Chemical Kinetics.** (3) I, in alternate years. Survey of experimental and/or theoretical aspects of dynamics of chemical reactions. Three hours lec. a week. Pr.: CHM 801 or CHM 854.

**CHM 904. Graduate Seminar in Physical Chemistry.** (0–1) I, II, S. Presentation of topics from literature in physical chemistry.

**CHM 950. Chemical Statistical Mechanics.** (3) I, in alternate years. Application of classical and quantum statistical mechanics to chemical phenomena. Three hours lec. a week. Pr.: CHM 801, 854.

**CHM 954. Theoretical Chemistry II.** (3) II. Quantum theory of atomic and molecular structure. Three hours lec. a week. Pr.: CHM 854.

**CHM 955. Selected Topics in Physical Chemistry.** (1–3) 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.: CHM 854.

# Economics

**Krishna Rao Akkina,** Associate Professor. Ph.D. 1972, University of Minnesota. Macroeconomics; econometrics; international trade.

**Michael W. Babcock,** Professor. Ph.D. 1973, University of Illinois–Urbana. Transportation economics, regional economics; location theory.

**Bernt Bratsberg,** Assistant Professor. Ph.D. 1991, University of California, Santa Barbara. Labor economics; microeconomics; econometrics.

**Yang-Ming Chang,** Associate Professor. Ph.D. 1984, SUNY at Buffalo. Microeconomic theory; mathematical economics; international trade.

**M. Jarvin Emerson,** Professor. Ph.D. 1963, University of Iowa. Regional and urban economics; macroeconomics; resource and environmental economics.

**Walter H. Fisher,** Assistant Professor. Ph.D. 1990, University of Washington. Macroeconomic theory; international finance; international trade.

**Patrick J. Gormely,** Associate Professor. Ph.D. 1967, Duke University. Development economics; international economics; nutrition economics.

**David G. Hula,** Instructor. Ph.D. 1982, University of Wisconsin–Madison. Industrial organization; monetary economics.

**Mark S. McNulty,** Associate Professor. Ph.D. 1985, Iowa State University. Econometrics; statistics; microeconomic theory.

**E. Wayne Nafziger,** Professor. Ph.D. 1967, University of Illinois–Urbana. Economic development; international economics; comparative economic systems.

**Edwin G. Olson,** Associate Professor. Ph.D. 1971, University of Washington. Managerial economics; public finance; history of economic thought.

**James F. Ragan, Jr.,** Professor and Department Head. Ph.D. 1975, Washington University. Labor economics; applied microeconomics; public policy.

**Milton D. Terrell,** Assistant Professor. Ph.D. 1991, Duke University. Econometrics; macroeconomics; public finance.

**Lloyd B. Thomas, Jr.,** Professor. Ph.D. 1970, Northwestern University. Monetary economics; macroeconomic policy; international monetary economics.

**Dennis L. Weisman,** Assistant Professor. Ph.D. 1993, University of Florida. Regulation; industrial organization; microeconomics.

## Admission

In addition to general Graduate School requirements, the Department of Economics has the following requirements for admission.

### Course requirements

3 credit hours of intermediate macroeconomic theory
3 credit hours of intermediate microeconomic theory
3 credit hours of statistics
3 credit hours of calculus

If these courses are not part of the student's undergraduate program, admission will be provisional upon completing these courses.

### Grade requirements

A 3.0 GPA in the last 60 credit hours taken with no C's, or lower, in the courses listed above. Although students with academic performance below these standards may be admitted because of other considerations such as high GRE scores, admission will be probationary.

### Graduate record examination

Applicants for admission to either M.A. or Ph.D. programs are expected to provide their Graduate Record Examination general test scores.

## Master of arts

### Required course work

Each master's degree program must consist of at least 30 hours and contain the following courses:

ECON 720 Microeconomic Theory
ECON 805 Income and Employment Theory I

A statistics course offered for graduate credit (unless such a course was included in the student's undergraduate program)

Specific course requirements beyond these core requirements are selected and agreed upon by the student and his or her advisory committee based on the student's background, objectives, and undergraduate preparation. The program may include a minor consisting of 6 to 12 hours of course credit in a single field (outside the Department of Economics).

### Degree options

Three options are available to complete the master's degree: thesis option, report option, and Ph.D. qualifying-exam option.

Thesis option: The thesis option requires a minimum of 30 semester hours of graduate credit. These hours include the nine hours mentioned above and also the master's thesis for which 6 semester credit hours are given.

Report option: The report option requires a minimum of 30 semester hours of graduate credit. These hours include the nine hours mentioned above and also a Master's report for which 2 semester hours of credit are given.

Ph.D. qualifying-exam option: The Ph.D. qualifying-exam option requires a minimum of 30 hours of graduate credit, successful completion (a grade of B or higher) of a graduate economics course that has as one of its requirements the writing of a term paper, and a master's-level pass in two of the Ph.D. qualifying exams.

## Ph.D. degree

### Required course work

As part of the 90 hours required for a Ph.D. degree, each Ph.D. degree program must contain the following 30 hours of course work or equivalent:

ECON 735 Mathematical Economics
ECON 805 Income and Employment Theory I
ECON 905 Income and Employment Theory II
ECON 940 Advanced Microeconomic Theory I
ECON 945 Advanced Microeconomic Theory II
ECON 730 Introduction to Econometrics
ECON 935 Econometric Methods
ECON 810 History of Economic Thought
AGEC 901 Research Methods in Economics
STAT 550 Basic Elements of Statistical Theory

An additional 30 hours of course work in economics or in related departments is required.

### Ph.D. dissertation

In the process of completing the research and writing of a Ph.D. dissertation, the student must enroll in at least 30 hours of ECON 999 Ph.D. Research.

### Ph.D. preliminary exams

Students must pass preliminary exams in macroeconomic theory, microeconomic theory, and econometrics. The courses preparing the students for these exams are

Macroeconomic theory: ECON 805 and ECON 905
Microeconomic theory: ECON 940 and ECON 945
Econometrics: ECON 730 and ECON 935

Students are normally expected to take these exams immediately after completing the aforementioned course work.

Preliminary exams must also be passed in two other fields, one of which may be outside of economics. These fields should consist of at least 9 hours of course work, and for fields in economics at least six hours must be 800 level or above. Field exams may not be taken until the macroeconomic theory, microeconomic theory, and econometrics exams are passed. Fields of study in economics that normally comprise these preliminary exam fields are economic development, industrial organization, international economics, labor economics, monetary economics, public finance, and regional economics.

Fields outside of economics may include areas such as statistics, finance, management, political science, industrial engineering, and regional and community planning.

## Research and teaching assistantships

Graduate research and teaching assistantships provide apprenticeship experiences for future teachers and researchers. Graduate research assistants work with faculty researchers on grant projects. There are two types of graduate teaching assistants—those who teach their own course and those who assist others by grading exams, proctoring, and carrying out other assignments.

### Criteria for GTA appointments

Each year the Department of Economics offers assistantships to some of its graduate students. The number of assistantships available in a given year depends on the size of the GTA budget, which the department receives from the College of Arts and Sciences. Because the budget is not large enough to provide financial aid to every graduate student, representatives of the department (principally the head and the director of graduate studies) must decide which students are to be offered support. These decisions are based on various criteria.

Grades are important, especially in core courses (graduate micro, macro, and econometrics). Graduate students seeking financial support are also expected to stay on a schedule that allows them to complete their degree in a timely fashion. Unless there are extenuating circumstances, required courses should be taken as soon as possible, and students in the Ph.D. program should take preliminary exams immediately after they have completed the necessary course work. Appointment or reappointment to a GTA position depends on suitable progress in terms of grades, courses taken, and preliminary exams.

Because the department relies on graduate students to teach some of its courses, graduate students with the academic ability, composure, and communication skills necessary for classroom instruction will be given a high priority for an assistantship.

## Economics courses

### Graduate credit in minor field

**ECON 505. Introduction to the Civilization of South Asia I.** (3) I. Interdisciplinary survey of the development of civilization in India. Pakistan, Sri Lanka, Bangladesh, and Afghanistan; geographical and demographic context, philosophical and social concepts; economic social and political institutions, literature and historical movements. Same as HIST 505, POL.SC 505. SOCIO-505, ANTH. 505.

**ECON 506. Introduction to the Civilization of South Asia II.** (3) II. Interdisciplinary survey of recent and contemporary civilization in India, Pakistan, Sri Lanka, Bangladesh, and Afghanistan, including recent history, current economy, religion, culture, languages and literature, geography, social and political structures and ideas. Same as HIST 506, POL.SC 506, SOCIO 506, ANTH. 506.

**ECON 507. The Japanese Economy.** (3) II. Analyzes Japan's growth, productivity change, income distribution, government policies, agriculture, industrial structure, labor relations education and technology, and international trade and finance. Emphases will be on U.S.–Japanese competition and comparisons. Pr.: ECON 110.

**ECON 510. 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; ECON 120 or AGEC 100.

**ECON 520. 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.

**ECON 530. 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.

**ECON 532. Fiscal Operation of State and Local Government.** (3) Some I. Designed for students who plan careers related to state or local government. Selected topics in state and local taxation and expenditure. Pr.: ECON 110 and permission of instructor.

**ECON 540. Managerial Economics.** (3) I, II, some S. Microeconomic topics applicable to understanding and analyzing firm behavior: optimization, demand, estimation, production, and cost theory. Applications to business problems. Pr.: ECON 120, an introductory-level statistics course, and MATH 205.

**ECON 555. Urban and Regional Economics.** (3) An examination of the determinants of the economic performance of urban and regional economies, including theory, problems, and policy. Pr.: ECON 120.

**ECON 595. Problems in Economics.** (Var.) I, II, S. Individual study is offered in international trade, labor relations, money and banking, public finance, transportation, general economics.

### Undergraduate and graduate credit

**ECON 620. Labor Economics.** (3) I. Economics of the labor market-labor force composition and trends, structure and characteristics of labor markets, wages, employment, and unemployment; economics of trade unions; current issues. Pr.: ECON 120 or consent of instructor.

**ECON 627. Contemporary Labor Problems.** (3) Some II. Emphasis on current research and public policies dealing

with such matters as full employment, poverty, discrimination, social security, unemployment insurance, health care, minimum wages, training, and education. Pr.: ECON 620 or consent of instructor.

**ECON 631. Principles of Transportation.** (3) II. 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; ECON 120 or AGEC 100.

**ECON 633. Public Finance.** (3) II. Course seeks answers to questions such as: Which goods should be provided by the private sector and which by the public sector (government)? With what criteria are public expenditures evaluated? What is an equitable and efficient tax system? Who bears the tax burden? What aspects of existing taxes need reform? Pr.: ECON 110; ECON 120 or AGEC 100.

**ECON 636. Capitalism and Socialism.** (3) II. A survey of Marxian economics, major perspectives on U.S. capitalism, market and self-governing socialism, and the Soviet, Chinese, and other communist economies. Pr.: ECON 110. ECON 636-0-2204.

**ECON 640. Industrial Organization and Public Policy.** (3) II. 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.

**ECON 681. International Trade.** (3) S. Principles of international trade and finance, including production, exchange, commercial policy, resource movements, balance of payments, foreign currency markets, and policies for internal and external balance. Pr.: ECON 110; ECON 120 or AGEC 100.

**ECON 682. Economics of Underdeveloped Countries.** (3) 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 110.

**ECON 686. Business Fluctuations and Forecasting.** (3) Some I. 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. Pr.: ECON 110; ECON 120 or AGEC 100.

**ECON 690. Monetary, Credit, and Fiscal Policies.** (3) II. Goals of aggregative economic policy, conflicts among goals, and measures to resolve conflicts; money markets; targets of central bank control; the relative strength of monetary and fiscal policies; rational expectations hypothesis and policy ineffectiveness debate; terms structure of interest rates. Pr.: ECON 530.

**ECON 699. Seminar in Economics.** (1–3) On sufficient demand. Seminars of special interest will be offered on demand. Pr.: ECON 120.

**ECON 720. Microeconomic Theory.** (3) I. Demand, cost, and production theories; price and output determination in different market structures; the theory of factor market pricing; an introduction to general equilibrium and welfare analysis. Pr.: ECON 520; MATH 205 or MATH 220.

**ECON 730. Introduction to Econometrics.** (3) II, some S. Analytical and quantitative methods used in economics. Applications to specific problems. Pr.: MATH 220 or 205; STAT 550 or both STAT 510 and 511.

**ECON 735. Mathematical Economics.** (3) I. Application of mathematical tools of concrete problems in micro- and macro-economics; mathematical treatment of models of consumption, production, market equilibrium, and aggregate growth. Pr.: ECON 520, MATH 205 or 220, or consent of instructor.

## Graduate credit

**ECON 801. Topics in Monetary Theory.** (3) Emphasis on recent literature of monetary economics; Federal Reserve control of the money stock; the demand for money; money and economic activity; monetary targets and indicators. Pr.: ECON 510 and ECON 530.

**ECON 805. Income and Employment Theory I.** (3) II. 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 510.

**ECON 810. History of Economic Thought.** (3) II, in even years. Development of economic ideas and doctrines and the relation of these to conditions existing when they were formulated. Pr.: ECON 510.

**ECON 823. Advanced International Economics.** (3) 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 or consent of instructor.

**ECON 832. Public Sector Analysis.** (3) Conditions for economic efficiency in the public sector; public good production functions; nonmarket decision making; rationale for public sector growth; systems analysis, cost-benefit and related techniques of allocating public goods. Pr.: ECON 633.

**ECON 840. Managerial Economics.** (3) I. Economic analysis of production, cost, and demand functions. Application of economic models to managerial decision making. Pr.: ECON 520, MATH 205, and one course in statistics with a prerequisite in the same department.

**ECON 860. Growth and Development Theories.** (3) Advanced theories of economic 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 682 or consent of instructor.

**ECON 890. Seminar in Economics.** Course will provide seminars on specific topics in economics. May be repeated for no more than 6 credit hours total. Prerequisites vary with announced subject matter.

**ECON 895. Problems in Economics.** (Var.) I, II, S. Advanced individual study is offered in selected subject matter. Pr.: Background of courses needed for problems being studied.

**ECON 898. Master's Report in Economics.**

**ECON 899. Master's Research in Economics.**

**ECON 905. Income and Employment Theory II.** (3) I. 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.

**ECON 915. Macroeconomic Modelling.** Examines current topics in Macroeconomics with an emphasis on empirical modelling. The course will be structured to allow the student an in-depth look at influential articles in the literature through presentations and required summary papers, and apply similar skills in an assigned original research paper. Pr.: ECON 730 and ECON 805.

**ECON 920. Labor Economics Seminar.** (3) A critical analysis of wage theories, collective bargaining, and unemployment problems. Pr.: ECON 620 or consent or instructor.

**ECON 925. Location of Economic Activities.** (3) An examination of the theory of location including central place theory, location of the individual producer, industrial location patterns, and urban land-use models. Also includes application of theoretical models to current urban problems.

**ECON 927. Advanced Labor Economics.** (3) An examination of studies in labor supply, labor demand, immigration, and current topics in labor economics. Pr.: ECON 730 (or conc.); ECON 720.

**ECON 935. Econometric Methods.** (3) I. Quantitative methods of research used in economics. Pr.: ECON 730 or consent of instructor.

**ECON 940. Advanced Microeconomic Theory I.** (3) II. An examination of demand, production, and cost theories; a discussion of duality theory and the application of the Le Chatelier principle; an analysis of price and output determination in different market structures. Pr.: ECON 520; ECON 735.

**ECON 945. Advanced Microeconomic Theory II.** (3) I. A study of advanced topics in economic theory, including general equilibrium theory, welfare economics, and risk and uncertainty. Pr.: ECON 940.

**ECON 955. Theory and Methods of Regional Economic Analysis.** (3) 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 925 or consent of instructor.

**ECON 999. Ph.D. Research in Economics.**

# English

**Professors**

**Jerome Dees,** Ph.D. 1968, University of Illinois (Renaissance and 17th-Century literature, literary criticism).

**Donald Hedrick,** Ph.D. 1974, Cornell University (Shakespeare, cultural studies).

**Steve Heller,** M.F.A. 1981, Bowling Green state University (20th-century fiction, creative writing: fiction).

**Jonathan Holden,** Distinguished University Professor and Poet-in-residence, Ph.D. 1974, University of Colorado (20th-century literature, creative writing: poetry and nonfiction).

**George Keiser,** Ph.D. 1971, Lehigh University (Medieval studies, Chaucer).

**Ben Nyberg,** Ph.D. 1965, University of Colorado (19th-century fiction, creative writing: fiction).

**John Rees,** Ph.D. 1965, University of Iowa (19th-century American literature).

**Leland Warren,** Ph.D. 1976, University of Illinois (18th-century British literature).

**Associate professors**

**William Brondell,** Ph.D. 1964, University of Missouri (Old English language and literature, modern short fiction).

**Margaret Conrow,** Ph.D. 1962, University of Illinois (Victorian literature).

**Elizabeth Dodd,** M.F.A. 1986, Ph.D. 1989, Indiana University (20th-century literature, creative writing: poetry).

**M.L. Donnelly,** Ph.D. 1970, Harvard University (Milton, 17th-century literature).

**Dean Hall,** Ph.D. 1977, Kent State University (Early American literature).

**James Machor,** Ph.D. 1980, University of Illinois (19th-century American literature, cultural studies).

**Thomas Murray,** Ph.D. 1982, Indiana University (English language and linguistics).

**Bonnie Nelson,** Ph.D. 1981, Pennsylvania State University (Restoration and 18th-century British drama).

**David Smit,** Ph.D. 1984, University of Iowa (Composition and rhetoric, 20th-century drama).

**Assistant professors**

**Linda C. Brigham,** Ph.D. 1991, University of Maryland (English Romantic Period, literary theory, semiotics).

**Timothy A. Dayton,** Ph.D. 1990, Duke University (American Literature, Cultural Studies, Modernism).

**Carol Franko,** Ph.D. 1990, University of Wisconsin (Feminist criticism, modern British literature).

**Irene Gale,** Ph.D. 1992, University of South Florida (Composition and Rhetorical Theory).

**S. Lillian Kremer,** Ph.D. 1979, Kansas State University (19th and 20th Century American Literature, Jewish–American Literature).

**Lawrence Rodgers,** Ph.D. 1989, University of Wisconsin (20th-century American literature, African American literature).

**Joseph Tabbi,** Ph.D. 1989, University of Toronto (20th-century American literature, cultural studies).

## M.A. program

The M.A. degree in English is awarded in one of four tracks, each of which can be completed in 30 to 33 hours. All tracks require English 802 Graduate Studies in English and English 790 History of the English Language (total of 4 hours); a literature core (15 hours); special courses in the chosen track (9 hours, students in some tracks may take up to 6 hours of electives outside the department); a written M.A. report or creative report with critical apparatus (2 hours); foreign language certification (or equivalent research tool); and a written exam over a reading list specialized for each candidate. Students in each track work closely with a committee of three faculty to produce the M.A. report.

### British and American literature

Concentration in this track is on the study of British and American literature; a student may emphasize any time period in either national literature and will work with graduate faculty who are experts in that period.

### Creative writing and literature

Concentration in this track is on the student's creative work in fiction, poetry, or drama; the student will work closely with graduate faculty well-published in the genre the student chooses to emphasize and will produce a substantial creative work for the M.A. report. The department's visiting writers program brings several writers of national stature to campus each year. In addition, opportunities for editorial experience are open to graduate students in this track.

### Language, composition/rhetoric, and literature

Concentration in this track is on language, composition, and rhetorical theory. Like the other M.A. tracks, this one can prepare students for going on to Ph.D. work and provide professional training as preparation for teaching in community and junior colleges.

### Cultural studies and literature

Concentration in this track is on training in Marxist, feminist, and psychoanalytic theory; a student may study both literary and such non-literary areas as the discourses of popular and mass culture, film, and other art forms, in addition to politics, sociology, and political economy.

## Admission

All applications are reviewed by the director of graduate studies and the graduate advisory committee within the department. Applicants are expected to have performed at a B level or better in all of their undergraduate work, but the committee bases its primary judgment on the student's performance in English courses.

Because some persons do not mature as students until late in their undergraduate careers, the department may sometimes accept students with less than the expected grade average if the students' final semesters indicate the ability to do graduate work. Moreover, the department recognizes that students who have majored in fields other than English as undergraduates may choose English for their graduate work. Such students are usually admitted with provisional standing and are enrolled in courses for undergraduate credit until any deficiencies are made up.

Since the Graduate School admits students only on the recommendation of a department, students desiring admission to the master's program in English should address all letters and have all records sent to:

Director of Graduate Studies
Department of English
107 Denison Hall
Kansas State University
Manhattan, KS 66506

Applications need to include the following:

1. Two completed copies of the standard application form.
2. Two copies of the official transcript from each college or university the applicant has attended. Only official copies are accepted by the Graduate School. (If the transcripts do not show an undergraduate major comparable with that of KSU with a minimum of 24 credit hours in English above the freshman level, the applicant may be admitted with provisional standing and enrolled in courses for undergraduate credit until the deficiency has been removed.)
3. Three letters of recommendation from persons qualified to speak informatively of the applicant's academic performance and his or her potential for advanced study in English.
4. A statement of objectives (a succinct account of aims and interests).
5. A copy of the applicant's GRE scores (aptitude section only).
6. a. A writing sample of 10–15 pages of expository, argumentative, or persuasive prose from applicants who do not have an English Major or whose GPA in English falls below 3.0.
   b. A writing sample of either 10–30 pages of fiction or 6–10 poems from applicants who expect to enter the creative writing track.
7. For international students, official reports of their TOEFL scores (for students overseas) or GRE scores, aptitude and advanced-literature sections (for those already studying in the United States).

## Financial Assistance

Most M.A. students qualify to be graduate teaching assistants and are provided valuable teaching experience as well as financial support. GTAs receive a nine-month stipend and a full tuition waiver (not including insurance). The Department of English also offers a small number of scholarships; awarded on a competitive basis, these may be held in addition to an assistantship. Students in the creative writing track may apply for William H. Hickock Fellowships; students in all four tracks may apply for Popkins Scholarships.

## English courses

**ENGL 600–799. Undergraduate or graduate credit**

**ENGL 604. Expository Writing Workshop.** (3) I, II, S. Course emphasizes stylistic analysis of modern non-fiction prose in the sciences, social sciences, and humanities. Extensive writing required. Pr.: Junior standing.

**Readings courses**

ENGL 605–660: The following Readings courses are designed primarily for advanced undergraduates although graduate students may also enroll in them. These courses constitute a sequence of period studies covering the chronological range of English and American literature. Within these historical periods, the specific course contents will vary by semester and instructor. They may emphasize literary figures and movements, historical and cultural contexts, or different genres and forms within the periods. Each semester's offerings will be specifically described before each enrollment period in university and department publications. The courses require Junior standing and are repeatable with change of subject matter.

**ENGL 605. Readings in Medieval Literature.** (3) I, II, S.

**ENGL 610. Readings in Renaissance Literature.** (3) I, II, S.

**ENGL 620. Readings in Seventeenth Century British Literature.** (3) I, II, S.

**ENGL 625. Readings in Eighteenth Century British Literature.** (3) I, II, S.

**ENGL 630. Readings in Nineteenth Century British Literature.** (3) I, II, S.

**ENGL 635. Readings in Twentieth Century British Literature.** (3) I, II, S.

**ENGL 640. Readings in Early American Literature.** (3) I, II, S.

**ENGL 645. Readings in Nineteenth Century American Literature.** (3) I, II, S.

**ENGL 650. Readings in Twentieth Century American Literature.** (3) I, II, S.

**ENGL 655. Readings in American Ethnic-Minorities Literature.** (3) I, II, S.

**ENGL 660. Readings in Major Authors.** (3) I, II, S.

**ENGL 661. Advanced Creative Writing: Fiction.** (3) I, II, S. Advanced writing of fiction. Repeatable once. Pr.: ENGL 500 or Instructor permission.

**ENGL 663. Advanced Creative Writing: Poetry.** (3) I, II, S. Advanced writing of poetry. Repeatable once. Pr.: ENGL 500 or Instructor permission.

**Topics courses**

ENGL 670–695: The following Topics courses are designed primarily for advanced undergraduates although graduate students may enroll in them. These courses address topics not confined to a single period in a national literature. Specific course content will vary by semester and instructor. It may emphasize cross-national subjects, literary criticism, the development of a theme or genre over time, new perspectives from social, intellectual, or cultural studies, or non-traditional texts and topics. Each semester's offerings will be described more specifically in university and department publications before each enrollment period. The courses require Junior standing and are repeatable with change of subject matter.

**ENGL 670. Topics in British Literature.** (3) I, II, S.

**ENGL 680. Topics in American Literature.** (3) I, II, S.

**ENGL 690. Topics in Literature for the Young.** (3) I, II, S.

**ENGL 695. Topics in Literature.** (3) I, II, S.

**ENGL 700. Old English.** (3) I, II, S. The elements of Old English grammar, with readings in prose and poetry. Pr.: Instructor permission.

**ENGL 705.** Theory and Practice of Cultural Studies. (3) I, II, S. An overview of selected approaches to the study of culture and of their current application in English studies, including psychoanalytic, feminist, Marxist, and structuralist approaches. Pr.: Junior standing.

**Studies courses**
ENGL 710–759: The following Studies courses are designed primarily for Graduate students, although advanced undergraduate students may also enroll in them. Their specific contents will vary by semester and instructor, but the courses will reflect concerns with literary and rhetorical forms and genres; with specific authors, periods, or literary movements; with perspectives from social, intellectual, and cultural studies; or with literary themes. Each semester's offerings will be described more specifically in university and department publications before each enrollment period. The courses require Junior standing and are repeatable with change of subject matter.

**ENGL 710. Studies in a Literary Genre.** (3) I, II, S.

**ENGL 720. Studies in a Major Author.** (3) I, II, S.

**ENGL 730. Studies in a Literary Period.** (3) I, II, S.

**ENGL 740. Studies in a Literary Theory.** (3) I, II, S.

**ENGL 755. Studies in Composition and Rhetoric.** (3) I, II, S.

**ENGL 759. Studies in Technical Communications.** (3) I, II, S.

**ENGL 761. Creative Writing Workshop: Short Fiction.** (3) I, II, S. Advanced writing of short prose fiction. Repeatable twice for credit. Pr.: ENGL 661 or Instructor permission.

**ENGL 762. Advanced Playwriting.** (3) I, II, S. Same as THTRE 762.

**ENGL 763. Creative Writing Workshop: Poetry.** (3) I, II, S. Advanced writing of poetry. Repeatable twice. Pr.: ENGL 663 or Instructor permission.

**ENGL 771. Creative Writing Workshop: Novel/Novella.** (3) I, II, S. Repeatable twice. Pr.: ENGL 661 or Instructor permission.

**ENGL 790. History of the English Language.** (3) I, II, S. The development of British and American English from Indo-European origins to the present. Pr.: Graduate standing or Instructor permission.

**ENGL 795. Literary Criticism.** (3) I, II, S. Major trends in modern American and British criticism and theory, with practice in the analysis of individual literary works. Pr.: Senior standing.

**ENGL 796. Theories of Grammar.** (3) I, II, S. Comparative examination of the assumptions, aims, and procedures of four types of English grammar—the normative grammar of Robert Lowth, the historical grammar of Otto Jespersen, the structural grammar of Leonard Bloomfield, and the generative-transformational grammar of Noam Chomsky—and their application. Pr.: Junior standing and ENGL 430 or ENGL 600.

**ENGL 799. Problems in English.** (Var.) I, II, S. Independent study in major authors, genres, and periods of English and American literature and language. Pr.: Background of courses needed for problem undertaken.

## Graduate credit

**ENGL 802. Graduate Studies in English.** (1) I, II, S. A survey of the principles of research and scholarship, the range of literary studies, basic bibliographies and other aids, and the techniques of writing documented papers. Required in the first year of study toward the M.A. in English as an orientation to the profession.

**ENGL 820. Seminar in Language.** (3) I, II, S. Intensive research concerned with one or more topics in the structure and history of the English language. Pr.: ENGL 600 or 790 or Instructor permission.

**ENGL 825. Seminar in Literature.** (3) I, II, S. Intensive research concerned with one or more literary genres, periods, authors, or issues/problems. Pr.: Graduate standing.

**ENGL 830. Seminar in Cultural Studies.** (3) I, II, S. Intensive research concerned with one or more tropics central to the theory and practice of Cultural Studies. Pr.: Graduate standing.

**ENGL 840. Seminar in Composition and Rhetoric.** (3) I, II, S. Intensive research on materials germane to the history, structure, and processes central to the concerns of Composition and Rhetoric. Pr.: Graduate standing.

**ENGL 898. Master's Report.** (2) I, II, S.

**ENGL 899. Research in English.** (Var.) I, II, S. Pr.: Permission, Director of Graduate Studies.

**ENGL 999. Research in English.** (Var.) I, II, S. Pr.: Sufficient training to carry on the research undertaken for dissertation. Consent of Director, Graduate Program.

## Courses in linguistics

### Undergraduate and graduate credit

**ENGL 600. Principles of Linguistics.** (3) I, II. The scientific study of language, with examples from English, Spanish, French, German, and others. Overview of language origins, phonetics, phonology, syntax, semantics, language acquisition, dialects, language change, and writing systems. Same as LING 600 and LG 600.

**ENGL 601. General Phonetics.** (3) I or II, in alternate years. Description and classification of speech sounds according to point and manner of articulation. Transcription in the International Phonetic Association Alphabet. Includes sounds of English, French, Spanish, German, and others. Same as LING 601 and LG 601.

**ENGL 602. Historical Linguistics.** (3) I or II, in alternate years. Internal and comparative reconstruction of earlier forms of languages. Genetic relationships in language families, and various typological considerations. Includes French, Spanish, and others. Same as LING 602 and LG 602.

**ENGL 603. Topics in Linguistics.** (3) I or II, in alternate years. Seminar on a special topic in linguistics. Topic to be announced for semester in which offered. Repeatable for credit on a different topic. Same as LING 603 and LG 603.

**ENGL 791. Methods and Techniques of Learning a Second Language.** (3)

# Geography

**Professor and head**
M. Duane Nellis, Ph.D. 1980, Oregon State University (Land use systems; natural resources; remote sensing; geographic information systems).

**Professors**
David E. Kromm, Ph.D. 1967, Michigan State University. Water resources; environmental assessment; Eastern Europe; Canada.

David R. Seaman, (Architecture and Geography), Ph.D. 1977, Clark University. Sense of place studies; urban-social geography.

William R. Siddall, Ph.D. 1959, University of Washington. Transportation geography, historical geography, Anglo-America.

Stephen E. White, Ph.D. 1974, University of Kentucky. Population and migration; environmental perception; quantitative analysis.

**Associate professors**
Charles E. Bussing, Ph.D. 1968, University of Nebraska. Cultural ecology; agricultural geography; Latin America.

David Darling, (Agricultural Economics and Geography) 1983, Ohio State University. Economic development, rural systems.

H. L. Seyler, Ph.D. 1971, University of Indiana. Economic-urban analysis; regional development; computer cartography; geographic information systems.

Ben A. Smith (Education and Geography) Ph.D. 1986, University of Georgia. Geographic education; historical geography.

**Assistant professors**
Karen J. DeBres, Ph.D. 1986, Columbia University. Urban geography; geography of tourism; Europe.

Charles W. Martin, Ph.D. 1990, University of Kansas. Geomorphology; human impact on environment; Great Plains.

Bimal K. Paul, Ph.D. 1988, Kent State University. Cultural geography; medical geography; cartography; quantitative techniques.

**Professor emeritus**
Huber Self, M.S. 1947, Oklahoma State University. Physical geography, Kansas.

Stephen L. Stover, 1960, University of Wisconsin, Agricultural geography, Oceania, historical geography.

**Adjunct faculty**
Kamlesh Lulla, 1983, Indiana State University. Senior Research Scientist–Space Shuttle Earth Observations Program. Physical geography, environmental geography, and remote sensing.

## Overview

The master of arts degree in geography at Kansas State University has been recognized as one of outstanding quality in reviews by the Kansas Regents, the college, and the Graduate School. Former geography graduate students excel in Ph.D. programs and assume important positions in the public and private sectors. Recent graduate students in our program have received prestigious Fulbright, Pearson, and NASA fellowships.

Advanced work consisting of classes and seminars is offered as part of a master of arts curriculum. Close supervision of the thesis research and frequent visits by geographers from other universities help provide a thorough and well-balanced program. The moderate size of the geography department makes possible an informal atmosphere and a close rapport between faculty and graduate students.

Kansas State University geography faculty research strengths in natural resources, human-environmental interaction, rural development, and emerging technologies/spatial analysis techniques (e.g., geographic information systems, remote sensing, and micro-cad cartography) creating an exciting environment for graduate work. Current sources of geography extramural support include the Ford Foundation; National Aeronautics and Space Administration, National Science Foundation, U.S. Agency for International Development, Kansas Water Office, National Geographic Society, and U.S. Soil Conservation Service.

Other parts of the university offer further opportunities for enrichment of the geography graduate student's program. Advanced study is possible in such areas as regional economic analysis, regional and community planning, natural resources management, ecology, and demography.

## Facilities

The geography department is centrally located on campus and housed on the second and third floors of Dickens Hall. Graduate students have access to numerous micro-computers throughout Dickens Hall. Other resources in the department which enhance graduate work

include: a geographic information systems/spatial analysis laboratory with remote sensing, digital image processing systems, microcomputers, computer mapping and geographic information system software, remote sensing imagery and photogrammetric instrumentation; a global positioning system; an optical map-enlarging/reducing machine; a large collection of topographic and wall maps; and, a small reference library. The university library, only a one-minute walk from Dickens Hall, contains a large number of geographical journals. Also nearby are the Kansas Population Lab, the Kansas Water Resources Research Institute, Konza Prairie Research Preserve, and University computing center. The department also houses the Institute for Social and Behavioral Research.

## Program requirements/options

Regular admission to the Graduate School requires a 3.0 grade point average on a 4.0 scale, plus three letters of recommendation. In some cases applicants with less than a 3.0 average may be admitted on a provisional basis. Students entering the geography graduate program must also have course preparation in regional geography, economic geography, physical geography, cartography, and statistics. Regular admission can be granted, however, contingent on the students addressing these core subject areas. For application materials, please contact Geography Graduate Corespondent, Professor David E. Kromm, Dickens Hall, Kansas State University, Manhattan, Kansas 66506–0801.

All geography candidates for the master of arts degree are required to take GEOG 700 Quantitative Analysis in Geography (except Option B students); GEOG 800 Graduate Colloquium I; GEOG 801 Graduate Colloquium II; and GEOG 820 History and Philosophy of Geography.

Students may choose, in consultation with their advisors, one of the three programs leading to the M.A. degree.

### Option A

This option requires 30 hours of graduate credit including 6 hours of credit for a thesis. Of the 24 hours of credit required in course work, at least 15 hours must be in geography.

### Option B

Option B is for students who intend to pursue or continue careers in public school or junior college teaching. It is open only to persons who are already certified to teach at the public-school or junior-college level in any state, or to those who will make courses required for such certification an integral part of their program. Thirty hours of graduate course work are required, including two credits of GEOG 898 Master's Report, which shall consist of the design of a teaching syllabus in some subfield of geography. At least 18 credit hours must be in geography. This option is not suitable for any student who may ultimately continue for the doctorate.

### Option C

This option is a nonthesis program designed for students who have a specific professional goal in mind other than teaching at any level, and who do not intend to continue for a Ph.D. The student may choose from several approved course groupings. Thirty hours of graduate-level work are required, of which 12 hours may be outside the geography department.

## Financial support

Several graduate teaching assistantships and some graduate research assistantships are available on a competitive basis. Full-time graduate teaching assistants receive a 100 percent waiver of graduate fees and a remuneration of more than $6,800 for a nine-month appointment.

Graduate research assistants, supported from geography faculty research programs, include a remuneration varying from $6,300 to $7,650 for a nine-month appointment, and also include an out-of-state fee waiver with some reduction of in-state fees. A limited number of Graduate School fellowships can also enhance graduate stipends. Graduate assistantships are continued for a second year assuming adequate scholastic and teaching/research performance.

## Career opportunities

Career opportunities in geography are diverse, and employment prospects after receipt of the master's degree are excellent. Employment opportunities vary from positions in business and government to jobs in planning and education.

Career opportunities for geographers with expertise in environmental studies have never been better. Federal agencies, such as the Environmental Protection Agency, Defense Mapping Agency, and Bureau of Land Management employ numerous geographers each year.

The geographer's training in location analysis, social, and environmental problems, and a variety of techniques, including remote sensing, geographic information systems, and computer cartography, make the geographer particularly valuable in the private sector. Business career opportunities in this sector are numerous. Demographer, market researcher, area analysts, travel agent, and location analyst are just a few of the varied job titles held by geographers in business.

## Geography courses

**GEOG 500. Geography of the United States.** (3) II. In odd years. A regional analysis of the United States with special attention to the historical, political, economic, and social factors which contribute to areal differentiation within the area.

**GEOG 505. Introduction to the Civilization of South Asia I.** (3) I. Interdisciplinary survey on the development of civilization in India, Pakistan, Sri Lanka, Bangladesh, and Afghanistan, including consideration of the geographical and demographic context, philosophical and social concepts, social and political institutions, literature and historical movements. Same as ECON 505. HIST 505. POLSC 505. SOCIO 505. ANTH 505.

**GEOG 506. Introduction to the Civilization of South Asia II.** (3) II. Interdisciplinary survey of recent and contemporary civilization of India, Pakistan, Sri Lanka, Bangladesh, and Afghanistan, including recent history, current economy, religion culture, language and literature, geography, social and political structure and ideas. Same as ECON 506. HIST 506. POLSC 506. SOCIO 506. ANTH 506.

**GEOG 620. Geography of Latin America.** (3) II, in even years. 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.

**GEOG 640. Geography of Europe.** (3) I. People and their environment, their cultures, problems, and prospects in Europe west of the Soviet Union; trends of development as affected by changing political and economic factors.

**GEOG 650. Geography of Former Soviet Lands.** (3) II. In odd years. Physical limitations, resource potentials, economic capabilities, and political and nationality issues, with particular emphasis on agriculture, manufacturing, urbanization, cultural diversity, and regional development. Pr.: Six hours of social science.

**GEOG 680. Seminar in Regional Geography.** (1–3) Pr.: Consent of instructor.

**GEOG 700. 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 techniques employed in spatial analysis. Pr.: One course in statistics.

**GEOG 702. Computer Mapping.** (3) I. Familiarizes students with computer applications to mapping problems. Students will produce a series of maps on the printer and plotter using prepared programs and, in the process, develop computer graphics skills to address problems in areal analysis, planning, and public administration. Pr.: One course in social science and one in natural science and junior standing.

**GEOG 705. Remote Sensing of the Environment.** (3) II. Remote sensing and its application to earth study, especially environmental problems and land use. Course employs both readings and the use of imagery. Two hours lec., two hours lab. Pr.: One course in physical science and one in biological science.

**GEOG 708. Geographic Information Systems.** (3) II. Examines both theoretical and applied dimensions of geographic information systems (GIS) in the contexts of environmental impact analysis, natural resource inventories, and community development studies. Applications of GIS concepts and procedures will be built around the use of PC ARC-Info, where case studies will be completed by teams of students. Pr.: GEOG 703 or GEOG 705.

**GEOG 709. Geography Field Research Techniques.** (Var.) Explore methods and techniques employed in modern geographic field research. Research design, techniques for acquisition of data in the field, and analysis of data will be stressed.

**GEOG 710. Geography of Hunger.** (3) I, in odd years. The problem of an adequate food supply for a rapidly growing world population; food deficit and surplus areas, possibilities of increased production, problems of distribution, and the future outlook. Pr.: Six hours of social science and Junior standing.

**GEOG 715. World Population Patterns.** (3) I, in even years. Geographical processes that govern population distributions, growth rates, and migrations. Emphasis on international comparisons and implications for world society of continued differential growth rates Pr.: Six hours of social science.

**GEOG 720. Geography of Land Use.** (3) I, in odd years. Critical factors affecting land use, scarcity, and management examined in a regional, national, and global context; land use classification system and variation of land use patterns. Pr.: Six hours of social science and Junior standing.

**GEOG 725. Geography of Water Resources.** (3) II, in even years. Interpretation and analysis of the physical geography of water and water as a resource. Evaluation of water, emphasizing quality, hazards, institutions, and selected domestic and global issues. Pr.: 6 hours of social science and Junior standing.

**GEOG 730. World Agricultural Systems.** (3) II, in odd years. Description and analysis of the spatial distribution of farm systems emphasizing traditional resource systems in the third world. The major objective is to analyze the interrelationships between natural and human elements in farm systems in order to gain an awareness and understanding of the complex issues involved in agricultural change and development. Pr.: Six hours of social science and Junior standing.

**GEOG 740. Geography of Transportation.** (3) II, in even 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.: Junior standing and consent of instructor: six hours of social science.

**GEOG 750. Urban Geography.** (3) II. 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 social science or planning.

**GEOG 760. Human Impact on the Environment.** (3) In even years. The social, economic, and political implications of the impact of human activity on the natural environment. Field research in environmental impact assessment. Pr.: Six hours of social science.

**GEOG 770. Perceptions of the Environment.** (3) II, in odd years. An examination of the way people perceive their geographic environment and the role of perception in spatial behavior. Perceptions of neighborhoods, cities, states, nations, frontier regions, and environmental processes are explored. Pr.: Six hours of social science with one course above the introductory level, and 6 hours of natural science with one course above the introductory level.

**GEOG 780. Cultural Geography.** (3) II, in even years. A study of the forms of human occupancy of landscapes, with consideration of innovations in the use of landscape, the origins and the dispersals of these innovations, and human attitudes toward the natural environment. Pr.: Six hours of social science.

**GEOG 790. Seminar in Cultural-Economic Geography.** (1–3)Pr.: Consent of instructor.

**GEOG 800. Graduate Colloquium I.** (1) I. An introduction to graduate level study in geography and to several sub-fields of the discipline. Required of all graduate students majoring in geography.

**GEOG 801. Graduate Colloquium II.** (1) The nature of geographic research and the processes involved in its structuring, development, and articulation. Each student will produce and present a formal Master's thesis proposal. Required of all graduate students majoring in geography.

**GEOG 820. History and Philosophy of Geography.** (2) I. 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.

**GEOG 850. Topics in Environmental Geography.** (1–3) I, II, S. Pr.: Consent of instructor.

**GEOG 860. Topics in Economic Geography.** (1–3) I, II, S. Pr.: Consent of instructor.

**GEOG 870. Topics in Cultural Geography.** (1–3) I, II, S. Pr.: Consent of instructor.

**GEOG 898. Master's Report.** (2) I, II, S. For students enrolled in geography option B. Pr.: Registration in Graduate School, with sufficient training to carry on the line of research undertaken. Consent of instructor.

**GEOG 899. Master's Thesis.** (6) I, II, S. For student enrolled in geography option A. Pr.: Registration in the Graduate School, with sufficient training to carry on the line of research undertaken. Consent of instructor.

# Geology

**Head**

**Joseph L. Graf,** Ph.D., Yale University (Economic geology and mineral exploration; Origin of massive sulfide deposits, iron formations, and carbonate-hosted ore deposits; Rare-earth elements in ore-forming systems).

**Professors**

**Sambhudas Chaudhuri,** Ph.D., Ohio State University (Isotopic and trace-element geochemistry. Strontium isotopic studies of subsurface brines and sulfide deposits. Rb-Sr geochronology of sedimentary, metamorphic, and igneous rocks).

**George R. Clark II,** Ph.D., California Institute of Technology (Molluscan paleoecology and marine ecology. Growth lines as environmental indicators. Trace-element uptake by marine invertebrates. Historical earthquakes, volcanic eruptions, and other natural disasters).

**Robert L. Cullers,** Ph.D., University of Wisconsin (Major and trace element geochemistry. Precambrian crustal evolution of the mid-continent. Petrogenesis of granitic and alkaline rock complexes. Groundwater geochemistry).

**Page C. Twiss,** Ph.D., University of Texas (Austin) (Sedimentology of Permian rocks of the Kansas midcontinent. Classification and distribution of grass opal phytoliths. Carbonate petrography of mid-continent. Clay mineralogy).

**James R. Underwood, Jr.,** Ph.D., University of Texas (Austin) (Geology of planets. Structural geology and geotectonics. Petroleum geology. Regional geology of North Africa and the Middle East).

**Ronald R. West,** Ph.D., University of Oklahoma (Paleoecology and paleozoology of Permian and Carboniferous organisms. Carbonate geology. Taphonomy and organism-sediment relationships. Recent marine invertebrate ecology).

**Associate professors**

**Lois M. Jones,** Ph.D., Ohio State University (Isotopic geochemistry, especially isotopes as natural tracers. Geochronology. Low-temperature geochemistry. Geochemistry of lakes. Geochemical processes in polar regions).

**Charles G. Oviatt,** Ph.D., University of Utah (Quaternary stratigraphy and paleoenvironments. Lake Bonneville and other Quaternary lakes of the Great Basin. Fluvial processes and alluvial stratigraphy. Hydrogeology).

**Assistant professor**

**Allen W. Archer,** Ph.D., Indiana University. (Sedimentology; quantitative stratigraphy. Modeling of cyclic sequences. Coal sedimentology of Carboniferous and Permian sequences. Computer-based applications to soft-rock geology).

## Program description

The Department of Geology offers a graduate program leading to the M.S. degree in geology. The department also cooperates in the Ph.D. program in geology at the University of Kansas. Candidates for the Ph.D. degree who wish to study with a faculty member from Kansas State University are admitted to the degree program at the University of Kansas and spend one year of residence there. The remaining course and research activity is carried out at Kansas State University.

Graduate degrees are essential for those who want careers as professional geologists in business, government, or higher education. The M.S. program in geology at Kansas State University is designed to provide the student with the understanding and ability to apply geological, chemical, physical, biological, and mathematical principles to the solutions of problems related to environmental management, mitigation of natural disasters, and use and management of natural resources. It is also geared to prepare students for further graduate study or professional employment. Students in the program take at least 30 hours of course and research work and complete a master's thesis.

The department has nine full-time and one half-time graduate faculty members and approximately 10 graduate students. Research emphases include stratigraphy, sedimentary geology, and paleobiology of the mid-continent; subsurface waters and water-rock interactions in aquifers, oil-fields, and ore systems; water quality and contamination assessments; surficial geology and geologic mapping in Kansas and Utah; planetary geology; geochemical studies of igneous and sedimentary rocks; computer applications in geology; and earth-science education.

The Department of Geology has active collaborations with a number of organizations, most notable among them are the K-State's Center for Science Education and Agricultural Experiment Station, the Kansas Geological Survey, the Department of Geology at the University of Kansas, and the U.S. Geological Survey.

The Department of Geology occupies all of Thompson Hall and has the following research equipment and facilities thermal ionization mass spectrometer and bake-out unit; laser microprobe for sample preparation in stable isotope analysis; isotopic geochemistry laboratories; student and faculty computing laboratories; X-ray laboratories; atomic absorption laboratory; complete rock and mineral preparation facilities; cathode-luminescence microscope; and gas-flow heating and cooling stage for fluid inclusion studies. Electron microscopes, scanning electron microscope, X-ray facilities, an ion-coupled plasma emission analysis unit, and a 100-kv nuclear reactor, 4096 multichannel analyzers, and Li-drifted Germanium detectors are in the Departments of Entomology, Physics, Chemistry, and Nuclear Engineering. 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, midcontinent-type structure, invertebrate paleobiology, and paleoecology.

Almost all full-time graduate students in residence are supported for two academic years. Awards include graduate teaching and research assistantships and scholarships. The department also has two endowed, student travel funds. Tuition is waived for graduate teaching assistants.

Application forms for admission and graduate assistantships can be obtained from the Graduate Advisor, Department of Geology, Thompson Hall, Kansas State University, Manhattan, Kansas 66506–3201

Applications to the M.S. program should be accompanied by: (1) college transcript(s), (2) three letters of recommendation, (3) GRE scores (including advanced geology examination), and (4) a statement of career goals and interests. To ensure consideration, applications for financial assistance should be received by March 1.

### Master of science degree

Research leading to the M.S. thesis is the most important part of graduate study in geology at Kansas State University. Students usually select a faculty advisor and develop research and course plans during their first term and begin the research project during their second term. The minimum requirements for the M.S. degree in geology are 30 semester hours of graduate courses under one of the following options:

#### Option A

Thesis option. This option, required of all students entering the graduate program as teaching or research assistants, requires the satisfactory completion of a master's thesis. Six credit hours of GEOL 899 Master's Thesis Research may be included in the 30-hour requirement.

#### Option B

Report option. This option is available to those students who have limited time for completion of a degree and are not contributing to the department's teaching or research efforts. Students choosing this option might include foreign students fully supported by their governments, or military personnel supported by the U.S. government, planning intense courses of study to complete the M.S. degree in the shortest possible time. Other students might include professional educators at the public school or community college level, or professional geologists with full-time employment, planning part-time studies to complete the M.S. degree over a period of years.

Under the report option, students will not complete a thesis but will be required to satisfactorily complete a substantive report, representing a scholarly effort in the research or practice of geology. Two credit hours of GEOL 898 Master's Report Research may be included in the 30-hour requirement.

### Doctor of philosophy

The Department of Geology at cooperates in the Ph.D. program in geology at the University of Kansas. Candidates for the Ph.D. degree who wish to study with a faculty member from Kansas State University are admitted to the degree program at the University of Kansas and spend one year of residence there. The remaining course and research activity is carried out at Kansas State University. Interested students should contact both departments and obtain application materials from: Director of Graduate Studies, Department of Geology, University of Kansas, Lawrence, Kansas 66045–2124.

## Geology courses

### Undergraduate and graduate credit in minor field

**GEOL 501. Independent Study in Geology.** (1–3) I, II, S. Independent reading; field or laboratory investigations, or both, of geologic problems. Pr.: GEOL 300 and junior standing.

**GEOL 502. Mineralogy.** (3) I. Crystallography; physical and chemical properties of minerals; descriptive mineralogy. Two hours lec. and three hours lab a week. Pr.: GEOL 100 or 105, 130, and CHM 230.

**GEOL 503. Petrology.** (3) II. Petrology of igneous, metamorphic, and sedimentary rocks. Two hours lec. and three hours lab a week. Pr.: GEOL 502.

**GEOL 506. Environmental Studies.** (2) I, II, S. Physical and chemical qualities of natural environments and health from a geologic perspective—detection and prediction of environmental changes, identification of sources of pollutants and their movements in soils, rocks, and waters. Pr.: GEOL 100.

**GEOL 510. Geology of Planets.** (3) I. Origin, evolution, and surficial geology of the extraterrestrial planets and satellites. Three hours rec. a week. Pr.: GEOL 100.

**GEOL 512. Earth Science.** (3) I, II. 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. a week. Pr.: GEOL 100 or GEOG 220 or junior standing.

**GEOL 515. Geology of the National Parks.** (3) On sufficient demand. Stratigraphy, structure, and geological history that produced the scenery of the national parks. Selected national monuments also will be studied. Pr.: GEOL 100 or 105.

**GEOL 520. Geomorphology.** (2) I, II. Laboratory exercises in reading and interpreting topographic maps and aerial photographs; field studies of landforms and surficial deposits, with an emphasis on earth-surface processes. One hour rec. and three hours lab a week. Pr.: GEOL 100.

**GEOL 530. Structural Geology.** (3) II. Mechanics of the earth's crust; origin and interrelation of structures of the earth. Two hours rec. and three hours lab a week. Pr.: GEOL 503.

**GEOL 540. Recent Earth History.** (3) I. Studies of the recent geologic past, especially of the last major ice age to the present. Causes of glaciation and climactic change, ways of reconstructing past geologic environmental and geologic environmental changes during the time when human civilization developed, including recent historic time. Three hours rec. a week. Pr.: GEOL 100 or GEOG 221.

**GEOL 581. Paleobiology.** (4) I. Biological principles applied to fossils; introduction to contributions of pro- and eukaryotic organisms, especially algae and marine invertebrates to earth history. Two hours rec. and six hours lab a week. Pr.: GEOL 300 and 503; MATH 220; PHYS 114.

**GEOL 599. Senior Thesis.** (1–3) I, II. Directed research and preparation of a senior thesis. May be repeated once to a maximum of 3 hours credit. Open only to seniors in geology or geophysics.

### Undergraduate and graduate credit

**GEOL 601. Geologic Presentation.** (1) I, II. Application of oral communication techniques to the effective presentation of geologic concepts. One hour rec. a week. Pr.: GEOL 530 and SPCH 105.

**GEOL 602. Mineral Exploration.** (3) I, II. Geological, geochemical, and geophysical prospecting techniques and their application in the exploration for metallic mineral deposits. Three hours rec. a week. Pr.: GEOL 503.

**GEOL 605. Exploration Geophysics.** (3) I. Seismic, gravity, magnetic, and electrical methods used in geophysical exploration for petroleum accumulations and for mineral deposits. Three hours rec. a week. Pr.: PHYS 214; GEOL 530.

**GEOL 608. Optical Mineralogy–Petrography.** (3) I. Identification of minerals and rocks as crushed fragments and in thin section. Two hours lec. and one four-hour lab a week. Pr.: GEOL 503 and PHYS 214 or 114.

**GEOL 610. Sedimentary Geochemistry.** (3) I, II. Geochemical principles and processes in deposition and diagenesis of sediments; different chemical pathways in the exogenic cycle. Two hours rec. and three hours lab a week. Pr.: GEOL 503 and MATH 220.

**GEOL 630. Stratigraphy–Sedimentation.** (4) II. Description, classification, correlation, chronology, and paleogeography of sedimentary rock systems and the depositional environments in which they formed. Three hours rec. and three hours lab a week. Pr.: GEOL 581.

**GEOL 680. Field Geology.** (6) S. Geologic mapping projects along the Colorado Front Range using Brunton compass, aerial photographs, topographic maps, and plane table; special problems in stratigraphy, structure, and petrology. Five six-day weeks in the field. Pr.: GEOL 503, 520, and 530.

**GEOL 702. Economic Geology.** (3) I. Geology and origin of metallic mineral deposits and of some nonmetallic deposits. Three hours rec. a week. Pr.: GEOL 503.

**GEOL 703. Economic Geology Laboratory.** (1) I. Laboratory activities related to metallic and nonmetallic mineral deposits, including detailed studies of selected deposits. Pr.: GEOL 702 or conc. enrollment.

**GEOL 704. Paleoecology.** (3) I. 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 581.

**GEOL 705. Geobiology.** (3) II. Discussion and critique of current and classic research in geobiology. Three hours rec. a week. Pr.: GEOL 581.

**GEOL 711. Water Resources Geochemistry.** (2) II. Geochemistry of ground and surface waters; emphasis on mineralogic and hydrologic controls on inorganic constituents and properties. Two hours rec. a week. Pr.: GEOL 503 or AGRON 705 or 755.

**GEOL 712. Advanced Geochemistry.** (3) II. Application of chemical principles to igneous, metamorphic systems; emphasis on equilibria, oxidation-reduction, crystal chemistry, and thermodynamics. Three hours lec. a week. Pr.: GEOL 503 and CH 500 or 585.

**GEOL 716. Hydrogeology.** (3) I, II. Origin, geologic occurrence, and migration of subsurface water; laws governing ground water flow and yield of aquifers. Three hours rec. a week. Pr.: GEOL 520, 530, or 630, or consent of instructor.

**GEOL 720. Quaternary Geology.** (3) II. Quaternary stratigraphy as the framework for studying the geomorphic, climactic, archaeological, and biological changes of the last two million years, with emphasis on the North American record. Three hours rec. a week and one field trip a semester. Pr.: GEOL 630.

**GEOL 730. Petroleum Geology.** (3) I, II. Origin, migration, and accumulation of petroleum; stratigraphy and structure of important fields. Three hours rec. a week. Pr.: GEOL 530 and 630.

**GEOL 740. Regional Geology.** (3) I. Structure and stratigraphy of the major tectonic units of North America. Pr.: GEOL 530, 630.

**GEOL 770. Subsurface Methods.** (3) II. Principles and applications of subsurface geology. Two hours rec. and three hours lab a week. Pr.: GEOL 530 or conc. enrollment.

**GEOL 790. Problems in Geology.** (Var.) I, II, S. Work is offered in mineralogy, paleobiology, paleoecology, stratigraphy, structural geology, igneous, metamorphic, and sedimentary petrology, geomorphology, planetary geology, hydrogeology, geochemistry, and isotope geology. Pr.: Background of courses needed for problem undertaken.

### Graduate credit

**GEOL 800. Graduate Seminar in Geology.** (Var.) I, II. Topics in geology, geochemistry, and geophysics.

**GEOL 801. Advanced Paleobiology.** (2) On sufficient demand. Detailed study of the functional morphology, ecology, biogeography, evolution, and classification of selected groups. Pr.: GEOL 704 or 705.

**GEOL 804. Igneous and Metamorphic Petrology.** (4) On sufficient demand. Selected problems in the petrogenesis of igneous and metamorphic rocks. Three hours lec. and three hours lab a week. Pr.: GEOL 608.

**GEOL 805. Advanced Igneous and Metamorphic Petrology.** (2) On sufficient demand. Field and laboratory study of selected problems in the origin of igneous and metamorphic rocks. Pr.: GEOL 804.

**GEOL 806. Sedimentary Petrology.** (4) II. Petrography, classification, and origin of terrigenous and chemical sedimentary rocks. Three hours lec. and three hours lab a week. Pr.: GEOL 608.

**GEOL 807. Advanced Sedimentary Petrology.** (2) I, II. Field and laboratory study of selected problems in the origin of sedimentary rocks. Pr.: GEOL 806.

**GEOL 810. Isotope Geology.** (3) I. Principles, techniques, and applications of natural radioactive isotopes to geochronology; application of isotopes to problems of petrogenesis. Three hours rec. a week. Pr.: GEOL 608 or consent of instructor.

**GEOL 830. Geotectonics.** (3) I. Origin and history of major tectonic elements of the earth, especially their interaction through time. Pr.: GEOL 530.

**GEOL 840. Planetology.** (3) II. Geologic principles applied to a study of the solar system. Pr.: GEOL 530, 712, or consent of instructor.

**GEOL 880. 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.: GEOL 503 or 711 or AGRON 515.

**GEOL 898. Master's Report Research.** (1–2) I, II, S. Research or practice of geology summarized in a scholarly report. Pr.: Enrollment in geology option B and permission of instructor.

**GEOL 899. Master's Thesis Research.** (1–6) I, II, S. Research in geology culminating in a master's thesis. Pr.: Enrollment in geology option B and permission of instructor.

**GEOL 999. Research in Geology, Ph.D.** (Var.) I, II, S.

# History

**Head**
**Professor Donald J. Mrozek,** Ph.D., Rutgers University, 1972 (American cultural, sport, military).

**Professors**
**Marsha L. Frey,** Ph.D., Ohio State University, 1971 (European diplomatic).

**Marion W. Gray,** Ph.D., University of Wisconsin–Madison, 1971 (modern Germany, European women).

**Albert N. Hamscher,** Ph.D., Emory University, 1973 (early modern France, absolutism).

**Robin Higham,** Ph.D., Harvard University, 1957, editor, Journal of the West (military, aviation, technology).

**Jack M. Holl,** Ph.D., Cornell University, 1969 (recent U.S., science and technology, urban and social, American intellectual).

**Kenneth W. Jones,** Ph.D., University of California–Berkeley, 1966 (South Asia, socio-religious movements).

**George M. Kren,** Ph.D., University of Wisconsin–Madison, 1960 (European intellectual, modern Germany, Holocaust, psychohistory).

**Robert D. Linder,** Ph.D., University of Iowa, 1963 (Renaissance, Reformation, Christianity).

**John M. McCulloh,** Ph.D., University of California–Berkeley (medieval).

**Associate professors**
**Robert Kent Donovan,** Ph.D., Harvard University, 1965 (Britain, dance).

**Leroy E. Page,** Ph.D., University of Oklahoma, 1963 (science, technology).

**Assistant professors**
**John C. K. Daly,** Ph.D., London University, 1986 (imperial Russia, Soviet Union, naval).

**Peter B. Knupfer,** Ph.D., University of Wisconsin–Madison, 1988 (ante-bellum U.S., political and social).

**Mark P. Parillo,** Ph.D., Ohio State University, 1987 (US military, American diplomatic, Japan).

**James E. Sherow,** Ph.D., University of Colorado, 1987 (American West, environmental, Kansas, native American).

**Lou Falkner Williams,** Ph.D., University of Florida, 1991 (U.S. legal-constitutional, Reconstruction, South, African–American).

**Sue Zschoche,** Ph.D., University of Kansas, 1984 (U.S., social, women).

## Overview

The Department of History offers well-prepared students an exceptional opportunity to work closely with an unusually productive and well regarded faculty. The department aims to help students find and develop their talents fully and to establish themselves as independent scholars, teachers, and other historical professionals.

The department offers programs of study leading to the master of arts and doctor of philosophy degrees in selected traditional and innovative fields. In addition to various American and European fields and modern South Asia, the department's strengths include areas such as social and cultural history, religious history, history of sport, the American West, and twentieth-century United States history. An area of particular emphasis at Kansas State University is military history.

The department also publishes *Journal of the West.*

The university's Farrell Library has a number of large, specialized collections. In addition, nearby are several excellent research facilities: the Eisenhower Presidential Library in Abilene, with outstanding holdings relating to the Eisenhower administration and recent military history; the Kansas State Historical Archives in Topeka; the Truman Presidential Library in Independence, Missouri, with valuable collections on the Truman administration, the history of the American presidency, and foreign policy; the Linda Hall Library, in Kansas City, Missouri, emphasizing materials pertaining to science and the history of science; and the regional Federal Records Center in Kansas City, currently rich in military and civilian records and eventually to have a microfilm duplication of the main holdings of the National Archives in Washington.

The history department encourages its students to engage in broad professional activities. Many students publish in historical journals, present papers at conferences, and speak to off-campus groups while completing their degrees. The history department also has an active internship program. Graduate students can gain valuable "hands-on" experience in institutions such as the Riley County Historical Museum, the Fort Riley Cavalry Museum, the Kansas State Historical Society, and the Dwight D. Eisenhower Library.

Graduate degrees in history have traditionally led to positions in higher education, and students earning the Ph.D. at Kansas State University have effective preparation for careers as teachers and scholars. But a high percentage of history graduate degree holders also enter archival or museum work, historical publishing, governmental official history programs, historical research for private businesses, and professional service as military officers. The history faculty at regards such nontraditional careers as legitimate first choices for its students and works with the students to define programs that accommodate these varied objectives.

## Degrees

The master of arts requires a minimum of 30 hours beyond the baccalaureate degree, and the program offers three options: 24 hours of course work plus a thesis (6 research hours); 28 hours of course work plus a report (2 research hours); or 30 hours of course work. All candidates for the M.A. must take a course in historiography. Those who write a thesis or report must offer two seminars or topics courses and pass an oral or written final examination that centers on the student's research. Those who take the nonthesis, nonreport degree must offer three seminars or topics courses and pass a written final examination over their coursework.

The doctor of philosophy requires completing 30 hours of course work beyond the master's, satisfying the language requirement, passing the qualifying examination, and writing a sound dissertation based on original historical research that is approved by the student's committee. The qualifying examination includes separate examinations in a geographically and chronologically defined general field (medieval, early modern, or modern Europe; United States; or modern South Asia) and three special fields, one of which must offer a mode of understanding that is significantly different from the dissertation field or be from outside history.

To satisfy the language requirement for the Ph.D., the student must demonstrate either a reading, writing, and speaking knowledge of one foreign language at the "intermediate-mid" level or a reading knowledge of one foreign language at the "advanced-plus" level as these terms are defined by the American Council of Teachers of Foreign Language provisional guide lines. New doctoral students entering the program with a master's degree from another university will demonstrate their progress in the acquisition of language competency by passing or by providing proof of passage of a reading knowledge examination at the "intermediate-mid" level within one year after having begun their Ph.D. work. Students who receive their master's in history from Kansas State University must satisfy this requirement for reading knowledge before they may take courses toward a doctorate.

## Admission

Applicants to graduate programs at Kansas State University must submit an application for admission and provide official copies of transcripts of record from each college or university attended. In addition all applicants to the programs in history must complete a statement of purpose and a supplementary information form and provide three letters of academic reference. Applicants should also submit scores from the Graduate Record Examination general test (the advanced test in history is not required) or the Miller Analogies Test.

International students must provide evidence of financial support as required by the Graduate School, and those whose native language is not English must present a score of 600 or better on the Test of English as Foreign Language for admission.

## Financial support

Outstanding graduate students in history qualify for fellowships granted by the Graduate School, and some students may be appointed to graduate research assistantships funded by the University or by money from external grants.

The Department of History also offers graduate teaching assistantships to qualified students on a competitive basis. Stipends generally range from $6,000 to $7,000 for nine months. For 1991-1992 the stipend for beginning assistants was $6,039. GTAs also receive a full fee waiver. Beginning GTAs work as graders or discussion leaders, and experienced assistants are frequently assigned to independent sections of survey courses. Prospective students wishing to be considered for graduate teaching assistantships must complete their applications for admission by March 1.

Prospective students may apply simultaneously for admission to the graduate program and for a GTA. Anyone wishing to be considered for an assistantship should indicate in the blank provided on the supplementary information form, but no additional application form is required.

Continuing students who do not already hold a GTA must write to the department head or the director of graduate studies as the head's representative to apply for an assistantship, and they must present a letter of recommendation from a member of the faculty, who is normally the student's major professor. These applicants are reviewed on the basis of their entire record, which includes all of the materials supplied for admission plus their grades and other evidence of their performance in our program, including the required letter of recommendation.

Students who hold an assistantship and seek to have it renewed for another year are likewise expected to apply for consideration, providing a letter of recommendation from the major professor and, for those who have assisted a faculty member, a letter from the supervising instructor. GTAs seeking renewal of their appointment must also present a copy of an application for a fellowship or grant, which they have filed with some external funding agency.

All applications are reviewed by the graduate admissions and awards committee. The committee considers first the requests for renewal. Master's students may hold an assistantship for a maximum of two years, doctoral students who have earned a master's degree elsewhere for a maximum of three years, and students who finish an M.A. here and proceed to the Ph.D. program for a maximum total of four years. To merit renewal, the holders of assistantships are expected to demonstrate satisfactory performance of their duties as GTA and satisfactory progress toward their degrees.

## History courses

### Undergraduate and graduate credit in minor field

**HIST 503. Overseas European Studies.** (2–3) Intersession only, in alternate years. Selected aspects of European history and culture with reading, lectures, and discussions which will relate historical events to the places visited. Pr.: Sophomore standing.

**HIST 504. History of Hinduism.** (3) I, in alternate years. Examines one of the world's oldest religions from its origins to the present. Covers the fundamental ideas and practices of Hinduism and the development of related religions such as Buddhism, Jainism, and Sikhism. Pr.: Sophomore standing.

**HIST 505. Introduction to the Civilization of South Asia I.** (3) In alternate years. Interdisciplinary survey of the development of civilization in India, Pakistan, Sri Lanka, Bangladesh, and Afghanistan, including consideration of the geographical and demographic context, philosophical and social concepts, social and political institutions, literature and historical movements. Same as ECON 505, POLSC 505, SOCIO 505, ANTH 505.

**HIST 506. Introduction to the Civilization of South Asia II.** (3) In alternate years. Interdisciplinary survey of recent and contemporary civilization in India, Pakistan, Sri Lanka, Bangladesh, and Afghanistan, including recent history, current economy, religion, culture, language and literature, geography, social and political structure and ideas. Same as ECON 506, POLSC 506, SOCIO 506, ANTH 506.

**HIST 508. Introduction to Modern East Asia.** (3) In alternate years. The history of China, Japan, and surrounding countries including the arrival of Europeans in the sixteenth century, reactions to Western imperialism, the rise of nationalism, and revolution. The impact of the two world wars, the era of post war developments, communism in China, democracy in Japan, and the end of Western colonialism are also examined. Pr.: Sophomore standing.

**HIST 512. Women in European History.** (3) I, in alternate years. A study of women in primitive European societies, in preindustrial times, and in the industrial era. Emphasis will be upon the position and role of women within the society. Pr.: Sophomore standing.

**HIST 513. Battles and Leaders.** (3) I, in alternate years. The course will emphasize military organization, tactics and strategy, generalship and grand strategy, manpower and logistics, and the wartime ramifications of war on land, at sea, and in the air. Pr.: Sophomore standing.

**HIST 514. World War II.** (3) I, in alternate years. Origins, conduct, and consequence of World War II. Films from the TV series "The World at War" form an integral part of the course. Pr.: Sophomore standing.

**HIST 515. History of Sport.** (3) In alternate years. The historical development of sport (especially in Europe and North America) including the growth of competition, the rise of mass spectator sports, elitism, and the changing function of sport. History of sport as business and history of the relationship between sport and other institutions. Same as PE 515. Pr.: Sophomore standing.

**HIST 516. History of Science I.** (3) I, in alternate years. Scientific activity and thought from antiquity to the end of the sixteenth century, with emphasis on Greek, late medieval, and Renaissance science. No background in science required. Pr.: Sophomore standing.

**HIST 517. History of Science II.** (3) II, in alternate years. Science in the seventeenth and eighteenth centuries, with emphasis on Galileo, Newton, philosophies of science, scientific societies, and developments in the physical, biological, and earth sciences, including the relations of science with technology, medicine, religion, exploration, and the enlightenment. No background in science required. Pr.: Sophomore standing.

**HIST 518. Science in the Modern Age.** (3) I, in alternate years. Science since the eighteenth century, including major developments in the physical, biological, and earth sciences, and the relations of science to scientific societies, technology, medicine, exploration, religion, and archaeology. No background in science required. Pr.: Sophomore standing.

**HIST 519. Science in America.** (3) I, in alternate years. A survey of American science from the colonial era to the present, with special attention to the historical context and the role of institutions and government. Some attention to the social problems faced by scientists and their responses to them. Pr.: Sophomore standing.

**HIST 520. Death and Dying in History.** (3) I, II, in alternate years. Examines European and American attitudes toward death and dying in various historical periods. Topics include: death and dying in the European Middle Ages and in nineteenth and twentieth century America, the impact of the Nazi Holocaust on modern opinions about death, suicide as a historical problem, the fear of cancer in modern times, and others. Pr.: Sophomore standing.

**HIST 521. History of Christianity.** (3) I, in alternate years. A history of the Christian religion from the era of Jesus Christ to the present with special emphasis on people and ideas. Pr.: Sophomore standing.

**HIST 522. Religion in American History.** (3) II, in alternate years. A study of the impact of religion on American culture and of American culture on religion, the Social Gospel and related issues, and the interrelationship of Christianity and politics. Pr.: Sophomore standing.

**HIST 523. A History of the Occult and Witchcraft.** (3) In alternate years. A study of the history of the occult and witchcraft in Western civilization with special attention to religious, intellectual, and social issues and influences. Pr.: Sophomore standing.

**HIST 524. The History of Baseball in American Culture.** (3) In alternate years. The history of baseball from its origins in the early nineteenth century to the present, with emphasis on the major leagues and their collateral organizations but also with attention to semi-pro and amateur baseball and to the old Negro Leagues. The history of the game will be examined in the context of American history with special reference to social issues, politics, religion, literature, music, and the medial. Pr.: Sophomore standing.

**HIST 525. Colonial America.** (3) In alternate years. About 1450 to 1763. Includes the European background of North American colonization, the rivalry for new world empire, seventeenth century English colonial foundations, and development of the various colonial societies. Pr.: Sophomore standing.

**HIST 526. The American Revolution.** (3) In alternate years. Eighteenth century colonial background of the Revolution and the revolutionary era itself, 1763–1789. Stresses ideological and other causes of the Revolution, the course of the war, its social results, the Confederation and its demise. Pr.: Sophomore standing.

**HIST 527. The Early National Period.** (3) In alternate years. Foundations of the new nation from the adoption of the Constitution to the conclusion of the War of 1812, approximately 1789–1815. Stresses the contest between Hamiltonians and Jeffersonians for philosophical dominance of institutions; other topics include diplomacy, westward expansion, military developments, the social and intellectual life of the era. Pr.: Sophomore standing.

**HIST 529. Civil War and Reconstruction.** (3) I, in alternate years. 1848-1877. Examination of the sectional controversy, the failure of the political system to resolve peacefully the conflict between North and South, the resort to arms, the nature of the post-war settlement. Emphasis is on the attempt of mid-nineteenth-century American leaders to deal with the complex problems of slavery and race. Pr.: Sophomore standing.

**HIST 531. The United States in the Twentieth Century.** (3) In alternate years. Examines the creation of modern America, 1890 to the present. Emphasis on the social and cultural roots, and political consequences, of Progressivism, World War I, the Great Depression, World War II, the Sixties, and Post-Vietnam America. Pr.: Sophomore standing.

**HIST 533. Topics in the History of the Americas.** (1–3) In alternate years. Provides instructor and students the opportunity to investigate in detail a particular theme, event, or problem in the history of North, Central, or South America. Topics vary. May be repeated for credit. Pr.: Sophomore standing.

**HIST 536. The American West.** (3) I, in alternate years. Primary emphasis on the nineteenth century when Americans were rapidly spreading across the continent. Also examines the earlier developments of the frontier and considers the twentieth century role of the trans-Mississippi region. Pr.: Sophomore standing.

**HIST 537. History of the Indians of North America.** (3) In alternate years. A discussion of Indian-white relations from 1492 to the present. Special emphasis given to federal government policy and the cultural decline of the native people of North America. Also includes an examination of Indian reservations and urban Indians.

**HIST 538. The Great Plains.** (3) II, in alternate years. Concentration on the one-fifth of North America identified as the Great Plains; the development of that region in historic times. Pr.: Sophomore standing.

**HIST 539. African–American History.** (3) In alternate years. An overview of the African–American experience from the seventeenth century through the civil rights movement. Emphasizes social, legal, economic, political, and intellectual aspects of black history as well a African–American contributions to American life and culture. Pr.: Sophomore standing.

**HIST 541. Women in American History.** (3) II, in alternate years. An overview of women in the history of the United States, emphasizing both important individual women and the changing position of women in American society. Pr.: Sophomore standing.

**HIST 543. The United States and World Affairs, 1776–Present.** (3) I, in alternate years. History of U.S. foreign policy since 1776. Stresses the continuity and intellectual foundations of foreign policy. Emphasizes territorial and foreign commercial expansion and America's response to war and revolution in the twentieth century. Pr.: Sophomore standing.

**HIST 544. History of U.S.–Soviet Relations Since 1917.** (3) II, in alternate years. History of U.S.-Soviet relations since 1917 with emphasis on WWI and the New Diplomacy; from nonrecognition to recognition, 1921–1933; the Grand Alliance and WWII; origins of the cold war; economic and atomic diplomacy; the Cuban missile crisis; and prospects for detente. Pr.: Sophomore standing.

**HIST 545. War in the Twentieth Century.** (3) In alternate years. Considers the military theory and practice, the technology, and the political and ideological constraints of World Wars I and II, the Spanish Civil War, the Korean War, and the Indo-chinese wars. Students are to gain an understanding of the varieties of military experience in the twentieth century, including civil wars, "total war,"and guerrilla warfare. Pr.: Sophomore standing.

**HIST 546. History of American Military Affairs.** (3) In alternate years. Deals with the development of military institutions in colonial America and the United States, civil-military relations and conflicts between political constraints and strategic demands, popular attitudes toward the military, and the rise of the military-industrial complex. Pr.: Sophomore standing.

**HIST 548. American Business History.** (3) In alternate years. The rise and development of the major commercial, financial, industrial, and transportation enterprises in the United States from the colonial period to the present. Emphasizes the gradual specialization of business through the Civil War, the movement from specialization to combination and integration along vertical/horizontal lines, the conglomerate movement, and the development of multinational enterprises after World War II. Pr.: Sophomore standing.

**HIST 552. Studies in American Social History.** (3) In alternate years. Exploration in depth of one specific topic in American social history, such as the impact of immigration, the development of cities, the history of labor and the rise of unions, development of the family, of education, or of medicine. Topics vary. May be repeated for credit. Pr.: Sophomore standing.

**HIST 553. History of American Culture.** (3) II, in alternate years. Main emphasis is on political, religious, and social thought and ideology, 1620 to present. Pr.: Sophomore standing.

**HIST 555. American Constitutional History.** (3) II,in alternate years. Survey of constitutional and legal development from colonial times to the present. English constitutional ideas and the common law in the American colonies, formation of the Constitution, the role of the Supreme Court, development of the modern American legal system, growth of the legal profession, the problem of civil liberties. The course offers insight into the relationship of constitutional-legal institutions to American society. Pr.: Sophomore standing.

**HIST 557. History of American Agriculture.** (3) In alternate years. Concentrates on the period since 1850 in an attempt to acquaint the student with the political and economic history of American agriculture. No attempt will be made to present the scientific or technological side of agriculture in detail, but agriculture will be shown in relation to the life of the entire United States. The life of the farmer and his family, the relationship between agricultural changes and other parts of the economy will be part of this course. Special attention will be paid to agriculture in Kansas and the Great Plains. Pr.: Sophomore standing.

**HIST 558. History of Kansas.** (3) I, II. Land, people, and cultural developments in Kansas, from the earliest written records to the present. Provides the student with an intimate understanding of the state of Kansas. Pr.: Sophomore standing.

**HIST 560. Latin American Nations.** (3) In alternate years. Survey of economic, social, and political developments of the Latin American nations from independence to the present decade with emphasis on Argentina, Brazil, Peru, Chile, and Mexico. Stresses reform and revolution of the last 50 years.Pr.: Sophomore standing.

**HIST 561. Colonial Hispanic America.** (3) In alternate years. Iberian and indigenous American background, exploration, conquest, settlement, and development of Latin America. Stresses growth of mestizo culture, colonial styles of living, and wars of independence. Pr.: Sophomore standing.

**HIST 562. Modern Mexico.** (3) In alternate years. Brief survey of lines of national development, 1821–1910, and major emphasis on the twentieth-century revolution and its reforms (1910–1940) as well as its subsequent implications. Pr.: Sophomore standing.

**HIST 563. Topics in Comparative History.** (1–3) In alternate years. Investigation in detail of a particular theme, event, or problem in comparative history. Topics vary. May be repeated once for credit. Pr.: Sophomore standing.

**HIST 564. The Russian Revolutions and the Soviet System.** (3) In alternate years. Russia's industrial revolution and its deepening crisis to the present. Emphasis on prospects for constitutional monarchy and a liberal parliamentary order from the revolution of 1905 to 1914, World War I and the February Revolution, social democracy and the roots of Leninism, Bolshevizing Soviet society under war, Communism and the NEP, Stalinism: fulfillment or betrayal of Leninism, the Great Patriotic War and the emergence of the Soviet empire, and de-Stalinization: prospects for the Soviet system. Pr.: Junior standing.

**HIST 565. History and Culture of Greece.** (3) In alternate years. The rise of civilization in the ancient Near East, the migrations of the Greeks and the Heroic Age, the Greek city-states, commerce and colonization, the Persian invasion, Athens' leadership of Greece, the war between Athens and Sparta, Alexander the Great, and the total Hellenic achievement. Pr.: Sophomore standing.

**HIST 566. History and Culture of Rome.** (3) In alternate years. Examines the various theories of Rome's origin, the causes, problems, and influences upon the republican government, political and economic problems of Roman expansion, and the Roman world. Various reforms including those of the Gracchi, Caesar, and Augustus. Contact with Greece and the older areas of civilization. The Roman imperial system, the many causes of Rome's fall, and Rome's role as a synthesizer of the ancient classical culture. Pr.: Sophomore standing.

**HIST 567. Europe in the Middle Ages.** (3) In alternate years. Europe from the fall of the Roman Empire to the thirteenth century. Investigates the conflict and interaction of Roman, Christian, and Germanic ideals and attitudes in the early Middle Ages, and the increasing complexity and sophistication of society, culture, religion, and government of the high Middle Ages. Pr.: Sophomore standing.

**HIST 568. The Renaissance.** (3) In alternate years. The Italian Renaissance as a major phase in the history of Western civilization and its spread to northern Europe. Pr.: Sophomore standing.

**HIST 569. The Reformation.** (3) In alternate years. A study of the Protestant, Catholic, and Radical Reformations , with special attention to Luther, Calvin, the origins of the Church of England and the Presbyterian Church, the Anabaptists, the Puritans, and Roman Catholic Reform, and the impact of religious developments on the political, economic, social, and intellectual history of the Western world. Covers the period from approximately 1500 to 1660. Pr.: Sophomore standing.

**HIST 570. Europe in the Seventeenth Century.** (3) I, in alternate years. Surveys the economic, social, political and intellectual history of western Europe in the seventeenth century, a period marked by economic depression, international conflict, and domestic revolutions as well as by cultural achievement. Emphasizes the complex interaction among social groups; the rise of a European state system; the development of constitutional monarchy in England and absolute monarchy in France; and the change in values generated by the scientific revolution. Pr.: Sophomore standing.

**HIST 571. Revolutionary Europe.** (3) In alternate years. Europe from the death of Louis XIV in 1715 to the fall of Napoleon in 1815. The origins and development of the French Revolution and the Napoleonic legacy, also examines reform and counter-revolutionary movements in England, Italy, Russia, Poland, and the Germanies. Pr.: Sophomore standing.

**HIST 572. Nineteenth Century Europe.** (3) In alternate years. The history of Europe from the French Revolution to the end of the first World War. Major topics covered will include the rise of conservatism as an ideology and its application in practice, the nature of liberalism and socialism, the impact of science and technology, the origins and course of World War I. Pr.: Sophomore standing.

**HIST 573. Twentieth Century Europe.** (3) In alternate years. Examines the political, social, and intellectual developments of Europe in the period of the two world wars. Emphasis on the failure of democracy and the rise of competing antidemocratic and nondemocratic mass movements and ideologies. The course will also deal with the attempted system of collective security, its failure, and the origins and course of World War II. Pr.: Sophomore standing.

**HIST 574. Europe since World War II.** (3) In alternate years. Postwar European society, politics, economy, and culture. The effects of total war on the population; restoration and reconstruction. The influence of the U.S. and U.S.S.R. on Europe. Capitalism, socialism, and communism in technological society. European unity movements and their conflicts with traditional values.

**HIST 576. European International Relations to 1815.** (3) In alternate years. The nature, evolution, and function of the diplomatic system for the Ancient World to 1815. Analyzes the Greek and Roman diplomatic tradition, international relations during the Medieval, Renaissance, and Early Modern periods, and the works of various theorists. Sophomore standing.

**HIST 577. European International Relations Since 1815.** (3) II, in alternate years. The nature, evolution, and functions of the European diplomatic system from 1815 to the present. Focuses on the Vienna settlement, the Eastern Question, the Crimean War, Italian and German unification, origins of World War I, international developments between the two world wars, the cold war, and the post-cold war era. Includes analysis of major theorists. Sophomore standing.

**HIST 578. Central Europe, 1500–1914.** (3) In alternate years. The diplomatic, military, political, cultural, and social aspects of the Hapsburg empire in Central Europe from its foundation to its dissolution in the twentieth century. Pr.: Sophomore standing.

**HIST 579. The British Isles to 1603.** (3) In alternate years. English, Scottish, and Irish culture in the medieval and pre-modern periods. Early folk societies, feudalism, the church in society and politics, the origins of representative institutions and the religious reformations are studied topically. Pr.: Sophomore standing.

**HIST 580. The British Isles Since 1603.** (3) In alternate years. English society and politics in modern times with reference also to Scotland and Ireland. Emphasis on topics such as the three orders of society (king, lords, and commons), the churches and religion, the appearance of parliamentary sovereignty, the industrial revolution, and the extension of democratic institutions. Pr.: Sophomore standing.

**HIST 582. Modern Eastern Europe.** (3) In alternate years. Eastern Europe as an ethnically diverse region between the Germanic lands and Russia, emphasizing the impact of both external and internal forces upon the political, socioeconomic, and intellectual development of the various nations. Covers the period from the triumph of the three eastern monarchies over Poland to the Brezhnev Doctrine and Ostpolitik, including the growth of national consciousness and the continuing struggle for political independence. Pr.: Junior standing.

**HIST 583. History of France, 1400–1715.** (3) In alternate years. France from the conclusion of the Hundred Years War to the death of Louis XIV. French economy, society, and royal administration, and the changes generated in these areas by significant events: the Reformation and the Wars of Religion; the rise of France to world power; peasant uprisings and constitutional crisis; and the reforms of Richelieu, Colbert, and Louis XIV. Trends in art, architecture, and philosophy. Pr.: Sophomore standing.

**HIST 584. History of France since 1715.** (3) In alternate years. France from the death of Louis XIV to the present. The impact of the French Revolution and the Napoleonic system on the agrarian economy and aristocratic society of the eighteenth century; the evolution of liberalism, socialism, and colonialism; the development of parliamentary democracy and the impact of the Industrial Revolution; the French response to the devastation of World War I, the humiliation of World War II, and the colonial wars of the De Gaulle era. Pr.: Sophomore standing.

**HIST 585. Medieval Religion and Politics.** (3) In alternate years. The interrelationship of religion and politics from the late Roman Empire to the Conciliar Epoch. Christianity in the Roman Empire and the barbarian kingdoms, the development of royal theocracy, the rise of the papacy, the conflict of church and state, the secularization of government, the Avignon papacy, the Great Schism, and conciliarism. Pr.: Sophomore standing.

**HIST 586. Junior Seminar.** (3) I, II. An undergraduate seminar that focuses on the intellectual principles of the historical discipline as well as the fundamental research techniques and writing skills used by historians. Each section of the Junior Seminar will center on a particular topic or historical problem. The students will prepare a research paper on a relevant subject of their choice. All history majors must take this seminar to complete the requirements for their degree.

**HIST 587. Nineteenth-Century Imperial Germany.** (3) In alternate years. Central Europe in the French Revolutionary era, the revolutions of 1848, German unification, imperial Germany, emphasizing social changes, especially the transition from agrarian to industrial society. Pr.: Sophomore standing.

**HIST 588. Rise and Fall of Nazi Germany.** (3) In alternate years. Examines the political, social, economic, and intellectual developments in Germany from World War I to the end of World War II. The establishment of the Weimar republic, the nature of its democratic system, the flourishing of cultural activities and the attack on democratic theory and practice leading to the establishment of a totalitarian dictatorship. National Socialism and its leader and alternative interpretations of National Socialism. Pr.: Sophomore standing.

**HIST 590. History through Film.** (3) I, in alternate years. A study of full-length, major production films to show how films can enhance, distort, or obscure our understanding of the past. Emphasizes historical development, using motion pictures as social documents.

**HIST 591. History of Russia to 1801.** (3) In alternate years. Medieval and early modern Russia with emphasis on the culture of Kievan Rus', the Mongol Yoke, the rise of Moscow, and the emergence of imperial Russia. Emphasizes those trends that contributed to the character of modern Russian society including Orthodoxy, autocracy, serfdom, and westernization. Pr.: Junior standing or consent of instructor.

**HIST 592. Grandeur and Decline of Imperial Russia.** (3) In alternate years. Russia in the nineteenth century with emphasis on the political, economic, social, and intellectual development of tsarist society. Topics of special concern: origins of the intelligentsia, plans for political reform under absolutism, serfdom and economic development, the legacy of the Great Reforms and counter reforms, origins and evolution of revolutionary populism. Pr.: Junior standing or consent of instructor.

**HIST 593. The Vietnam War.** (3) In alternate years. This course examines the origins, actions, and consequences of the Indochina wars fought by the French, Japanese, and Americans during the last century. Particular emphasis is placed on America's experience in Southeast Asia. Videos from the PBS series, "Vietnam: A Television History," are used in the course. Pr.: Sophomore standing.

**HIST 596. Holocaust: The Destruction of the European Jews.** (3) I, in alternate years. Analysis of the attempts by the National Socialist government of Germany to exterminate the Jewish population of Europe. Major issues discussed will include: nineteenth-century antidemocratic and antisemitic movements; Hitler's concept of antisemitism and personal sources of Hitler's genocidal policy; evolution of the genocidal policy and its implementation; Jewish resistance and collaboration; long-range consequences of the Holocaust. Pr.: Sophomore standing.

**HIST 597. Topics in European History.** (1–3) In alternate years. Provides instructor and students the opportunity to investigate in detail a particular theme, event, or problem in European history. Topics vary. May be repeated for credit. Pr.: Sophomore standing.

**HIST 598. Topics in Non-Western History.** (1–3) On sufficient demand. Provides instructor and students the opportunity to investigate in detail a particular theme, event, or problem in non-Western history. Topics vary. May be repeated for credit. Pr.: Sophomore standing.

**HIST 599. Senior Seminar for Secondary Teachers.** (3) II. Analysis of the historical content of teaching materials currently in use at the secondary level in public schools to determine the historical validity of the materials. Pr.: Sophomore standing.

## Undergraduate and graduate credit

**HIST 648. Naval History.** (3) I or II, in alternate years. Ships, technological developments, navies, tactics, warfare, strategy, and the interrelationship between naval thinking and national and international politics. Pr.: Junior standing or consent of instructor.

**HIST 649. Introduction to the History of Aviation.** (3) In alternate years. The development of aviation since the Wrights, providing a world view of man's conquest of the air in both human and technological terms including the development of military, commercial, and general aviation. Pr.: Junior standing or consent of instructor.

**HIST 650. Internship in History.** (3) I, II, S. Practical professional experience involving at least three weeks in an archive, museum, historical library, or business. Student projects must be approved in advance and a report submitted at the end of the work period. May be repeated once for credit. Pr.: Junior standing.

**HIST 703. Overseas European Studies.** (2–3) Intersession only, in alternate years. Short-term, intensive, and in-depth study of various aspects of European history and culture with readings, lectures, discussions, and on-the-spot experiences which will relate historical events to the places visited. Pr.: Senior or graduate standing.

**HIST 798. Readings in History.** (1–3) Students will read on a central theme, attend weekly discussions, and write a final report.

**HIST 799. Problems in History.** (Var.) Intensive study of a particular phase of history. Students will attend weekly discussions and write a major research paper on their findings.

## Graduate credit

**HIST 801. Historiography.** (3–4) 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.

**HIST 899. Master's Research in History.** (Var.)

**HIST 901. Advanced Historiography.** (1–4) Advanced work offered on demand and by arrangement, in main currents in historical research, the writing of history, and the influence of great historians.

**HIST 903. Renaissance and Reformation Europe.** (3) In alternate years. An examination of the major historical problems and literature.

**HIST 904. Early Modern Europe.** (3) In alternate years. An examination of the major historical problems and literature.

**HIST 905. Nineteenth-Century Europe.** (3) In alternate years. An examination of the major historical problems and literature.

**HIST 906. Twentieth-Century Europe.** (3) In alternate years. An examination of the major historical problems and literature.

**HIST 907. Colonial/Revolutionary America.** (3) In alternate years. An examination of the major historical problems and literature. Pr.: HIST 801 or concurrent enrollment.

**HIST 908. Nineteenth-Century America.** (3) In alternate years. An examination of the major historical problems and literature. Pr.: HIST 801 or concurrent enrollment.

**HIST 909. Twentieth-Century America.** (3) In alternate years. An examination of the major historical problems and literature. Pr.: HIST 801 or concurrent enrollment.

**HIST 919. Seminar in History of Christianity.** (3)

**HIST 920. Seminar in American Social History.** (3)

**HIST 921. Seminar in Latin American History.** (3)

**HIST 922. Seminar in American Diplomatic History.** (3)

**HIST 923. Seminar in the History of the American West.** (3)

**HIST 924. Seminar in Colonial America.** (3)

**HIST 926. Seminar in American Economic History.** (3)

**HIST 927. Seminar in American Science and Technology.** (3)

**HIST 928. Seminar in American History.** (3)

**HIST 930. Seminar in Modern European History.** (3)

**HIST 931. Seminar in German History.** (3)

**HIST 932. Seminar in French History.** (3)

**HIST 933. Seminar in European Diplomatic History.** (3)

**HIST 935. Seminar in Modern Russian History.** (3)

**HIST 936. Seminar in Renaissance and Reformation.** (3)

**HIST 937. Seminar in British History.** (3)

**HIST 940. Seminar in Military History.** (3)

**HIST 950. Seminar in South Asian History.** (3)

**HIST 979. Seminar in the History of Science.** (3)

**HIST 980. Topics in European History.** (1–3)

**HIST 981. Topics in Third World History.** (1–3)

**HIST 982. Topics in the History of Science.** (1–3)

**HIST 983. Topics in Military History.** (1–3)

**HIST 984. Topics in American History.** (1–3)

**HIST 985. Readings in History.** (1–3)

**HIST 986. Problems in History.** (1–3)

**HIST 987. Topics in History of Publishing.** (3) A historical introduction and training in the central means by which historical knowledge is transmitted in written format. Pr.: Graduate standing.

**HIST 999. Ph.D. Research in History.** (Var.)

# Kinesiology

**Larry Noble,** Professor, Ph.D., University of Texas at Austin. Areas of interest: Biomechanics. Research in progress: "Human response to vibrations of hand-held implements."

**Mary McElroy,** Professor, Ph.D., University of Maryland. Areas of interest: sport sociology and sport psychology. Research in progress: "Organized sport and popular culture in early modern London."

**David Dzewaltowski,** Associate Professor, Ph.D., University of Iowa. Areas of interest: exercise and sport psychology. Research in progress: "Effects of logical and emotional persuasion information on cognition about physical activity."

**Charles Layne,** Associate Professor, Ph.D., University of Texas at Austin. Areas of interest: motor learning and motor control. Research in progress: "Effects of vibration on proprioceptive inputs and motor control functions."

**Edmund Acevedo,** Assistant Professor, Ph.D., University of North Carolina-Greensboro. Areas of interest: exercise and sport psychology. Research in progress: "Increased training intensity effects on lactate accumulation, endurance and ventilatory threshold."

**Nancy Bouchier,** Assistant Professor, Ph.D., University of Western Ontario. Areas of interest: history and philosophy of sport and physical education, women in sport. Research in progress: "War, gender, and sport: physical fitness and training programs for World War II male and female military personnel."

**Karla Kubitz,** Assistant Professor, Ph.D., Arizona State University. Areas of interest: exercise and sport psychology. Research in progress: "The influence of electrocortical biofeedback performance on archers."

**Miriam Satern,** Assistant Professor, Ed.D., University of North Carolina-Greensboro. Areas of interest: sport biomechanics. Research in progress: "Running mechanics of cross country runners."

## Program description

The Department of Kinesiology offers programs of study leading to the master of science degree. Kinesiology integrates perspectives from a number of domains into its own unique body of knowledge, that of human movement. Kinesiology faculty study human movement from several perspectives, including biomechanical, physiological, neurological, psychological, and sociocultural. Kinesiology is an academic discipline that joins several perspectives together to explain how movement contributes to the human experience at all ages.

The specific program of study is tailored by an advisor and supervisory committee to meet the needs and interests of the student. Every program of study includes adequate breadth and depth in the discipline of kinesiology. Within students' programs of study they may choose to emphasize biomechanics, physiology of exercise, motor control, psychology of exercise and sport, sociology of sport and physical activity, or history of sport and physical culture. In a culminating experience, students are expected to assimilate scholarship in their emphasis area, which they present in written and oral form.

## Requirements

Students choose from one of three different degree options: thesis, master's report, or course work. All degree options require at least 30 hours of approved graduate work. A maximum of 12 hours of supporting work in other departments may be applied toward the 30 hour requirement. Major program components are as follows:

**Research core** (6 hrs)
KIN 815 Research Methods in Kinesiology
STAT 702 Statistical Methods for the Social Sciences
**or**
STAT 703 Statistical Methods for the Natural Sciences

**Subject core** (6 or 9 hrs)
Two courses from the following list required for thesis option, 3 courses required for other options:
KIN 700 Physical Culture in the Western World
KIN 800 Advanced Physiology of Exercise
KIN 805 Sport and Human Behavior
KIN 806 Motor Development
KIN 807 Motor Learning and Control
KIN 808 Advanced Issues in Sport Sociology
KIN 825 Mechanical Analysis of Human Movement

## Research

Two hours for report option, 6 hours for thesis option

## Support courses

Maximum of 12 hours outside the department

## Research facilities

The master of science degree is supported by four research laboratories: biomechanics, motor learning/control, exercise physiology, and exercise biochemistry. The department has developed the Center for Exercise Research to facilitate research projects which have clinical and/or instructional components. Collaboration with colleagues in other disciplines on multidisciplinary projects having a human movement component is facilitated by the Institute for Social and Behavioral Research. Microcomputers, extensive software, and direct access to the university's mainframe computer serve to enhance the research capabilities of each of these laboratories.

## Financial support

Graduate assistantships are available each year for qualified candidates. Duties consist of teaching and related activities associated with the required Principles of Physical Fitness and lifetime sports programs, undergraduate laboratories, and faculty research. Students are also given opportunities to work in the department's Center for Exercise Research which includes corporate and adult fitness programs. The total time commitment per week is approximately 20 hours. Graduate assistantships are also available from the following university units: Department of Intercollegiate Athletics and Lafene Health Center. Contact those units directly for further information.

## Career opportunities

The strength of the program lies in the student-faculty interactions. Students gain valuable on-hands experience in such areas as research, fitness testing and prescription, and teaching. These experiences are carefully designed to prepare students for Ph.D. programs as well as to enhance employment opportunities. Kinesiology provides an excellent knowledge base for professional preparation in prephysical therapy, exercise and other health-related professions, and coaching and sports medicine.

## Application procedures

Admission to the program is secured upon the basis of satisfactory preparation for graduate work and demonstrated potential for scholarly achievement and include the following: At least a 3.0 GPA during the last two years of undergraduate work, satisfactory scores on the GRE examination, and three letters of reference. Students without an undergraduate degree in kinesiology or a related area will be required to satisfy undergraduate competencies.

Application for admission to the program in a fall semester should be made in the preceding late fall or early winter. For application materials and further information, please contact:

Coordinator of Graduate Studies
Department of Kinesiology
8 Natatorium
Kansas State University
Manhattan, Kansas 66506
(913) 532-6765

The completed application should include a letter to the coordinator of graduate studies providing a statement of your reasons for pursuing graduate study in kinesiology, areas of special interest, and faculty members whose interests seem to be similar to your own.

## Courses

### Undergraduate and graduate credit for non-kinesiology majors

**KIN 510. Measurement and Research Techniques in Kinesiology.** (3) II. Theory and techniques of measurement and research in the psychomotor domain including the use of statistical analyses. Pr.: KIN 320, 330, 335, 340, STAT 320.

**KIN 515. History of Sport.** (3) The historical development of sport (especially in Europe and North America) including the growth of competition, the rise of mass spectator sports, elitism, and the changing function of sport. History of sport as business and history of the relationship between sport and other institutions. Cross-listed with History, see HIST 515.

**KIN 550. Rehabilitation and Conditioning for Athletic Injuries.** (3) II. A study of applied rehabilitation and conditioning techniques used by athletic trainers. Pr.: KIN 315, 330.

**KIN 551. Evaluation and Emergency Management of Athletic Injuries.** (3) I. An in-depth study of evaluation techniques for athletic injuries by the athletic trainer. Pr.: KIN 315 and BIOL 240.

**KIN 555. Therapeutic Modalities in Athletic Injuries.** (3) II. The theory and application of the various energy systems used in the treatment of athletic injuries. Practical experiences will be emphasized. Pr.: KIN 315, PHYS 115.

**KIN 557. Administration of Athletic Training Programs.** (3) I. Application of various problems and issues affecting athletic trainers in their roles as administrators in the areas of role delineation, budget designs, legal aspects of sport, facility design, and drug testing/drug education.

**KIN 561. Adapted Physical Education.** (3) I, II. Developmental, remedial, and corrective physical education, emphasizing adaptations designed around specific principles to meet the needs of individuals requiring special attention. Pr.: KIN 330.

**KIN 585. Internship in Athletic Training.** (1–4) I, II. Supervised clinical application of practical skills in athletic training. Pr.: KIN 315. May be repeated for a total of 4 credit hours with additional prerequisite of KIN 330 and KIN 335 required for last four semesters.

**KIN 598. Topics in Kinesiology.** (1–3) On sufficient demand. Study of a selected topic in kinesiology involving either an in-depth study or application of theory presented in a related core course. May be repeated as topic varies. Pr.: Related core course.

**KIN 599. Independent Studies in Kinesiology.** (1–3) I, II. Selected topics in kinesiology. Maximum of 3 hours applicable towards a degree. Pr.: Consent of undergraduate coordinator.

## Undergraduate and graduate credit

**KIN 625. Exercise Testing and Prescription.** (3) I. Benefits and risks of exercise testing and prescription with healthy populations, individuals at risk, and patients with cardiovascular and metabolic diseases. Includes experiences with exercise test technology and methods of exercise prescription. Two hours rec. and two hours lab each week. Pr.: KIN 335, proof of current CPR, BLS, and First Aid certification.

**KIN 635. Nutrition and Exercise.** (3) II. The interrelationships between diet, nutrition, and exercise. Topics covered include physical fitness, weight control, nutrient metabolism during exercise, and athletic performance. Pr.: KIN 335 and FN 132 or FN 502. Cross-listed with Foods and Nutrition, see FN 635.

**KIN 655. Fitness Promotion.** (3) II. The study of the implementation and promotion of preventative health programs for populations at worksites, hospitals, and community settings. Pr.: KIN 335.

**KIN 700. Physical Culture in the Western World.** (3) I. A seminar on selected topics in the historical and philosophical foundations of physical culture in western civilization. Pr.: Three hours of Western Heritage.

**KIN 703. Minority Groups in Sport.** (3) On sufficient demand. The contributions by, problems of, and discrimination against minority groups in sports. Pr.: SOCIO 211, KIN 340, PSYCH 435, or HIST 539.

**KIN 718. Cinematographic and Videographic Analysis of Human Movement.** (3) On sufficient demand. Techniques and instrumentation for the analysis of overt human movement using film, videotape, and other imaging techniques. Pr.: KIN 330.

**KIN 792. Internship in Exercise Science.** (6–8) I, II, S. Supervised field experience for the exercise science major in training settings such as YMCA, YWCA, municipal recreation agency, or industrial fitness agency. May be completed with half-time assignment for 12–16 weeks or full-time assignment for 6–8 weeks. Pr.: KIN 655.

**KIN 796. Topics in Kinesiology.** (1–4) On sufficient demand. Intensive study of a selected topic in kinesiology involving either greater in-depth study, or application of theory presented in a related course. May be repeated as topic varies. Pr.: 6 hours in kinesiology 500 and above. Only 6 hours may be counted toward degree.

## Graduate credit

**KIN 800. Advanced Physiology of Exercise.** (3) II. An in-depth study of the physiological responses of the human body during exercise, the adaptation that occur with exercise training, and the laboratory techniques to assess these responses and adaptations. Pr.: KIN 335.

**KIN 805. Sport and Human Behavior.** (3) I. A study of the state of the sport performer and the effects of sport on human behavior. Pr.: KIN 340 or 9 hours of graduate credit in psychology (500 level or above).

**KIN 806. Motor Development.** (3) On sufficient demand. A study of psychomotor development. The focus is on the growth years, though developmental considerations for all age groups are considered. Implications for sport, exercise, an physical activity are discussed. Pr.: KIN 320.

**KIN 807. Motor Learning and Control.** (3) I. Application of learning principles to skill acquisition in sport and human domain; and practical applications. Pr.: KIN 320 or 9 hours of graduate credit in psychology (500 level or above).

**KIN 808. Advanced Issues in Sport Sociology.** (3) II. An in-depth analysis of the sociology of sport literature with special interest in critiquing the theoretical frameworks and methodologies employed. Pr.: KIN 340 or SOCIO 435.

**KIN 815. Research Methods in Kinesiology.** (3) I. A study of techniques of the research process including the identification of a research problem, the design of experimental and non-experimental strategies, and the presentation of written research.

**KIN 825. Mechanical Analysis of Human Movement.** (3) II. Mechanical principles and analysis procedures for the study of overt human movement. Applications to movements in exercise, sport, occupational, and daily living activities will be emphasized. Pr.: KIN 330.

**KIN 830. The Child in Sport.** (3) On sufficient demand. Factors prompting children's entry into sports and the consequences of participation in organized sports for children. Pr.: KIN 320 or EDAF 215.

**KIN 896. Independent Study in Kinesiology.** (1–4) I, II, S. Intensive independent study in a topic or problem involving the integration, application, and synthesis of theory presented in a related course. The course culminates in the preparation of an original paper. Pr.: KIN 815 and related graduate subject core courses.

**KIN 897. Research in Kinesiology.** (1–4) I, II, S. Independent study in one or more of the research processes involved in the scientific method. Pr.: STAT 702 or 703, KIN 815, and related graduate subject core course.

**KIN 898. Master's Report.** (1–4)

**KIN 899. Master's Thesis.** (1–6)

# Mass Communications

**William Adams,** Assistant Professor. Ph.D. 1988, Indiana University. Television audience research, radio and television programming, formation of public opinion.

**Ali Kanso El-Ghori,** Assistant Professor. Ph.D. 1986, Ohio University, Public relations, international communication and marketing.

**Tom Grimes,** Assistant Professor. Ph.D. 1986, Indiana University. Television news effects, experimental method.

**Charles Lubbers,** Assistant Professor. Ph.D. 1992, University of Nebraska..Public relations, business communications, research methods.

**David MacFarland,** Associate Professor. Ph.D. 1972, University of Wisconsin. Radio programming, music selection by audiences, audience reaction to programming.

**Harry Marsh,** Professor. Ph.D. 1974, University of Texas. News performance, journalism history, newspaper technology as it relates to news and layout.

**Richard Nelson,** Professor. Ph.D. 1980, Florida State University. Public relations, advertising, propaganda, media history, public policy issues. Accredited in Public Relations (APR).

**Carol Oukrop,** Professor and Director of the School. Ph.D. 1969, University of Iowa. Public relations, history of mass communications, women and the media, ethics, community journalism. Accredited in Public Relations (APR).

**Paul Parsons,** Professor. Ph.D. 1987, University of Tennessee. News accuracy, libel law, First Amendment issues, scholarly publishing, media and religion.

**R. Charles Pearce,** Associate Professor. Ph.D. 1984, University of Tennessee. Advertising effects, social issues in advertising, attitude theory, FTC administrative law.

**Paul Prince,** Associate Professor. Ph.D. 1971, University of Utah. Broadcast management and advertising, international mass communication.

## The program

The A.Q. Miller School of Journalism and Mass Communications offers a master of science in mass communication. The degree program requires a core of mass communication research and theory classes and an emphasis from one of the school's specialties: newspaper and broadcast journalism, public relations management, advertising, and radio/television programming and management. The courses in each emphasis encourage students to apply the core concepts and to prepare for careers in the mass media and teaching professions. Hands-on opportunities on campus for developing skills and for research include the student-run *Collegian* and KSDB-FM as well as the Regents Educational Communication Center, the university's low-power station for television production, and the Huck Boyd National Center for Community Media.

## Requirements

30 graduate semester hours, distributed as follows:

MC 765 Communication Theory
MC 780 Research Methods
MC 850 Applied Research in Mass Media
Two 700-level electives in MC
Stat 702 Statistical Methods in Social Science
Thesis or report
Graduate electives in the area of specialization to complete 30 semester hours

Master's degree candidates must pass written comprehensive examinations covering their course work and a final oral defense of their theses or reports.

Admission to the master's degree program requires an undergraduate degree from a four-year college or university, with basic undergraduate course work in journalism or radio and television. Provisional admission may be granted to applicants entering the degree program with no previous course work in Mass Communications, with the requirement to take basic undergraduate courses along with the graduate course work. Also required are satisfactory scores on the GRE and an undergraduate GPA of 3.0 or above on the final 60 hours of course work.

## Financial support

The school has a limited number of paid teaching assistantships, renewable nine-month appointments, 20 hours per week during the regular semester. Stipends vary but are usually $6,000 for nine months. Academic year tuition is waived during the academic year for a student holding a .4 GTA appointment. GTAs perform various tasks from monitoring basic media labs to assisting professors with grading. Preference is given to applicants with academic and/or professional media experience. Application for assistantship is by letter, with resume and samples of professional work, addressed to Dr. Carol Oukrop, Director, A.Q. Miller School of Journalism and Mass Communications, 105 Kedzie Hall, Kansas State University, Manhattan, Kansas 66506–1501.

## Career opportunities

Students seek a master's degree for various reasons. Some students are in mid-career and need the degree for advancement or to change career direction. Other students, upon completing the undergraduate degrees, join us to gain additional skills and insights into specific media so as to be better prepared for the start of their careers. Others enroll as a step towards the Ph.D. and an academic career.

For more information write:
Dr. Paul Prince, Director of Graduate Study
A.Q. Miller School of Journalism and Mass Communications
105 Kedzie Hall
Kansas State University
Manhattan, KS 66506–1501
Phone (913) 532-7645
or (913) 532-6890

## Undergraduate and graduate credit in minor field

**MC 500. Advanced News and Feature Writing.** (3) Intensive course emphasizing reportial principles and practices. Students serve as reporters for the *Kansas State Collegian,* writing for an audience of 20,000 readers daily. Pr.: MC 300 with grade of C or better.

**MC 505. Electronic News Reporting.** (3) Practical experience in gathering, writing, editing, producing, and presenting news for the electronic media, and study of related issues. Pr.: MC 500 with grade of C or better.

**MC 510. Yearbook Editing and Management.** (2) Planning, editing, layout, writing, and financing a publication.

**MC 520. Newspaper Advertising Sales.** (3) Basics of retail advertising, applied to newspapers including sales, design, copy writing, production, budgeting, and legal and ethical issues. Pr.: MC 320 with grade of C or better.

**MC 525. Electronic Media Advertising Sales.** Pr.: MC 320 or MKTG 400 with grade of C or better.

**MC 530. The Ethnic Media in America.** (3) Consideration of the growth, development, and current status of the ethnic media in the United States. Pr.: Junior standing.

**MC 535. Photojournalism.** (1–3) I. The materials, principles, and processes of photography directed toward visual reporting in newspapers, magazines, and other media. Content and credit vary. Potential topics include documentary picture story, essay, and sequence; spot news, feature, and sports photography; combining words and pictures effectively; marketing techniques; legal restrictions. Lectures, demonstrations, and laboratory. Pr.: MC 275 and 310 with grades of C or better.

**MC 540. Advanced Editing and Design.** Pr.: MC 500 with grade of C or better.

**MC 545. Advertising Media Planning.** (3) I, II. The selecting, scheduling, selling, and buying of the various advertising media. Pr.: MC 355 grade of C or better.

**MC 550. Mass Communications Internship.** (1–3) The student works in a professional capacity under proper professional and faculty supervision with reports from student and supervisor required. Pr.: Twelve semester hours of MC courses and consent of instructor. Print Journalism—Pr.: MC 500; Electronic Journalism—Pr.: MC 505; Public Relations—Pr.: MC 635; Advertising—Pr.: MC 555; Radio–TV Production—Pr.: MC 240 and MC 250; Radio–TV sales or promotion—Pr.: Either MC 240 or MC 250 either MC 525 or MC 655 or MC 720.

**MC 555. Advertising Techniques.** (3) The planning, creation, and production of advertising messages for the various mass communication media. Pr.: MC 355 with grade of C or better.

**MC 560. Non-Traditional Press.** (3) A study of the changing journalistic attitudes toward objectivity in the 1960s and since. Examination of the resulting resurgence and development of alternative, minority, underground, and counterculture media. Techniques, style, impact, use, and consequences to the media and society of the new journalism will be analyzed.

**MC 565. Law of Mass Communications.** (3) A study of legal issues relating to mass communications. Emphasis on defamation, privacy, copyright, administrative controls, and other areas related to the mass media. Pr.: Senior standing.

**MC 585. Advanced Electronic News Reporting.** (3) Reporting of issues of local importance, information-gathering techniques, in-depth writing, and electronic media news production methods. Pr.: MC 505 with grade of C or better.

**MC 595. Mass Communication Research.** (3) Formulation of mass communication research and design. Appropriate methods of data collection and data analysis. Pr.: MC 235 and completion of a mathematics or statistics course.

## Undergraduate and graduate credit

**MC 600. Public Affairs Reporting.** (3) Investigative reporting of local, state, and national affairs. Pr.: MC 500.

**MC 605. Supervision of School Publications.** (3) A methods course for those planning to teach secondary or junior college journalism courses and advise high school or junior college publications.

**MC 610. Interpretation of Contemporary Affairs.** (3) Critical questions of the day and interpretive articles and editorials which document and analyze the news. Pr.: MC 500.

**MC 612. Gender Issues and the Media.** (3) The portrayal of women and men by the media, and media employment issues based on gender. Pr.: One course in MC or women's studies.

**MC 615. Magazine Article Writing.** (3) Preparation of feature stories and articles; techniques of market analysis, and marketing of articles written in course. Pr.: MC 500.

**MC 620. Magazine Production.** (3) The practical application of theory to writing, editing, graphic reproduction, layout, and management of magazines. Pr.: MC 500.

**MC 630. Public Relations Case Studies.** (3) Study of historic and contemporary public relations situations using a case-method approach. Attention is directed at strategic planning and implementation by public relations managers. Students establish criteria on what constitutes a public relations program and theories and norms for the selection of objectives and strategies under varying conditions. Pr.: MC 325.

**MC 635. Public Relations Techniques.** (3) Information gathering, writing, and production applications of persuasive public relations principles in print and electronic media. Pr.: MC 275 and MC 325.

**MC 640. Advertising Campaigns.** (3) The managerial development and execution of consumer, industrial, and institutional advertising campaigns. Pr.: MC 545, 555, and 595.

**MC 645. Public Relations Campaigns.** (3) Advanced study of an organization's public relations needs. Includes researching the situation, analyzing audiences, and preparing strategic plans for approved clients. Pr.: MC 595, 635, and completion of at least one course in social science methods or data analysis.

**MC 650. Newspaper Management.** (3) The management of newspapers dealing with organization, ownership, promotion, research, production, equipment, markets, personnel, legal aspects, advertising, buying and selling of newspaper properties, business practices, and news policy. Pr.: MC 540 or conc. enrollment.

**MC 655. Electronic Media Programming.** (3) The principles, planning, and development of radio–television–cable programs, schedules and related regulation. Pr.: MC 237.

**MC 680. Readings in Mass Communications.** (1–3) Investigation of the literature of mass communications. Three significant books per credit hour with written analysis and oral presentation. Pr.: Minimum of nine hours of completed course work in MC and consent of supervisory instructor.

**MC 685. Electronic Media Management.** (3) Management practices of broadcast, cable, and nonbroadcast facilities including regulation and sales. Pr.: MANGT 420 or MC 237

**MC 690. Problems in Mass Communications.** (1–4) Pr.: Background of courses needed for problem undertaken.

**MC 700. Propaganda and Mass Communications.** (3) History, theory, development, and impact of propaganda as a controversial mass communication strategy that influences public opinion.

**MC 710. History of Journalism.** (3) Growth and development of the news media in the United States and their economic, political, and social significance. Pr.: MC 235 and a U.S. history course.

**MC 715 History of the Electronic Media.** (3) Growth and development of the electronic media in the United States and their economic, political, and social significance. Pr.: MC 235 and a U.S. history course.

**MC 720. Ethics in Mass Communications.** (3) Moral analysis, argument, and decisionmaking by the mass communicator, with linkage of ethics to the conduct of media professionals in the United States. Pr.: MC 235 and a philosophy course.

**MC 725. International Communications.** (3) Comparative study of world media systems and the role of mass communications in national development. Pr.: MC 235.

**MC 730. Seminar in the Future of the Media.** (3) A study of philosophical and technological advances in mass communications with emphasis on projected patterns of future growth and development.

**MC 740. Colloquium in Mass Communications.** (1–3) Discussion of selected topics in mass communications research and practice. May be repeated for credit when topic varies.

**MC 765. Communication Theory.** (3) An examination of major communication theories as they relate to individual, interpersonal, group, and mass communications.

**MC 770. Professional Journalism Practicum.** (1–4) For advanced students. Supervised practical work in professional journalism and mass communications. Includes laboratory investigation, field work, and internships. Pr.: MC 300 or 505 and consent of supervising instructor.

**MC 780. Research Methods in Mass Communications.** (3) Survey of research methods used in the study of the mass media.

## Graduate credit

**MC 850. Applied Research in Mass Media.** (3) Study and application of mass media research, its literature, and methodology.

**MC 865. Seminar in Mass Communication Law.** (3) Analysis of mass communication freedoms and limitations in such areas as defamation, privacy, copyright, censorship, obscenity, and advertising and electronic media regulation. Pr.: Graduate standing.

**MC 880. Seminar in Telecommunication History.** (3) Analysis of the social, economic and political significance of the development of electronic media in the United States, with attention to government regulation theories. Pr.: Graduate standing.

**MC 899. Research in Mass Communications.** (Var.) Thesis/report credit. Pr.: Sufficient training to carry on the line of research undertaken.

# Mathematics

**Louis Pigno,** Head, Professor, Ph.D. 1969, State University of New York, Stony Brook, Harmonic Analysis.

**Robert E. Dressler,** Associate Head, Professor, Ph.D. 1969, University of Oregon, Analytic Number Theory.

**Alexander V. Arhangel'skii,** Adjunct Professor, D. Sci. 1966, Moscow State University, General Topology.

**Andrew G. Bennett,** Associate Professor, Ph.D. 1985, Princeton University, Probability Theory, Harmonic Analysis.

**Robert. B. Burckel,** Professor, Ph.D. 1968, Yale University, Harmonic Analysis, Classical Complex Analysis.

**Andrew Chermak,** Associate Professor, Ph.D. 1975, Rutgers University, Finite Group Theory.

**Todd E. Cochrane,** Associate Professor, Ph.D. 1984, University of Michigan, Analytic Number Theory.

**Louis Crane,** Assistant Professor, Ph.D. 1985, University of Chicago, Mathematical Physics and Topological Quantum Field Theory.

**Alberto L. Delgado,** Associate Professor, Ph.D. 1981, University of California, Berkeley, Finite Group Theory, Theory of Amalgams.

**Louis M. Herman,** Associate Professor, Ph.D. 1970, University of Massachusetts, Lattice Theory, Algebra and Operator Theory.

**Yu-Lee Lee,** Professor, Ph.D. 1964, University of Oregon, Topology, Ring Theory, Global Analysis.

**Lige Li,** Associate Professor, Ph.D. 1986, Tulane University, Nonlinear Partial Differential Equations and Applications.

**John Maginnis,** Assistant Professor, Ph.D. 1987, Stanford University, Algebraic Topology.

**Forrest R. Miller,** Professor, Ph.D. 1968, University of Massachusetts, Global Analysis and Applications to Physics.

**Charles N. Moore,** Assistant Professor, Ph.D. 1986, University of California, Los Angeles, Harmonic Analysis, Probability Theory.

**Thomas B. Muenzenberger,** Associate Professor, Ph.D. 1972, University of Wyoming, General Topology.

**Willard A. Parker,** Associate Professor, Ph.D. 1970, University of Oregon, Abstract Harmonic Analysis, Mathematics Education.

**Alexander G. Ramm,** Professor, D. Sci. 1972, Mathematics Institute Academy of Science, Minsk, Applied Mathematics, Functional Analysis, Differential and Integral Equations, Scattering Theory, Ill-Posed Problems.

**Sadahiro Saeki,** Distinguished University Professor, D.Sc. 1970, Tokyo Metropolitan University, Harmonic Analysis.

**Ernest E. Shult,** Regents Distinguished Professor, Ph.D. 1964, University of Illinois, Geometry, Finite Groups.

**Brent P. Smith,** Professor, Ph.D. 1977, Louisiana State University, Analytic Number Theory, Harmonic Analysis.

**George E. Strecker,** Professor, Ph.D. 1966, Tulane University, Categorical Topology.

**Karl R. Stromberg,** Professor, Ph.D. 1958, University of Washington, Harmonic Analysis, Real Analysis, Measure Theory.

**David B. Surowski,** Professor, Ph.D. 1975, University of Arizona, Group Representation Theory.

**Fangbing Wu,** Assistant Professor, Ph.D. 1989, Ohio State University, Global Analysis.

**Huanan Yang,** Assistant Professor, Ph.D. 1989, University of California, Los Angeles, Numerical Analysis.

**David Yetter,** Assistant Professor, Ph.D. 1984, University of Pennsylvania, Low-Dimensional Topology, Categorical Algebra, Topological Field Theory.

**Qisu Zou,** Associate Professor, Ph.D. 1986, Brown University, Applied Mathematics, Fluid Dynamics.

## Overview

The Department of Mathematics offers programs of study leading to master of science and the doctor of philosophy degrees. There are over 50 graduate students in both the master's and Ph.D. programs; in addition to American students, there is also a large number of European, Middle Eastern, and Asian students, thus lending a truly international flavor to the academic environment in the department. Financial assistance is available on a competitive basis to well-qualified applicants in the form of graduate teaching assistantships and graduate research assistantships; in addition, there are graduate student fellowships and GTA stipend supplements available through the Graduate School on a competitive basis.

For additional information and application materials, please write to:

Professor David B. Surowski
Director of Graduate Studies
Department of Mathematics
Cardwell Hall
Kansas State University
Manhattan, KS 66506–2602

## Research areas and facilities

The mathematics department has internationally recognized programs in harmonic analysis, group theory and finite geometries, and applied mathematics. The applied mathematics group is active in computational fluid dynamics, wave propagation, reaction diffusion equations, as well as in numerical analysis. There are also robust research groups in categorical and point-set topology, geometry of manifolds, analytic number theory, and probabilistic harmonic analysis.

Kansas State University provides excellent research facilities through a newly renovated Math/Physics Branch Library and the University Computing Center, both of which are in the same building as the mathematics department.

The university libraries have extensive holdings in the mathematical sciences, including all major journals in pure and applied mathematics. Even very obscure publications are readily available due to our close association with the Linda Hall Science Library in Kansas City.

The University Computing Center gives direct access to a National Advanced System 6630 with 12 megabytes of main memory and four billion bytes of direct access storage. Several departmentally owned microcomputers and Sun Workstations are available for smaller problems and for word processing. The computing center's mainframe supports the latest release of CAYLEY, the software for computational algebra. The department also owns a copy of SUN CAYLEY, a version specially written for the Sun Workstation.

## Admission

In most cases an applicant to the master's program should have completed work in mathematics equivalent to that required for a bachelor's degree at Kansas State University, whereas applicants to the Ph.D. program will have normally completed the equivalent of a master's degree in an accredited program. While there are no formal application deadlines, international applicants from outside the U.S. or Canada should have their application materials in by April 1 to be guaranteed consideration for the fall semester of the same year.

## Master of science degree

There are three distinct master's degree options recognized by both the department and the graduate school: master's thesis; master's report; and the nonthesis, nonreport option. In general terms, the master's thesis option is best suited for the student seeking the master's degree as the terminal degree. The master's report generally is shorter than the master's thesis, but in principle is closer in format and spirit of creativity to published works in mathematics than is the master's thesis, which tends to be more expository in nature. The nonthesis, nonreport option is generally best suited for students wishing to continue into the Ph.D. program in mathematics. Here, instead of defending a thesis or a report, the student will pass a written exam, administered by the student's master's committee. In all cases, the graduate student must include at least 30 credit hours of mathematics at the 700 level or above on the program of study, which is drafted in consultation with the student's supervisory committee.

There is no language requirement for the master's degree.

## Doctor of philosophy

The basic requirements for the Ph.D. degree in the Department of Mathematics include:

At least 90 credit hours of mathematics, all at the 700 level and above, of which at least 24 credit hours are taken in residence at Kansas State University, and at least 30 credit hours of MATH 999. A master's degree from a reputable graduate program in mathematics can be used in lieu of 30 credit hours in mathematics.
Passing the qualifying exam
Passing the preliminary exam
Demonstrating reading proficiency of mathematical exposition in French, German, or Russian.
Writing and defending the Ph.D. dissertation.

It is the department's philosophy that the qualifying examination tests the student's mathematical breadth, whereas the preliminary examination tests the student's depth.

The qualifying exam consists of three two-hour examinations, chosen from seven possible general areas: algebra, complex variables, differential equations, geometry of manifolds, numerical analysis, real variables, and topology. These examinations are given within a two-week period, normally at the beginning of the fall and the spring semesters. In addition, each student must include on the program of study at least one year-long course chosen from at least three of the following four general categories.

Algebra: Math 810 Higher Algebra I and Math 811 Higher Algebra II.

Topology/geometry of manifolds: Math 871 General Topology I and Math 872 General Topology II, or Math 881 Differentiable Manifolds I Math 882 Differentiable Manifolds II.

Analysis: Math 821 Real Analysis I, and Math 822 Real Analysis II, or Math 825 Complex Analysis I and Math 826 Complex Analysis II.

Applied mathematics: Math 861 Numerical Analysis I and Math 862 Numerical Analysis II, or Math 864 Theory of Ordinary Differential Equations I and Math 865 Theory of Ordinary Differential Equations II or Math 866 Partial Differential Equations I and Math 867 Partial Differential Equations II.

After passing the qualifying exam, the graduate student will, within one year, select a thesis advisor and compile the Ph.D. supervisory committee. This committee is responsible for administering the preliminary examination, which tests the student's mathematical depth, and therefore his or her readiness to undertake serious mathematical research. The Ph.D. dissertation resulting from the student's independent and original research naturally represents the successful conclusion of the time spent as a graduate student. The student's supervisory committee will schedule a public defense of the dissertation, during which the student will defend not only the mathematical correctness of the work, but also its originality and importance.

## Mathematics courses

**MATH 506. Introduction to Number Theory.** (3) II. Divisibility properties of integers, prime numbers, congruences, multiplicative functions. Pr.: MATH 221.

**MATH 510. Discrete Mathematics.** (3) I, II, S. Combinatorics and graph theory. Topics selected from counting principles, permutations and combinations, the inclusion-exclusion principle, recurrence relations, trees, graph coloring, Eulerian and Hamiltonian circuits, block designs, and Ramsey Theory. Pr.: Sophomore standing and MATH 221.

**MATH 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.

**MATH 512. Introduction to Modern Algebra.** (3) I, II. Introduction to the basic algebraic systems, viz., groups, rings, integral domains, fields, elementary number theory. Special emphasis will be given to methods of theorem proving. Pr.: MATH 222 or consent of instructor.

**MATH 515. Introduction to Linear Algebra.** (2–3) II. Finite dimensional vector spaces, linear transformations and their matrix representations, dual spaces, invariant subspaces, Euclidean and unitary spaces, solution spaces for systems of linear equations. Pr.: MATH 512.

**MATH 520. Foundations of Analysis.** (3) A study of sets and sequences, neighborhood, limit point, convergence, open and closed sets in the real line and in the plane, the concept of a continuous function. Pr.: MATH 222.

**MATH 521. 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.

**MATH 551. Applied Matrix Theory.** (3) I, II. Matrix algebra, solutions to systems of linear equations, determinants, vector spaces, linear transformations, eigenvalues, linear programming, approximation techniques. Pr.: MATH 205 or 220.

**MATH 560. Introduction to Topology.** (3) An introduction to the basic topological concepts. Topological spaces, metric spaces, closure, interior, and frontier operators, subspaces, separation and countability properties, bases, subbases, convergence, continuity, homeomorphisms, compactness, connectedness, quotients and products. The course will include a brief introduction to proof techniques and set theory. Other topics in topology also may be included. Pr.: MATH 222.

**MATH 570. History of Mathematics.** (3) II. A survey of the development of mathematics from ancient to modern times. Cannot be used a part of the advanced mathematics needed for the B.S. degree in mathematics. Pr.: MATH 221.

**MATH 572. Foundations of Geometry.** (3) Euclidean, non-Euclidean, and finite geometries; role of axioms; practice proving theorems in a formal system; synthetic, metric, and transformation approaches to Euclidean geometry. Pr.: MATH 221.

**MATH 591. Topics in Mathematics for Teachers.** (1–3) I, II, S. Topics of importance for teachers of mathematics. May be repeated for credit. Pr.: Consent of instructor.

**MATH 615. Advanced Engineering Mathematics I.** (3) I. Vector calculus; higher dimensional calculus; topics in ordinary differential equations; complex analysis. Pr.: MATH 240 and 551.

**MATH 616. Advanced Engineering Mathematics II.** (3) II. Fourier series; Fourier and Laplace transforms; basic partial differential equations; basic calculus of variations. Pr.: MATH 240 and 615.

**MATH 630. Introduction to Complex Analysis.** (3) I, II. Complex analytic functions and power series, complex integrals. Taylor and Laurent expansions, residues, Laplace transformations, and the inversion integral. Pr.: MATH 240.

**MATH 632. Elementary Partial Differential Equations.** (3) I. Orthogonal functions, Fourier series, boundary value problems in partial differential equations. Pr.: MATH 240.

**MATH 633. Advanced Calculus I.** (3) I. Functions of one variable; limits, continuity, differentiability, Riemann-Stieltjes integral, sequences, series, power series, improper integrals. Pr.: MATH 222.

**MATH 634. Advanced Calculus II.** (3) II. Functions of several variables; partial differentiation and implicit function theorems, curvilinear coordinates, differential geometry of curves and surfaces, vectors and vector fields, line and surface integrals, double and triple integrals, Green's Theorem, Stokes' Theorem, and Divergence Theorem. Pr.: MATH 633.

**MATH 640. Ordinary Differential Equations I.** (3) I. First order equations and applications, second order equations and oscillation theorems, series solutions and special functions, Sturm-Liouville problems, linear systems, autonomous systems and phase place analysis, stability, Liapunov's method, periodic solutions, perturbation and asymptotic methods, existence and uniqueness theorems. Pr.: MATH 240.

**MATH 641. Ordinary Differential Equations II.** (3) II. Continuation of MATH 640. Pr.: MATH 640.

**MATH 655. Elementary Numerical Analysis I.** (3) I. Error analysis, root finding, interpolation, approximation of functions, numerical integration and differentiation, systems of linear equations. Pr.: MATH 221, a computer language, and either MATH 515 or 551.

**MATH 656. Elementary Numerical Analysis II.** (3) II. A continuation of MATH 655. Linear programming, numerical solutions of differential equations, and the use of standard packages for the solutions of applied problems. Pr.: MATH 655 and 240.

**MATH 670. Mathematical Modeling.** (3) Introduction of modeling procedures. Case studies in mathematical modeling projects from physical, biological, and social sciences. Pr.: Four mathematics courses numbered 500 or above.

**MATH 689. Combinatorial Analysis.** (3) II, in alternate years. Permutations, combinations, inversion formulas, generating functions, partitions, finite geometries, difference sets, and other topics. Pr.: MATH 512.

## Graduate Credit

**MATH 700. Set Theory and Logic.** (3) An introduction to logic, mathematical proof, and elementary set theory; elementary logic, the basic constructions of set theory, relations, partitions, functions, cartesian products, disjoint unions, orders, and a construction of the natural numbers; also ordinal and cardinal numbers, the Axiom of Choice, and transfinite induction. Special emphasis will be given to proving theorems.

**MATH 701. Elementary Topology I.** (3) I. Introduction to axiomatic topology including a study of compactness, connectedness, local properties, separation axioms, and metrizability. Pr.: Math 633.

**MATH 702. Elementary Topology II.** (3) Path connectedness, fundamental groups, covering spaces, introduction to topological and differentiable manifolds. Pr.: MATH 701.

**MATH 704. Introduction to the Theory of Groups.** Introduction to abstract group theory; to include permutation groups, homomorphisms, direct products, Abelian groups. Jordan–Holder and Sylow theorems. Pr.: MATH 512.

**MATH 706. Theory of Numbers.** (3) II. Divisibility, congruences, multiplicative functions, number theory from an algebraic viewpoint, quadratic reciprocity, Diophantine equations, prime numbers. Pr.: MATH 221 and either 511 or 512.

**MATH 710. Introduction to Category Theory.** (3) Categories, duality, special morphisms, functors, natural transformations, limits and colimits, adjoint situations, and applications. Pr.: MATH 701 and MATH 730.

**MATH 711. Category Theory.** (3) Set-valued functors and concrete categories, factorization structures, algebraic and topological functors, categorical completions, Abelian categories. Pr.: MATH 710.

**MATH 713. Advanced Applied Matrix Theory.** (3) II. A development of the concepts of eigenvalues by considering applications in differential equations and quadratic forms. A discussion of the Jordan canonical form, functions of matrices, vector and matrix norms, and various related numerical methods. Pr.: MATH 551 or 515.

**MATH 721. Analysis I.** (3) I, II, S. Metric spaces, limits, continuity, sequences and series, connectedness, compactness, Baire category, uniform convergence, theorems of Stone-Weierstrass and Arzela. Pr.: MATH 240 or graduate standing.

**MATH 722. Analysis II.** (3) II. Lebesgue and Riemann-Stieltjes integration on the real line, differentiation on the real line, elementary transcendental functions. Pr.: MATH 721.

**MATH 730. Abstract Algebra I.** (3) Groups, rings, fields, vector spaces and their homomorphisms. Elementary Galois theory and decomposition theorems for linear transformations on a finite dimensional vector space. Pr.: MATH 512 or consent of instructor.

**MATH 731. Abstract Algebra II.** (3) II. Continuation of MATH 730. Pr.: MATH 730 or consent of instructor.

**MATH 740. Calculus of Variation.** (3) On sufficient demand. Necessary conditions and the Euler-Lagrange equa-

tions. Hamilton-Jacobi theory, Noether's theorems, direct methods, applications to geometry and physics. Pr.: MATH 722 or equivalent.

**MATH 755. Dynamic Modeling Processes.** (3) Topics to include equilibrium and stability, limit circles, reaction-diffusion, and shock phenomena, Hopf bifurcation and cusp catastrophes, chaos and strange attractors, bang-bang principle. Applications from physical and biological sciences and engineering. Pr.: MATH 240 and 551.

**MATH 772. Elementary Differential Geometry.** (3) Curves and surfaces in Euclidean spaces, differential forms and exterior differentiation, differential invariants and frame fields, uniqueness theorems for curves and surfaces, geodesics, introduction to Riemannian geometry, some global theorems, minimal surfaces. Pr.: MATH 240.

**MATH 791. Topics in Mathematics for Secondary School Teachers.** (3) Topics of importance in the preparation of secondary school teachers to teach modern mathematics. May be repeated for credit.

**MATH 801. Numerical Solution of Differential Equations I.** (3) I. Single and multistep methods for initial value problems for ordinary differential equations; discretization and round-off error; consistency, convergence, and stability of these methods; stiff equations and implicit methods; two point boundary value problems; initial and boundary value problems for partial differential equations; finite difference methods; marching schemes for parabolic and hyperbolic problems; consistency, stability, convergence, and the Lax equivalence theorem; treatment of boundary conditions; boundary value problems for elliptic equations; relaxation, alternating direction, and strongly implicit iterative methods; nonlinear problems; finite element methods. Pr.: MATH 655 and knowledge of a programming language.

**MATH 802. Numerical Solution of Differential Equations II.** (3) II. Continuation of MATH 801. Pr.: MATH 801.

**MATH 810. Higher Algebra I.** (3) Theory of groups, theory of rings and ideals, polynomial domains, theory of fields and their extensions. Pr.: MATH 731.

**MATH 811. Higher Algebra II.** (3) Continuation of MATH 810. Pr.: MATH 810.

**MATH 821. Real Analysis I.** (3) I. Measurability, integration theory, regular Borel measures, the Riesz representation theorem, and Lebesgue measure in Euclidean spaces. Pr.: MATH 722.

**MATH 822. Real Analysis II.** (3) 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 821.

**MATH 825. Complex Analysis I.** (3) I. Holomorphic functions, harmonic functions, the Cauchy integral theorem, normal families and the Riemann mapping theorem, and the Mittag-Leffler theorem. Pr.: MATH 822 or consent of department.

**MATH 826. Complex Analysis II.** (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 825.

**MATH 852. Functional Analysis I.** (3) I, in alternate years. Topics to be selected from linear topological spaces, seminormed linear spaces, Banach spaces, Hilbert spaces, Banach algebras, spectral theory, harmonic analysis, and others. May be taken four times for a total of 12 credit hours. Pr.: MATH 822.

**MATH 853. Functional Analysis II.** (3) II, in alternate years. Continuation of Functional Analysis I. May be repeated for credit. Pr.: MATH 852.

**MATH 855. Methods of Applied Mathematics I.** (3) An introduction to the mathematical techniques of problem solving in the sciences and engineering. Construction of mathematical models; problem formulation, dimensional analysis and scaling; solution methods for differential equations and difference equations; methods for obtaining approximate solutions; regular and singular perturbations methods, asymptotic series, applications to specific equations and scientific problems. Pr.: MATH 630, 633 and 551.

**MATH 856. Methods of Applied Mathematics II.** (3) A continuation of MATH 855. Asymptotic expansion of integrals; the methods of stationary phase and steepest descent; summations of series, the Shanks transformation and the Pade fractions; boundary layer theory; the WKB and Langer approximations; the method of averaging and the method of multiple scales. Pr.: MATH 855.

**MATH 861. Numerical Analysis I.** (3) I. Topics covered may include elementary functional analysis relevant to numerical analysis; numerical solution of differential or integral equations; analysis of stability and convergence; numerical linear algebra including large-scale systems; approximation theory. Pr.: MATH 634 and 655.

**MATH 862. Numerical Analysis II.** (3) II. Continuation of MATH 861. Pr.: MATH 861.

**MATH 864. Theory of Ordinary Differential Equations I.** (3) I. the modern theory of ordinary differential equations including general theory and the theory of linear differential equations. Pr.: MATH 641, 722 and 731.

**MATH 865. Theory of Ordinary Differential Equations II.** (3) II. Continuations of MATH 864 to include nonlinear equations and differential equations in Banach spaces. Pr.: MATH 864.

**MATH 866. Partial Differential Equations I.** (3) I. Elliptic, parabolic, and hyperbolic partial differential equations of the second order. First order partial differential equations, characteristics. Linear and nonlinear hyperbolic systems, nonlinear elliptic equations. Pr.: MATH 634, 641.

**MATH 867. Partial Differential Equations II.** (3) II. Continuation of MATH 866. Pr.: MATH 866.

**MATH 871. 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 700 and 701.

**MATH 872. General Topology II.** (3) II. Compact spaces and compactification, uniform and proximity spaces, metric spaces and metrization, topology of $R^n$, function spaces, complete spaces, introduction to homotopy theory. Pr.: MATH 871.

**MATH 881. Differentiable Manifolds I.** (3) I. Differentiable structures, tangent bundles, tensor bundles, vector fields and differential equations, integral manifolds, differential forms, Stokes' Theorem, DeRham cohomology, Riemannian metrics, introduction to Lie groups, topics in algebraic topology from a differentiable viewpoint. Pr.: MATH 702.

**MATH 882. Differentiable Manifolds II.** (3) Continuation of MATH 881. Pr.: MATH 881.

**MATH 896. Topics in Mathematics.** (Var.) I, II, S. Pr.: Background of courses needed for topic undertaken and consent of instructor.

**MATH 897. Seminar in Mathematics Education.** (1–3) II, S.

**MATH 898. Master's Research.** (Var.) I, II, S. Pr.: Consent of instructor.

**MATH 899. Thesis Topics.** (Var.) I, II, S.

**MATH 910. Universal Algebra I.** (3) I. Topics include congruences, homomorphisms and isomorphisms, direct and subdirect products, varieties, Birkhoff's theorem, and the Mal'cev conditions. In addition, special topics will be selected from Stone duality, ultra products, Boolean products, and connections with model theory. Pr.: MATH 811.

**MATH 911. Universal Algebra II.** (3) II. Continuation of MATH 910. Pr.: MATH 910.

**MATH 914. Lattice Theory I.** (3) I, in alternate years. Posets, quantum logics, orthocomplemented, orthomodular, and Boolean lattices; the concepts of atomicity, completeness, reducibility, modularity, M-symmetry, O-symmetry, distributivity, algebraic coordinatization, and specific realization. Pr.: Consent of instructor.

**MATH 915. Lattice Theory II.** (3) II, in alternate years. Continuation of MATH 914.

**MATH 920. Theory of Groups.** (3) I. Group representations and group characters, transfer, signalizer functors, theory of pushing-up, groups of Lie type, (B,N)-pairs, chamber systems and buildings, sporadic simple groups, amalgam methods, Bass-Serre theory. Pr.: MATH 811.

**MATH 925. Group Representations and Character Theory I.** (3) I. The basic topics in representation theory are covered: Schur's Lemma, irreducibility, class functions, characters, orthogonality relations, Frobenius-Schur theorem, induced characters and Frobenius reciprocity, Mackey's theorem, Clifford's theorem, exceptional characters and applications to group orders, generalized characters and Brauer's characterizations of characters. Pr.: MATH 811.

**MATH 926. Group Representations and Character Theory II.** Depending on the interests of the students, topics may be chosen from the following: modular representations, Brauer's theory of blocks, characters of the linear groups, homologically induced representations, representations of complex Lie algebras. Pr.: MATH 925.

**MATH 971. Algebraic Topology I.** (3) I. Homotopy groups, covering spaces, fibrations, homology, general cohomology theory and duality, homotopy theory. Pr.: MATH 702 and 811.

**MATH 972. Algebraic Topology II.** (3) II. Continuation of MATH 971. Pr.: MATH 971.

**MATH 973. Low-Dimensional Topology I—Geometric Topology.** (3) I. Manifolds, triangulations, differentiable structures, wild vs. tame embeddings, the Jordan Curve theorem, Schonflies Theorems, the classification of compact surfaces, Dehn's Lemma, the Triangulation Theorem and Huaptvermutung in dimensions 2 and 3, introduction to knot theory: knot groups, the Alexander polynomial, and related topics. Pr.: MATH 872 or 881.

**MATH 974. Low-Dimensional Topology II—Quantum Topology.** (3) II. Artin's braid groups, Markov's Theorem, the Jones Polynomial and its generalizations, state-sum invariants of knots and manifolds, skein-relations, quantum groups and categories of tangles, topological quantum field theories. Pr.: MATH 973 or consent of instructor.

**MATH 991. Topics in Algebra.** (3) On sufficient demand. Selected topics in modern algebra. May be repeated for credit. Pr.: Consent of instructor.

**MATH 992. Topics in Analysis.** (3) On sufficient demand. Selected topics in modern analysis. May be repeated for credit. Pr.: Consent of instructor.

**MATH 993. Topics in Harmonic Analysis.** (3) On sufficient demand. Selected topics in harmonic analysis. May be repeated for credit. Pr.: Consent of instructor.

**MATH 994. Topics in Applied Mathematics.** (3) On sufficient demand. Selected topics in applied mathematics. May be repeated for credit. Pr.: Consent of instructor.

**MATH 995. Topics in Geometry.** (3) On sufficient demand. Selected topics in geometry. May be repeated for credit. Pr.: Consent of instructor.

**MATH 996. Topics in Topology.** (3) On sufficient demand. Selected topics in topology. May be repeated for credit. Pr.: Consent of instructor.

**MATH 997. Topics in Number Theory.** (3) On sufficient demand. Selected topics in number theory. May be repeated for credit. Pr.: Consent of instructor.

**MATH 999. Research in Mathematics.** (Var.) I, II, S. Pr.: Sufficient training to carry on the line or research undertaken and consent of instructor. Pr.: Consent of instructor.

# Modern Languages

**Head**

**Bradley A. Shaw,** Associate Professor of Spanish. Ph.D. 1974, University of New Mexico. Latin American Fiction, Hispanic Literary Bibliography, Translation Studies.

**Professors**

**Robert T. Corum,** Professor of French. Ph.D. 1975, University of Virginia. Seventeenth-Century French Literature, Baroque Lyric Poetry.

**Claire L. Dehon,** Professor of French. Ph.D. 1973, University of Kansas. Nineteenth-Century French Literature, French Symbolism, Literature of French Africa.

**Michael Ossar,** Professor of German. Ph.D. 1973, University of Pennsylvania. Anarchism and Expressionism, Jahrhundertwende, Post-War German Literature.

**Associate Professors**

**Loren R. Alexander,** Associate Professor of German and Secondary Education. Ph.D. 1971, Michigan State University. Nineteenth and Twentieth-Century German Literature; Foreign Language Instruction.

**Douglas K. Benson,** Spanish. Ph.D. 1973, University of New Mexico. Twentieth-Century Spanish Literature, Contemporary Spanish•American Literature, Literary Theory, Foreign Language Instruction.

**C. Lucia Garavito,** Spanish. Ph.D. 1982, University of Kansas. Contemporary Latin American Theatre, Spanish American Prose Fiction, Literary Theory.

**Walter F. Kolonosky,** Russian. Ph.D. 1972, University of Kansas. Twentieth-Century Russian Literature, Literary Theory.

**Betty R. McGraw,** French. Ph.D. 1988, University of Paris. Critical Theory, Semiotics, Twentieth-Century French Literature.

**George C. Tunstall,** German and Classical Languages. Ph.D. 1968, Princeton University. German Lyric Poetry, Jahrhundertwende, Philosophy and Literature.

**Assistant Professors**

**Maureen Ihrie,** Assistant Professor of Spanish. Ph.D. 1980, Bryn Mawr College. Cervantes, Golden Age Literature, Picaresque Genre.

**Carol L. Miller,** Assistant Professor of German. Ph.D. 1963, Washington University, St. Louis. History of German Language, Older Germanic Literatures.

**Salvador A. Oropesa,** Assistant Professor of Spanish. Ph. D. 1990, Arizona State University. 19th-20th Century Spanish Literature, Spanish and Spanish American Narrative, Literary Theory.

**Silvia Sauter,** Spanish. Ph.D. 1988, University of Texas-Austin. Twentieth-Century Spanish American Fiction, Literary Theory.

## Program description

The graduate program in modern languages offers the M.A. degree in French, German, and Spanish, with two optional areas of emphasis: literature and language acquisition.

### Literature

The program is designed to help the student attain a high level of skills proficiency in all aspects of the chosen language; learn how to read, analyze, interpret, and discuss in an intelligent manner a wide selection of works in the chosen language; and to synthesize the material read into an accurate and coherent picture of the literary and cultural developments of the chosen language-speaking area. Selected classes are available in the afternoon or evening and during the summer. This degree is recommended for those students who wish to continue graduate work elsewhere, with the intention of teaching at the secondary or university level, or for students who prefer to develop their skills in language and literature in preparation for other careers.

In the literature option students may choose to complete the degree with a minimum of 24 hours of graduate courses and a thesis (typically 60–80 pages in length), they may complete 30 hours and produce a written report on a topic in the major field with evidence of other scholarly work such as term papers, or they may complete a minimum of 30 hours of graduate course work including such evidence of scholarly effort as term papers.

### Language acquisition

The program is designed to meet the needs of practicing and potential secondary school teachers. It is intended to enhance language skills, cultural awareness, and general humanistic development; encourage new patterns and techniques of teacher preparation and teacher/student interaction in the classroom; narrow the traditional gap in graduate study between teaching methodology and the content areas of literature and culture; facilitate the professional certification of prospective teachers; and encourage professional development and communication in the field. Emphasis is given to the integration of linguistic, cultural, literary, and methodological concepts that may have direct application in the classroom. Selected courses are available in the late afternoon or evening via a telephone communications system, thus making it possible for a practicing teacher to participate in class discussions using special equipment at home. Summer credits are also offered through on-campus offerings.

In the language acquisition option, students complete the degree with a minimum of 24 hours of graduate course work (as outlined in the special list of classes for this degree) and a thesis that applies the integration of cultural, literary, and methodological components to the language classroom.

### Final examinations

In both program options a final comprehensive written and oral examination is required at the completion of work. This exam is tailored to the particular M.A. option. It generally takes two years to complete the M.A. program in literature. Practicing teachers who typically take only one course per semester may need an additional year or two to complete the option in language acquisition.

### Teaching support

The Department of Modern Languages prides itself on the excellence of its teaching staff, and it considers one of its most important goals that of training outstanding future teachers. The faculty work closely both with on-campus teaching assistants and practicing teachers to ensure the maximum benefit from the program.

### Careers

Graduates in modern languages may also wish to pursue careers in textbook publishing, consultation in multimedia language programs, educational graphics, translation and editing, educational foundations, educational travel, and educational administration. Some of these career fields require additional specialized training. The knowledge of a language, culture, and literature at this level can also be combined with other fields journalism, ecology, theology, music and art, film, library science, and trade organizations.

### Special programs and activities

We offer a summer program in Cuernavaca, Mexico, and participate in full-year exchange programs in Giessen, Munich, and Zurich. The university has an agreement with the University of Costa Rica and connections to a number of study abroad programs including International Students Exchange Program. The department co-sponsors the publication of *Studies in Twentieth Century Literature*, a scholarly journal devoted to the study of literature written in French, German, Russian, and Spanish. Graduate students in German may qualify for substantial scholarships in a recently expanded program for study in selected universities of Austria, Germany, or Switzerland.

In 1988 and 1991 the department received major grants from the National Endowment for the Humanities to conduct a year-long institute for secondary-school foreign-language teachers. Through these Institutes, our faculty developed considerable expertise in the integration of language, culture, and literature in secondary instruction. A considerable amount of the course work was carried out using a telecommunications system provided by the Regents TELEnet system located in the Educational Communications Center on campus. The department also cooperates with ECC staff in the development of Spanish and French courses which are transmitted by satellite to high schools all over the United States.

### Financial support

A limited number of graduate teaching assistantships is available that offer the opportunity of teaching university-level courses under close pedagogical supervision. Appointments may be partial (teaching two courses per year) or full-time (three courses per year). All full-time GTAs receive a 100 percent tuition waiver. Those who have partial appointments will receive a tuition reduction. GTAs must be enrolled in a minimum of 6 hours of classwork per semester to qualify. Except in unusual circumstances, GTAs are expected to enroll in 9 hours. Assistantships are normally renewable for a period of two years, assuming satisfactory teaching performance and progress toward the degree.

### Admission

Most incoming students have undergraduate degrees in the particular language or in teaching, although we also may accept on a provisional basis those students who have considerable expertise in the language and culture in other ways, e.g., native speakers or U. S. citizens with extensive travel, living, and educational experience abroad.

We do not require the GRE examination for admission. Graduate applications to begin study in the fall must be received in our office by March 1, and by October 1 for the spring. Depending on the language you wish to study, assistantships may or may not be available

after this date. Application forms and other information may be requested from:

Coordinator, Graduate Programs
Department of Modern Languages
Eisenhower Hall 104
Kansas State University
Manhattan, KS 66506–1003

All international students must provide evidence of financial support. International students who do not have a degree from a university in the U.S. must submit a minimum TOEFL score of 560 before they will be admitted to any graduate program at K-State. International students who apply for a teaching assistantship must attain a minimum score of 240 on the Test of Spoken English as well. We do have assistance on campus in July and August to help applicants reach this TSE speaking score should they need. It is in the applicant's best interest to take both the TOEFL and the TSE early if possible.

### Modern languages courses

Courses at the 500 level may not be included in the M. A. program of study unless they are in a language or discipline other than the candidate's major field.

### Taught in English

#### Undergraduate and graduate credit in minor field

**FREN 502. French Literature in Translation.** (3) Selected readings in English from the works of such major French authors as Flaubert, Zola, Sartre, Camus, and Ionesco.

**GRMN 503. German Literature in Translation.** (3) Selected readings in English from such major German authors as Mann, Brecht, Hesse, Grass, and Kafka.

**LATIN 501. Classical Literature in Translation.** (3) Selected readings in English from the works of such major classical authors as Homer, Euripides, Vergil, Horace, and Terence.

**MLANG 507. European Literature in Translation.** (3) Selected readings in English from the major authors of Europe and the Spanish-speaking world.

**RUSSN 504. Russian Literature in Translation: The Nineteenth Century.** (3) Survey of the principal writers of tsarist Russia with emphasis upon Turgenev, Dostoevsky, Tolstoy, and Chekhov.

**RUSSN 508. Russian Literature in Translation: The Soviet Period.** (3) The development of Russian literature since the Revolution, with emphasis upon Mayakovsky, Sholokov, Pasternak, and Solzhenitsyn.

**SPAN 505. Spanish Literature in Translation.** (3) Selected readings in English from the works of such major Spanish and Latin American authors as Garcia Lorca, Borges, Neruda, and García Marquez.

#### Graduate credit

**MLANG 800. Colloquium in Modern Languages.** (2) A graduate colloquium for M. A. candidates in French, German, and Spanish. Variable topics in literary and cultural fields appropriate to study in common by students in these languages.

### French

#### Undergraduate and graduate credit in minor field

**FREN 502. French Literature in Translation.** (3) Selected readings in English from the works of such major French authors as Flaubert, Zola, Sartre, Camus, and Ionesco.

**FREN 510. Modern French Culture.** (2) French culture since World War II with special emphasis on social, economic, historical, and artistic developments of that period. Taught in English.

**FREN 511. Masterpieces of French Literature I.** (3) The reading and discussion of major works of French literature from the Middle Ages to the end of the eighteenth century.

**FREN 512. Masterpieces of French Literature I.** (3) The reading and discussion of major works of French literature from the early nineteenth century to the present.

**FREN 513. French Composition and Conversation.** (3) Review in depth of the structure of the language. Intensive practice in written and conversational French.

**FREN 514. French Civilization.** (3) Introduction to French culture with special emphasis on social and historical developments since World War II.

**FREN 516. Readings in French.** (3) Practice in reading a variety of literary, journalistic, and specialized texts.

**FREN 517. Commercial French.** (3) Advanced grammar necessary for adequate oral and written expression in international business and diplomatic situations, including specialized terminology, conversation and discussion, and translation.

**FREN 518. Advanced French Conversation.** (3) Practice in spoken French, with emphasis on idiomatic expression. Course not open to students whose primary language is French and whose competence has been demonstrated in the language at this level. May be repeated once for credit.

#### Undergraduate and graduate credit

**FREN 709. Medieval French Literature.** (3) An introduction to literary forms, style, and thought from the eleventh century to the fifteenth century in France. Readings in modern French include Chanson De Roland, Chretien de Troyes, Roman de la Rose, etc.

**FREN 710. Sixteenth-Century French Literature.** (3) Reading and discussion of selected prose and poetry of the French Renaissance.

**FREN 711. Seventeenth-Century French Literature I.** (3) Various literary forms of the French baroque period. Reading of representative texts by Corneille, Pascal, Descartes, and others.

**FREN 712. Seventeenth-Century French Literature II.** (3) Various literary forms of the French classical period. Reading of representative texts by Moliere, Racine, Lafayette, La Fontaine, and others.

**FREN 713. Eighteenth-Century French Literature.** (3) Critical study of the literature of the Enlightenment.

**FREN 714. Nineteenth-Century French Literature I.** (3) A study of preromanticism and romanticism.

**FREN 715. Nineteenth-Century French Literature II.** (3) A study of realism, naturalism, and symbolism.

**FREN 716. Twentieth-Century French Literature I.** (3) The study of major themes and trends in the novel, drama, and poetry as reflected in representative works of such authors as Proust, Mauriac, Cocteau, Claudel, Valery, and others.

**FREN 717. Twentieth-Century French Literature II.** (3) Reading and analysis of recent innovations in literary theory and practice as found in the works of such authors as Sartre, Camus, Beckett, Ionesco, Robbbe-Grillet, Sarraute, and others.

**FREN 718. The French Novel.** (3) The development of the novel from the seventeenth century to the present, seen through selected masterworks.

**FREN 719. Advanced Spoken and Written French.** (3) An advanced, intensive study of French prose style. Introduction to the techniques of translation from English to French. Intensive practice in oral style and diction.

**FREN 720. Seminar in French.** (3) A seminar with variable topics.

**FREN 799. Problems in Modern Languages.** (Var.)

#### Graduate credit

**FREN 899. Research in Modern Languages.** (Var.)

### German

#### Undergraduate and graduate credit in minor field

**GRMN 503. German Literature in Translation.** (3) Selected readings in English from such major German authors as Mann, Brecht, Hesse, Grass, and Kafka.

**GRMN 521. Introduction to German Literature I.** (3) Literary movements of the nineteenth century are introduced through the reading and discussion of texts in various forms and by representative authors.

**GRMN 522. Introduction to German Literature II.** (3) Discussion of significant works of twentieth-century prose, poetry, and drama. Special emphasis is placed on the literature of recent decades.

**GRMN 523. German Composition.** (3) A study of German syntax and exercises in composition.

**GRMN 524. German for Reading Knowledge I.** (3) The grammar and sytax of German and the reading of basic material selected from modern German texts.

**GRMN 525. German for Reading Knowledge II.** (3) Continued reading of material from modern German texts.

**GRMN 526. Business German.** (3) Advanced grammar necessary for adequate oral and written expression in international business and diplomatic situations, including specialized terminology, conversation and discussion, and translation.

**GRMN 527. Advanced German Conversation.** (3) Intensive practice in conversation.

**GRMN 530. German Civilization.** (3) The political and cultural development of the German-speaking people and their role and influence in the history of the Western world.

#### Undergraduate and graduate credit

**GRMN 721. German Classicism.** (3) Reading and discussion of late eighteenth-century texts, including works by Goethe, Schiller, Hoelderlin, etc.

**GRMN 722. German Romanticism.** (3) A study of representative works of German romantic literature by such authors as Schlegel, Tieck, Eichendorff, Novalis.

**GRMN 723. Goethe and Faust.** (3) The writings of Goethe and his masterpiece, Faust.

**GRMN 724. German Prose and Drama of the Nineteenth Century.** (3) A consideration of post-romantic German literature with special emphasis on the novella. Authors including Grillparzer, Keller, and Meyer are discussed.

**GRMN 725. Early Twentieth-Century German Literature.** (3) A study of the drama and lyric of naturalism, neoclassicism, neo-romanticism, and expressionism.

**GRMN 726. German Literature since 1945.** (3) A discussion of the postwar writings of the Gruppe 47, Swiss playwrights, and others.

**GRMN 727. The Modern German Novel.** (3) Theory of the German novel with examples from authors such as Mann, Hesse, Grass, and others.

**GRMN 728. History of the German Language.** (3) A study of the development of the sounds, forms and syntax of standard German.

**GRMN 729. Seminar in German.** (3) A seminar with variable topics, including literature of social and political protest, Austrian and Swiss literature, literature of the Middle Ages, emigre literature, etc.

**GRMN 731. Advanced Spoken and Written German.** (3) Intensive practice in conversation and diction, with considerable practice in the writing of essays in German.

**GRMN 732. Methods in German Literary Criticism.** (3) Introduction to the various theories of literary analysis. Interpretation of representative German texts.

**GRMN 733. The Enlightenment and Storm and Stress.** (3) A study of representative texts from various movements in German literature and culture of the eighteenth century,

including Empfindsamkeit and Rococo. Such authors as Gottsched, Klopstock, Lessing, Lichtenberg, Wieland, and the young Goethe and Schiller will be discussed.

**GRMN 734. Literature of the German Democratic Republic.** (3) A study of the literary developments within the German Democratic Republic. The course will consider the writers' role in a socialist society and their impact upon the cultural scene. Readings will include representative works from all genres.

**GRMN 740. German Literature in Second-Language Learning.** (3) Analysis of literary texts from German-speaking countries within their cultural context. The development of interpretive skills and application to the German curriculum will be emphasized.

**GRMN 741. German Culture in Second-Language Learning.** (3) Emphasis on the study of German culture and application to German curriculum including the development of materials.

**GRMN 799. Problems in Modern Languages.** (Var.)

### Graduate credit

**GRMN 899. Research in Modern Languages.** (Var.)

## Latin

### Undergraduate and graduate credit in minor field

**Latin 501. Classical Literature in Translation.** (3) Selected readings in English from the works of such major classical authors as Homer, Euripides, Vergil, Horace, and Terence.

## Linguistics

### Undergraduate and graduate credit in minor field

**LG 730. Foundations of Semiotics.** (3) The general theory of signs; detailed classification of signs and examination of several semiotic systems such as language, literature, culture, and society. The semiotics of communication and signification.

**LG 600. Principles of Linguistics.** (3) Same as LING 600 and ENGL 600.

**LG 601. General Phonetics.** (3) Same as LING 601 and ENGL 601.

**LG 602. Historical Linguistics.** (3) Same as LING 602 and ENGL 602.

**LG 603. Topics in Linguistics.** (3) Same as LING 603 and ENGL 603.

**LG 783. Phonology I.** (3) Same as LING 783 and ENGL 783.

**LG 785. Syntax I.** (3) Same as LING 785 and ENGL 785.

**LG 792. Field Methods in Linguistics.** (3) Same as LING 792.

## Russian

### Undergraduate and graduate credit in minor field

**RUSSN 504. Russian Literature in Translation: The Nineteenth Century.** (3) Survey of principal writers of Tsarist Russia with emphasis upon Turgenev, Dostoevsky, Tolstoy, and Chekhov.

**RUSSN 508. Russian Literature in Translation: The Soviet Period.** (3) The development of Russian literature since the Revolution, with emphasis upon Mayakovsky, Sholokhov, Pasternak, and Solzhenitsyn.

**RUSSN 551. Russian V.** (3) Reading of Russian short stories of the nineteenth and twentieth centuries, including works by Pushkin, Lermontov, Dostoevsky, and Chekhov.

**RUSSN 552. Survey of Russian Literature.** (3) A history of Russian literature from its beginnings until the present, with emphasis on the works of the nineteenth century, including those of Pushkin, Lermontov, Gogol, Turgenev, Dostoevsky, and Tolstoy.

**RUSSN 553. Russian Conversation and Composition.** (3) Discussion in Russian. Extensive practice in writing Russian compositions.

## Spanish

### Undergraduate and graduate credit in minor field

**SPAN 505. Spanish Literature in Translation.** (3) Selected readings in English from the works of such major Spanish and Latin American authors as García Lorca, Borges, Neruda, and García Márquez.

**SPAN 563. Introduction to the Literature of Spanish America.** (3) Reading and analysis of representative works of Spanish–American literature from the colonial period to the present.

**SPAN 564. Spanish Composition and Grammar.** (3) The grammar and syntax of modern Spanish.

**SPAN 565. 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 field.

**SPAN 566. Hispanic–American Civilization.** (3) Survey of Spanish-American culture and civilization from 1492 to the present.

**SPAN 567. Introduction to the Literature of Spain.** (3) Reading and analysis of representative works of Spanish literature from its beginnings to the present.

**SPAN 571. Advanced Spanish Conversation.** (3) Intensive practice in conversation.

**SPAN 573. Business Spanish.** (3) Advanced grammar necessary for adequate oral and written expression in international business and diplomatic situations, including specialized terminology, conversation and discussion, and translation.

**SPAN 574. Hispanic Readings.** (3) Practice in reading a variety of literary, journalistic, and specialized texts.

### Undergraduate and graduate credit

**SPAN 751. Spanish–American Narrative to 1950.** (3) Development of the narrative in Spanish America from the colonial period to the mid-twentieth century. Analysis and discussion of representative authors from various regions.

**SPAN 752. Contemporary Spanish–American Narrative.** (3) Analysis and discussion of the narrative since approximately 1950, including such outstanding writers as Borges, Cortázar, Fuentes, García Márquez, and Vargas Llosa.

**SPAN 755. Spanish-American Poetry and Drama.** (3) Analysis and discussion of Spanish-American poetry and drama, with emphasis on the twentieth century. Readings of selected major poets and leading playwrights from various regions of Spanish America.

**SPAN 756. Nineteenth-Century Spanish Literature.** (3) The reading and study of nineteenth-century Spanish literature: drama, essay, novel, poetry, and short story. Such authors as Larra, Zorrilla, el Duque de Rivas, Espronceda, Tamayo y Baus, Echegaray, Bécquer, and Pérez Galdós will be discussed.

**SPAN 757. Pérez Galdós and the Generation of '98.** (3) Readings and analysis of works by Benito Pérez Galdós and such members of the Generation of '98 as Unamuno, Benavente, and Machado, within the historical and cultural framework of the late nineteenth and early twentieth centuries.

**SPAN 760. Advanced Spoken and Written Spanish.** (3) Intensive review of grammatical structure and refinement of standard Spanish usage. Extensive practice in composition and conversation, and translation from English into Spanish.

**SPAN 761. Medieval and Renaissance Literature.** (3) Reading and interpretation of the principal literary works of Medieval and Renaissance Spain, from the jarchas and the Poema de Mío Cid to the crónicas and La Celestina, studied within the historical and cultural content of each.

**SPAN 763. Twentieth-Century Spanish Literature.** (3) The major writers and directions of twentieth-century literature in Spain. Analysis and discussion of the works of such representative authors as Unamuno, Jiménez, Guillén, Lorca, Cela, Buero Vallejo, and Delibes.

**SPAN 764. Spanish Literature of the Golden Age.** (3) Reading and analysis of the works of such major writers as Lope de Vega, Tirso de Molina, Calderón de la Barca, Garcilaso, Fray Luis de León, San Juan de la Cruz, Góngora, and Quevedo, as well as selected works from the picaresque tradition.

**SPAN 771. Introduction to Spanish translation.** (3) Translation theory and practice as applied to Spanish. Translations from Spanish to English and English to Spanish, involving unique problems related to science, business, reporting, and literature.

**SPAN 772. The Hispanic World Today.** (3) An investigation of selected social, political, and humanistic aspects of contemporary Hispanic culture.

**SPAN 775. Cervantes.** (3) Reading of the works of Cervantes and discussion of the literary and cultural background of the period.

**SPAN 777. Hispanic Cultures in Second-Language Learning.** (3) Emphasis on the study of Spanish culture and applications to the Spanish curriculum, including the development of materials.

**SPAN 778. Spanish and Spanish–American Literature in Second-Language Learning.** Analysis of literary texts from Spanish-speaking countries, with emphasis on the development of interpretive skills and application to the Spanish curriculum.

**SPAN 779. Seminar in Spanish.** A seminar with variable topics.

**SPAN 799. Problems in Modern Languages.** (Var.)

### Graduate credit

**SPAN 899. Research in Modern Languages.**

# Music

**Head**

**Jack A. Flouer,** D.M. 1971, Indiana University. (Trombone, baritone, tuba).

**Professors**

**Robert L. Edwards,** Chair, Keyboard Division, D.M.A. 1972, University of Oregon. (Piano, piano literature; host of the KKSU radio show, "Keyboard and Comment").

**Sara Funkhouser,** Director of Collegium Musicum, D.M. 1982, University of Missouri-Kansas City. (Medieval–Renaissance styles, oboe, bassoon, early winds, symphonic literature, chamber ensembles).

**T.Hanley Jackson,** KSU Composer-in-Residence, and Director of Styles Program, M.A. 1968, California State College at Long Beach. (20th-century styles, theory, composition, orchestration, electronic and computer music).

**Jerry R. Langenkamp,** Chair, Voice-Opera Division, D.M.A. 1970, University of Michigan. (Voice, opera theater).

**Jean C. Sloop,** D.M.A. 1975, Eastman School of Music. (Voice, diction, song literature).

**Mary Ellen Sutton,** D.M.A. 1975, The University of Kansas. (Baroque styles, organ, harpsichord, research interests include battle music of the 16th and 17th centuries, the music of J.S. Bach, and the music of Max Reger).

**Rodney G. Walker,** Director of Choral Activities and High School Choral Institute, M.M.E. 1961, Wichita State University. (Conducting).

**Associate professors**

**Alfred W. Cochran,** Chair, Wind and Percussion Division, Ph.D., 1986, Catholic University of America. (Styles {Textures of Music}, saxophone, flute, jazz history, film music, research interests include the music of Aaron Copland and the music of Gail Kubik).

**Jana Fallin,** Chair, Division of Music Education, Ph.D. 1979, University of Texas–Austin. (Elementary music education).

**David Littrell,** Director of Orchestras, D.M.A. 1979, University of Texas–Austin (Violoncello, double bass, viola da gamba, chamber music).

**Craig B. Parker,** Director of Graduate Studies in Music, Ph.D. 1981, University of California, Los Angeles. (Music history, theory, trumpet, horn, research interests include 19th and 20th century American music, especially Herbert L. Clarke and Ellen Taaffe Zwilich).

**Gerald S. Polich,** Director of K-State Singers, Men's Glee Club and Women's Glee Club, M.M.E. 1966, University of Colorado. (Music listening lab).

**Frank M. Sidorfsky,** D.M.A. 1974, Eastman School of Music. (Clarinet, flute, saxophone, woodwind methods, music fundamentals).

**Frank Tracz,** Director of Bands, Ph..D., 1975, Ohio State University. (Symphonic band, marching band).

**Assistant professors**

**Mary Lee Cochran,** D.M.A. 1984, Catholic University of America. (Flute, history of musical instruments, introduction to music).

**Cora Cooper,** D.M., 1992, Florida State University. (Classical era styles, violin, viola, string methods, chamber music).

**Jennifer Edwards,** M.M. 1970, University of Oregon. (Voice).

**Virginia Houser,** D.M.A. 1992, University of Oklahoma. (Piano, piano pedagogy, class piano).

**Gary Mortenson,** Director of Brass Ensembles, D.M.A. 1984, University of Texas–Austin. (Trumpet, brass methods, research interests include Charles Ives, Francis Poulenc, and Igor Stravinsky).

**David Royse,** Ph.D. 1989, Kent State University. (Music education, American music, introduction to music).

**James Strain,** Assistant Band Director, M.M. 1981, University of Cincinnati, College-Conservatory of Music. (Concert band, marching band, percussion, percussion ensemble, introduction to music).

**Instructors**

**Benjamin Rohrer,** Assistant Band Director and Director of Jazz Studies, M.M. 1984, Kansas State University. (Jazz bands, improvisation, marching band).

**William Wingfield,** M.M. 1983, Kansas State University. (Piano, accompanying, music theater).

**Assistant instructor**

**Chris Banner,** M.M. 1983, Kansas State University. (Instrument repair).

**Areas of emphasis**

*Bands:* Rohrer, Strain, Tracz
*Brass instruments:* Flouer, Mortenson, Parker
*Chamber music:* Cooper, Edwards, Funkhouser, Houser, Littrell, Mortenson, Strain
*Choral groups:* Polich, Walker
*Collegium musicum:* Funkhouser
*Composition:* Jackson
*Conducting:* Flouer, Littrell, Walker
*Early wind instruments:* Funkhouser
*Electronic studio:* Jackson
*Introductory courses for non-majors:* M.L. Cochran, Polich, Royse, Sidorfsky, Strain
*Jazz studies:* A.W. Cochran, Rohrer
*Keyboard instruments:* R. Edwards, Houser, Sutton, Wingfield
*Music education:* Fallin, Royse
*Music history and musicology:* A.W. Cochran, M.L. Cochran, R. Edwards, Funkhouser, Parker, Sutton
*Opera and musical theatre:* Langenkamp, J. Edwards, Wingfield
*Orchestras:* Littrell
*Percussion:* Strain
*String instruments:* Cooper, Littrell
*Styles (comprehensive musicianship):* A.W. Cochran, Cooper, J. Edwards,Funkhouser, Jackson, Sutton
*Theory:* Jackson, Parker, Sutton
*Voice:* J. Edwards, Langenkamp, Sloop
*Woodwind instruments:* A.W. Cochran, M.L. Cochran, Funkhouser, Sidorfsky

## Program

Kansas State University's graduate program in music is designed to furnish specialized professional training supported by competence in those fundamental areas needed by all musicians. Emphasis is placed on the personal growth and development of the student toward individual goals. The program is large enough to provide ample variety yet small enough to allow personal attention to each student. While students are given considerable responsibility in all phases of the educational program, faculty guidance is constantly available.

The Department of Music offers the master of music with specialization in the following areas: performance, performance with pedagogy emphasis, theory-composition, music education, and music history.

## Facilities

The Department of Music is housed in a handsome auditorium building, opened in 1970, with extensive additions in 1974. Ample classrooms, rehearsal halls, practice studios, and offices are supplemented by a small hall for chamber music and an 1,800-seat auditorium. The department owns four concert grand pianos, several studio grands, and a number of well-maintained practice uprights. Organs include a concert Austin (40 rks), a Bosch tracker (9rks), two Reuters (6rks and 17rks), and a Walker Continuo organ. An electronic studio centers around digital and analog synthesizers with ample supporting equipment. For the performance of early music, the department owns two harpsichords, a chest of matched viols, and assorted wind instruments.

The music division of Farrell Library, located nearby the Music Department, contains a growing reference and research collection fully adequate to master's level work, as well as an extensive collection of recordings. The Special Collections Division holds a number of rare items, from 16th century prints to one of the two largest collections of the manuscripts of Gail Kubik, world-renowned 20th-century composer. The Graduate Music Seminar-Study Room offers a place in the Music Department in which materials may be placed on reserve for easy, convenient availability to graduate students.

## Careers

In addition to enriching the quality of one's life, enhancing the understanding of other epochs and cultures, and providing outlets for self-expression, graduate study in music prepares students for a variety of professions. K-State's music alumni perform professionally with symphony orchestras, military bands, chamber music ensembles, opera and musical theatre companies, choral ensembles, jazz, rock, country, and bluegrass groups, in recording studios, and as soloists and accompanists. Others are active as composers of concert, commercial, liturgical, and/or educational music. K-State graduates also hold prominent positions in the fields of music education (pre-school through collegiate levels), private teaching, church music, music therapy, librarianship, and in the music industry. In addition, several K-State music graduates have used their arts degrees as preparation for professional schools such as law and medicine.

## Ensembles, organizations, and concerts

A full range of performing organizations and small ensembles provides the graduate student with a variety of performance opportunities. In vocal music, these include the Concert Choir, the Chamber Singers, the Collegiate Chorale, the Collegium Musicum, and the Opera Theater and Workshop; in instrumental music, opportunities include University Orchestra, the Symphonic Wind Ensemble, the Concert Band, and the Concert Jazz Ensemble. The Collegium Musicum provides performance of early music on authentic instruments. Chamber music flourishes in a number of small groups of various instrumentation.

The McCain Auditorium Performance Series brings to the campus large musical attractions, world-famous soloists, and chamber music, as well as dance troupes and drama companies. Faculty recitals expand the opportunities to hear performances of professional caliber.

## Degree options and requirements

Kansas State University offers the master of music degree with specialization possible in performance, performance with pedagogy emphasis, music education, theory-composition, and music history. The degree requires a minimum of 32 credit hours including a master's report (or recital) or a master's thesis. Music education majors may elect to take 36 credit hours without master's report or master's thesis.

### Core requirements

Theory and history-literature
11-12 hours, including MUSIC 702 and at least one seminar course. The Proficiency Examination will determine whether or not the student needs to take MUSIC 601, MUSIC 614, and MUSIC 615. See areas of specialization for further explanation.
MUSIC 801 Introduction to Graduate Study. 2.

## Requirements for individual areas of specialization

### Performance

Admission: Each student wishing to major in performance must audition in person or send a recording of a recent concert. The audition or audition recording must be of substantial length and include music from three different style periods. The audition must be approved by the faculty of the appropriate division. Prospective conducting majors will take an examination in sight singing, score reading, and conducting methods.

Core requirements as above with the following amplifications:

History-Literature hours must include:
For wind and percussion majors: 704
For conducting majors: 704 or 708
For string majors: 705
For voice majors: 706
For organ majors: 737
For piano majors: 738

Electives: 4 to 6 hours.

Major field: A minimum of 12 hours in the division of the student's major performance area, 8 hours of which must be individual instruction. The remaining 4 hours may be in pedagogy, methods, or ensemble. Voice majors who are found deficient in knowledge of foreign language diction will take 1 hour of diction.

Master's report (recital), 2 hours: All graduate students majoring in performance will perform a full recital of not less than one hour. The program for the recital must be approved by the student's advisory committee, and the advisory committee will judge the recital. All solo literature (including concertos) will be played from memory, unless the advisory committee grants an exception in recognition of unusual circumstances. The recital will be recorded and the recording bound, with supporting material, for presentation as a master's report. The student will also either (a) prepare substantial program notes of a historical and analytical nature, these notes to be bound with the recorded recital; or (b) present a lecture-recital on a major work not included on the master's recital, the lecture-recital to be recorded and bound with the master's recital. Under both options a and b, the project is to be done under supervision of the major professor or the director of graduate studies. The program notes or the lecture should demonstrate the student's ability to investigate and interpret the historical aspects of a work, to analyze style, and to use commendable English. The literary standards should be comparable to those required for the usual master's report. Under option b the student's choice of a work must be approved by his or her advisory committee.

Additional requirements and policies: students in areas in which ensemble performance plays an important role will be expected to take part in appropriate ensembles and organizations as determined in consultation with the student's advisory committee.

**Performance with pedagogy emphasis**
Differs from the performance specialization in the following:

Major field: 6 hours individual instruction; 3 hours Methods and Materials, including supervised practice teaching; 3 hours of MUSIC 805.

Master's report (recital): Should the student choose to write program notes (option a), these should include discussion of the pedagogical problems and values of the works. Should the student choose to present a lecture-recital (option b), this should be a musically-illustrated presentation on some aspect of pedagogy in his or her field.

In place of a master's recital, the student may write a master's report in the field of pedagogy. The student choosing this option will also play the equivalent of a half recital for the faculty of his or her performance division and advisory committee.

**History–literature**
Core requirements: as above.

Performance: Collegium Musicum, 2 hours.

Major field: 12 hours minimum, excluding 601 and including at least 9 hours from 830, 832, 834, 836, and 837.

Master's report, 2 hours.
or

Master's thesis, 6 hours (this option is open by permission to history majors who are not required to take 601 and who have a special interest in research.)

Electives: 2 to 8 hours.

Additional requirements: Reading knowledge of foreign language; German or French preferred, Latin or Italian acceptable.

Oral examination, in defense of thesis or report.

**Theory–composition**
Admission: Entrance to the program normally requires at least 26 undergraduate hours of theory-composition courses. The applicant should submit original scores to the composition faculty for approval.

Core requirements: as above with the following amplification: MUSIC 837 Seminar in 20th-Century Music is required.

Performance: One course (2 hours) in advanced conducting or score reading.

Major field: Total, 16 hours, as follows: 10 to 14 hours, including 802 (Seminar in Music Theory) or 804 (Advanced Analysis), and individual instruction in composition; and master's report, 2 hours or master's thesis, 6 hours. The report or thesis may be either a theoretical paper or a composition in a larger form with an accompanying report.

Electives: up to 6 hours.

Additional requirements and policies: The composition student must prove his or her proficiency in conducting and in electronic instrumentation, either by class study or by actual performance in the area.

All students receiving individual instruction in composition are required to copy their music in the prescribed professional manner.

Wherever possible, the composer should assume the responsibility of seeing to the performance of his or her own music.

**Music education**
Admission: An applicant in music education may arrange a personal audition or send a recording demonstrating ability in the major area of performance as part of the admission process. Those who do not do so will audition during the registration period.

Core requirements: same as above.

Performance: 4 hours individual instruction in the major performance area of the student's undergraduate study, or in a chosen secondary performance area, or in advanced conducting.

Major field:
Music education core: 805 and 808, 6 hours.

Music education electives: 6–7 hours, from 809, 811, and 814; not more than 2 hours of 811 or 814 may be counted.

Master's report, 2 hours. With the approval of the student's advisory committee and the graduate faculty of the area concerned, the requirements may be satisfied by one of the following:

1. A scholarly paper on some aspect of the student's major area of teaching;
2. An original composition of acceptable proportions, with an accompanying report;
3. A recital on the student's major instrument, the recital to be given under the conditions listed under the performance major;
4. Six additional semester hours of graduate courses in music education and/or related advanced courses in the field of music (e.g., art, drama, philosophy, psychology, statistics, education, etc.)

## Master's report or thesis

The master's report should demonstrate the student's ability to locate and gather information, to organize this information, and to interpret and evaluate it. While the subject need not be taken from a totally unexplored area, the master's report should reflect originality of thought and approach, and it must represent essentially the student's own work. The report is written with the guidance of the major professor. The director of graduate studies is the second reader and should be consulted early in the work. The other member of the advisory committee also reads the report and should be consulted well before the work is finished.

The master's thesis differs from the report only in the broader scope and greater length required.

Both the thesis and the report must be in clear and commendable English. The form and style should follow Richard Wingell's *Writing About Music: An Introductory Guide.* (Music education majors will use the *Publication Manual of the American Psychological Association*, third edition, instead.)

For discussion of the master's report (recital), see above under the performance specialization.

## Final examination

All candidates for the master of music degree are required to take a final written comprehensive examination. The total time of the examination is approximately six to seven hours.

The examination covers three general areas: the candidate's major field, history-literature, and theory. The emphasis is placed on material that has been stressed in the candidate's program of study. The candidate will be expected, however, to demonstrate breadth of knowledge in the field of music beyond that covered in course work, as well as the ability to relate his or her special area to other areas.

The responsibility for making up and evaluating the examination lies with the candidate's advisory committee. The final examination will be given twice during each semester, the dates to be announced no later that the second week of the semester.

## Problems courses

Not more than three hours in Problems in Music should ordinarily be applied to the master's degree except that two hours of Problems in Music may be applied to the master's report.

The purpose of the Problems in Music course is to provide opportunity for guided independent study in areas not included in regular course offerings. If scheduling difficulties have made it impossible for the student to take a needed or desired course, Problems in Music may be used to cover that subject matter.

## Symposium in music and workshops

MUSIC 811 Symposium in Music and the other short, concentrated workshop courses, designed especially for school music teachers and supervisors, are given during the summer session. Often these are taught by visiting musicians and educators of national prominence. The symposium and various workshops carry graduate credit, but only 2 hours of these courses may be applied toward the master's degree. Further information may be obtained from Professor Jana Fallin, Department of Music, McCain Auditorium, Kansas State University, Manhattan, KS 66506–4702.

## Admission

Applicants interested in the graduate program in music should send inquiries to Dr. Craig B. Parker, Director of Graduate Studies, Department of Music, McCain Auditorium, Kansas State University, Manhattan, KS 66506–4702.

Instructions for application will be enclosed with the application form, which the Department of Music will gladly furnish. The applicant should be sure that (1) each undergraduate or graduate institution previously attended sends one copy of the official transcript directly to the Music Department; (2) persons asked to write recommendations are told to send them to Dr. Craig B. Parker, Director of Graduate Studies, Department of Music, McCain Auditorium, Kansas State University, Manhattan, KS 66506–4702; and (3) a statement of the applicant's personal and professional goals is included.

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 the forms furnished by the university. International students must submit a health certificate as part of their application and report to Lafene Health Center during enrollment for a physical examination.

International students whose native language is not English must present a score of at least 600 on the Test of English as a Foreign Language in order to be admitted to the graduate program in music.

### Entrance requirements

To be considered for admission with full standing, the applicant must have:

1. A bachelor's degree from an approved institution.
2. Adequate preparation in the field of music: normally a B.M., B.M.E., B.S. in music education, B.A. in music, or the equivalent.
3. An undergraduate average of B or better in the junior and senior years.

If all of the foregoing requirements are not met, probationary admission may be considered provided there is other evidence that the applicant has the ability to do satisfactory graduate work. Such evidence might include a post-graduate record at another institution, scores on the Graduate Record Examination, or successful professional work.

Students may be admitted provisionally if there is uncertainty in evaluating transcripts.

Full standing for probationary or provisional students is attained automatically upon completion of at least 9 hours of work for graduate credit with a grade of B or better.

The Department of Music recommends that all entering students take the advanced music test of the Graduate Record Examinations. This test is most helpful if taken early enough for the scores to be evaluated as part of the admission process.

An application for admission to the Graduate School in the Department of Music ordinarily implies the student's intention to work toward an advanced degree. Students who do not plan to work toward an advanced degree, however, may be admitted as special students. Those who later wish to enter the degree program must undergo a full review. No more than 9 semester hours earned as a special student may be transferred into a regular degree program.

Admission to the Graduate School in the Department of Music does not necessarily imply admission to a particular program within the department. For special requirements, see the individual areas of emphasis.

### Residence requirements

Graduate School regulations require that candidates for the master's degree spend one academic year or its equivalent in residence. Candidates in music, however, are seldom advised to attempt completion of the master's degree in less than two semesters and one summer. Candidates who serve as graduate assistants or hold positions outside of their academic responsibilities are generally advised to take four semesters.

A summer session of six weeks may be regarded as slightly less than half a semester; a candidate whose work is confined to the summer, therefore, will usually require at least five summers, plus some independent work, for completion of the master's degree.

### Transfer credit

Graduate credit may be transferred from other accredited institutions if the grade is a B or better. Transfer of more than 6 hours requires special action; in no case may more than 10 hours be transferred.

### Course loads

No graduate student in music shall take more than 16 hours of credit in any semester. Students are not advised to take more than 6 hours during the six-week summer term. Graduate assistants may not take more than 12 hours in any semester and must take at least 6 hours.

### Registration

Registration procedures are outlined each semester in the Schedule of Classes and Enrollment Procedures. First-term graduate students may be required to come three days before the registration date for orientation and testing. The needed information will be communicated to each student in ample time by the Director of Graduate Studies.

All music graduate students will register through the office of the director of graduate studies.

### Proficiency tests

Before registration for the first term, each entering graduate student will take proficiency tests. The tests will consist of two sections, each section lasting approximately three hours.

1. History and literature.
a. Style analysis. The student will discuss the style of several recorded selections and scores and will tell the approximate date of composition of each.
b. Short-answer, factual information—the names and dates of composers.
and compositions; terminology, general information.
c. Essays on selected historical topics.

2. Theory.
a. Test of aural skills.

b. Harmonic analysis of a Baroque, Classic, or Romantic piano score.
c. Harmonization in free style from a lead sheet.
d. Composition of a three-voice fugue.
e. Piano proficiency. This test is approximately the equivalent of piano proficiency requirements at most undergraduate institutions. It is designed as a test of the students's ability to use the instrument, not as a test of public performance.

The results of the tests will be used in planning the most suitable program for each individual. If remedial work is indicated, this may be accomplished either by taking the proper undergraduate course or by doing independent study before reexamination. In most cases, remedial work can be successfully done without extending the residence time needed to complete the degree.

### Advisory committee

During the student's first semester (provided the student is taking 6 hours or more) the director of graduate studies shall, in consultation with the student, appoint for each student a major professor. The major professor will then organize an advisory committee consisting of himself or herself as chairman, the director of graduate studies, and one other faculty member.

The duties of the advisory committee will be (1) to meet with the student in the first or second term in order to formulate and approve the student's academic program; (2) to meet early in the student's second semester to review the student's work; (3) to offer counsel and advice to the student throughout his academic career and to approve such changes in his program as are agreed upon; (4) to advise the student in the selection of a topic for the master's thesis or report, or the program for master's recital, and to approve the final choice; (5) to act as the final reading committee of the master's thesis or report or judging committee for the student's final master's recital; (6) to serve as the examining committee for the student's comprehensive examination.

The initial organization of the advisory committee and the scheduling of its first meeting shall be the responsibility of the major professor; thereafter, the student has the responsibility for consultation with members of his committee and for obtaining the approval of the committee on appropriate matters.

### Student's program

During his or her second term in Graduate School, each student will, at some time before preregistration for the following term, meet with his major professor and, in consultation with other members of his advisory committee, plan his academic program. This program is entered on the official form which the student receives from the Graduate School office. When each of the members of the advisory committee and the head of the music department have signified approval by signing the completed form, the student will make enough copies for each member of his advisory committee to have one and will deliver all copies to the Graduate School Office.

The student is then responsible for following the program through his academic career, for obtaining approval from his advisory committee for any desired or needed changes, and for seeing to it that his major professor registers such changes with the Graduate School.

### Assistantships and financial aid

A limited number of graduate assistantships are available during the regular academic session. Assistantships are not available in the summer. These are given in specific areas, according to the needs of the department. Teaching assistants are normally needed in comprehensive musicianship, band, chorus, collegium musicum, orchestra, music appreciation, piano (accompanying and/or class and studio teaching), and voice (class and/or studio teaching). Other assistantships involve work in the Music Library, the instrument room, and various aspects of administration.

Full-time graduate assistantships require up to 16–20 hours a week. Such an appointment pays $6,000, plus a full tuition waiver. Part-time assistants work 8 to 10 hours per week and receive a yearly salary of $3,000, plus a 50 percent reduction of in-state fees.

Assistantships are awarded with the expectation that the student will spend two years in residence and that satisfactory performance of duties will bring renewal of the assistantship for a second year.

For students who are eligible, work-study may be available for a variety of jobs on the campus. Inquiries as to eligibility for work-study should be addressed to the Office of Student Financial Assistance, Kansas State University, Manhattan, KS 66506–1104.

For additional information, please contact:
Dr. Craig B. Parker
Director of Graduate Studies in Music
McCain Auditorium
Kansas State University
Manhattan, KS 66506–4702
913-532-5740

## Music courses

## Graduate credit

### Courses in music history, literature, and theory

**MUSIC 570. Musical Comedy.** (3) On sufficient demand. The history of operetta and music comedy from Offenbach to the present. Offered jointly by Departments of Music and Speech. Same as THTRE 570.

**MUSIC 601. Western Music before 1750.** (3) II, in alternate years, alternate S. A survey of the development of Western music from early Greek civilization to 1750. Pr.: MUSIC 398 and 406.

**MUSIC 614. Harmony and Tonal Counterpoint.** (1) I. Recommended for graduate students in music who need additional work in the harmonic aspects of 18th-century counterpoint. Concurrent enrollment in MUSIC 615 required.

**MUSIC 615. Canon and Fugue.** (2) I. Alternate S. Counterpoint in eighteenth century style. Pr.: MUSIC 398. consent of instructor.

**MUSIC 616. Twentieth-Century Counterpoint.** (2) II, S. Contrapuntal devices used by twentieth-century composers; serial techniques. Pr.: MUSIC 398, consent of instructor.

**MUSIC 620. Music Calligraphy and Score Preparation.** (2) On sufficient demand. Tools and procedures for professional preparation of music manuscript in facismile edictions. Computer applications for typesetting and music publishing. Pr.: MUSIC 201.

**MUSIC 631. Technology of the Electronic Music Studio.** (2) I, S. Instrumentation and systematic procedures as applied to the construction of electronic music. Principles of voltage-controlled systems, synchronous tape machines, and audio mixing. Individual and team projects. Pr.: MUSIC 521, consent of instructor.

**MUSIC 632. Digital Sound Synthesis.** (2) On sufficient demand. Exploration of real-time interactive systems. Theory and application pertaining to the creation of instruments and scores using additive and FM techniques. Team projects. Pr.: MUSIC 631.

**MUSIC 650. History of the Opera.** (3) I. A study of selected masterpieces of musical drama, with emphasis on the relationship of music and drama, and on the unique qualities of opera as a collective artwork. Pr.: MUSIC 201 or MUSIC 250. Same as THTRE 67.

**MUSIC 702. Style Analysis.** (3) I, alternate S. Training in a comprehensive, systematic analytical approach to all style periods, and in verbalizing analytical perceptions. Pr.: MUSIC 407.

**MUSIC 704. Symphonic Literature.** (3) II, in alternate years. The development of orchestral music from the late Baroque to the present, with emphasis on selected symphonies of the late eighteenth and nineteenth centuries. PR.: MUSIC 407.

**MUSIC 705. Chamber Music Literature.** (3) II, in alternate years. A selected survey of masterpieces of small ensemble music from 1750 to the present. Special emphasis on the string quartet. Pr.: MUSIC 407.

**MUSIC 706. Song Literature.** (3) II, in alternate years. Survey, by historical period and national style, of major solo vocal works. PR.: MUSIC 407.

**MUSIC 708. Choral Literature.** (3) II, in alternate years. A study of standard choral masterpieces in both large and small forms from 1450 to the present. Pr.: MUSIC 407.

**MUSIC 711. Practical Composition and Arranging.** (2) On sufficient demand. Explanation of styles and techniques applicable to contemporary commercial music. Practical arranging for the stage band. Pr.: MUSIC 213 or consent of instructor.

**MUSIC 714. Advanced Orchestration.** (2) On sufficient demand. The study of orchestra and band scores. Exercises in orchestrating this type of music for different choirs of instruments, as well as scoring for full orchestra and symphonic band. Pr.: MUSIC 503 or consent of instructor.

**MUSIC 737. Organ Literature.** (3) I, in alternate years. A survey of significant compositions from the Renaissance to the present with emphasis on performance practice. Pr.: MUSIC 407.

**MUSIC 738. Piano Literature.** (3) I, in alternate years. Selective survey of music for piano from 1750 to the present. Pr.: MUSIC 407.

**MUSIC 740. Studies in Music Literature.** (3) On sufficient demand. Study of the repertory of a selected musical genre or medium of performance. Pr.: MUSIC 407.

**MUSIC 766. Seminar in the Life and Works of an Individual Composer.** (3) I, alternate S. Study of the career and achievements of a selected composer of major stature. Pr.: MUSIC 407.

**MUSIC 767. Topics in American Music.** (3) On sufficient demand. Studies of the various genres of American Music. Pr.: Music 407.

**MUSIC 799. Problems in Music. (Var.)** I, II, S. Individual guided work in a selected area. No more than three hours of Problems in Music may be applied to the master's degree. Pr.: 6 hours graduate credit in music.

**MUSIC 801. Introduction to Graduate Study in Music.** (2) I, alternate S. Library procedures, bibliography, research methods, and practice in preparing scholarly papers. Required of all graduate students in music. Pr.: At least 30 hours of music theory and music history.

**MUSIC 802. Seminar in Music Theory.** (3) II, alternate S. Comparison of major theoretical treatises and historical compositional practices; practical application for the modern musician. Pr.: Twenty hours of music theory.

**MUSIC 803. Seminar in Music History.** (2) S. The history of music with emphasis on the correlation of stylistic factors and man's cultural environment. Pr.: MUSIC 407.

**MUSIC 804. Advanced Analysis.** (3) in alternate years. An in-depth study of works by later Romantic and modern composers: techniques and styles in relation to form. Pr.: Twenty hours music theory.

**MUSIC 830. Seminar in Medieval and Renaissance Music.** (3) II, in alternate years. In-depth investigation of a selected area or problem in medieval or Renaissance music. Emphasis on individual research. Pr.: MUSIC 601 and consent of instructor.

**MUSIC 832. Seminar in Baroque Music.** (3) I, in alternate years. In-depth investigation of a selected area or problem in Baroque music. Emphasis on individual research. Pr.: MUSIC 601 and consent of instructor. MUSIC 832-0-1006

**MUSIC 834. Seminar in Classical Music.** (3) II, in alternate years. In-depth investigation of a selected area or problem in classical music. Emphasis on individual research. MUSIC 601 and consent of instructor.

**MUSIC 836. Seminar in Romantic Music.** (3) II, in alternate years. In-depth investigation of a selected area or problem in Romantic music. Emphasis on individual research. Pr.: MUSIC 601 and consent of instructor.

**MUSIC 837. Seminar in 20th-Century Music.** (3) II, alternate years, alternate S. In-depth investigation of a selected area or problem in twentieth-century music. Emphasis on individual research. Pr.: MUSIC 601, consent of instructor.

**MUSIC 898. Master's Report in Music.** (2) I, II, S. Independent directed research leading to master's report. Pr.: sixteen hours graduate credit in music.

**MUSIC 899. Research in Music.** (Var.) I, II, S. Independent research that may lead to master's thesis. Pr.: sixteen hours graduate credit in music.

## Courses in music education

**MUSIC 511. Music in the Schools, K–6.** (4) II. The music curriculum in grades K–6, including a study of the musical characteristics of children and materials and techniques for teaching instrumental, vocal, and general music at this level. Pr.: Admission to teacher education and junior standing in music.

**MUSIC 512. Music Program in Junior/Senior High Schools.** (4) I. Organization and administration of the comprehensive music program in junior and senior high schools; including the study of vocal and instrumental ensemble development, as well as techniques and materials for other types of music classes. Pr: Admission to teacher education and junior standing in music.

**MUSIC 670. Advanced Studies in Music Education.** (2) I, II, S. Advanced undergraduate studies of various topics related to the teaching of music in grades K–12. May be repeated for credit when topics vary. Pr.: MUSIC 511 or 512.

**MUSIC 805. Theories in Music Education.** (3) On sufficient demand. A survey of the history of music teaching in the United States, with emphasis on the relationship of various theories of music, musical perception, and musical cognition to current practices in teaching music at all levels. Pr.: Nine hours graduate credit in music.

**MUSIC 808. Research in Music Education.** (3) II, alternate S. An introduction to historical, descriptive, and experimental research in music education; including a study of techniques for the evaluation of music teaching and learning. Pr.: MUSIC 805.

**MUSIC 809. Seminar in Music Education.** (3) I, alternate S. Advanced studies of various topics related to the instrumental, choral, and general music programs in elementary and secondary schools. May be repeated when topics vary. Pr.: MUSIC 805 or graduate standing in music education and consent of the instructor.

**MUSIC 811. Symposium in Music.** (1-3) S. Intensive short-term studies of various topics in music, featuring presentations by nationally known scholars in the field. Only two hours of Symposium in Music and Workshop in Music may be applied toward the master's degree.

**MUSIC 814. Workshop in Music.** (1–2) S. Advanced studies in specialized interest areas. Students may enroll in different areas simultaneously. Only two hours of Symposium in Music and Workshop in Music may be applied toward in the master's degree.

## Performance organizations

**MUSIC 838. Opera Theatre.** (Var.) I, II. Opera workshop for graduates. Pr.: Baccalaureate degree and previous experience at the undergraduate level.

**MUSIC 839. Vocal Ensemble.** (1) I, II, S. Performance and study with established University vocal organization or small ensemble.

**MUSIC 840. Instrumental Ensemble.** (1) I, II, S. Performance and study with an established University instrumental organization or a small ensemble.

**MUSIC 841. Collegium Musicum.** (1) I, II. An ensemble devoted primarily to the performance of music written before 1700. Authentic instruments used when possible.

**MUSIC 842. Concert Choir.** (1) I, II. Pr.: Baccalaureate degree and previous experience at the undergraduate level.

**MUSIC 843. Symphony Orchestra.** (1) I, II. Pr.: Baccalaureate degree and previous experience at the undergraduate level.

**MUSIC 844. Concert Jazz Ensemble.** (1) I, II. Pr.: Baccalaureate degree and previous experience at the undergraduate level.

**MUSIC 845. Symphonic Wind Ensemble.** (1) I, II. Pr.: Baccalaureate degree and previous experience at the undergraduate level.

## Performance classes

**MUSIC 828. Methods and Materials for the Studio.** (1–3) I, II, S. Methods of teaching fundamental techniques; selection of teaching materials outlining courses of study. For graduate students in performance curricula. Taught in divisions according to the major. Practical application through supervised studio teaching. Pr.: MUSIC 391 or MUSIC 492. May be repeated for a maximum of 3 hours.

**MUSIC 859. Advanced Conducting.** (Var.) I, II, S. Pr.: MUSIC 417 and consent of instructor.

**MUSIC 885. Advanced Diction.** (1) On sufficient demand. Concentrated study of Italian, German, and French diction for singing. Materials are related to work in the voice studio, and concurrent registration in MUSIC 855 is required. Pr.: MUSIC 466. May be repeated once.

## Studio performance

**MUSIC 641. Secondary Performance Area.** (1–2) I, II, S. For graduate students who wish to study an instrument (or voice) other than the major performance area. Pedagogical methods and fundamentals are stressed.

**MUSIC 855. Graduate-Level Performance.** (Var.) I, II, S. Instruction is offered every semester in voice and each of the following instruments: baritone, bassoon, clarinet, double bass, early winds, flute, french horn, harpsichord, oboe, organ, percussion, piano, saxophone, trombone, trumpet, tuba, viola, viola da gamba, violin, and violoncello. Students may enroll in more than one instrument simultaneously and may earn 1 to 4 hours per semester in each instrument.

# Physics

**Department head**
**James C. Legg,** Professor, Ph.D., Princeton (Experimental Atomic Physics).

**Professors**
**Chander P. Bhalla,** Ph.D., Tennessee (Theoretical Atomic Physics).

**C. Lewis Cocke,** Ph.D., Cal. Tech (Experimental Atomic Physics).

**Timothy R. Donoghue,** Vice Provost for Research and Dean of the Graduate School, Ph.D., Notre Dame.

**Nathan O. Folland,** Ph.D., Iowa State (Theoretical Condensed Matter Physics).

**Thomas J. Gray,** Ph.D., Florida State (Experimental Atomic Physics).

**Siegbert J. Hagmann,** Ph.D., Cologne, West Germany (Experimental Atomic Physics).

**Chii-Dong Lin,** University Distinguished Professor, Ph.D., Chicago (Theoretical Atomic Physics, Computational Physics).

**Thomas R. Manney,** Ph.D., California–Berkeley (Physics Education).

**Talat S. Rahman,** Ph.D., Rochester (Theoretical Condensed Matter Physics, Computational Physics).

**Patrick Richard,** University Distinguished Professor and Director of the James R. Macdonald Laboratory, Ph.D., Florida State (Experimental Atomic Physics).

**Christopher M. Sorensen,** Ph.D., Colorado (Experimental Condensed Matter Physics).

**O. Laurence Weaver,** Ph.D., Duke (Theoretical Atomic Physics).

**Dean A. Zollman,** Ph.D., Maryland (Physics Education).

**Associate professors**
**Brett Depaola,** Ph.D., Texas at Dallas (Experimental Atomic Physics).

**Michael J. O'shea,** Ph.D., Sussex, England (Experimental Condensed Matter Physics).

**Assistant professors**
**Itzhak Ben-Itzhak,** Ph.D., Technion, Israel (Experimental Atomic Physics).

**Kevin Carnes,** Assistant Research Professor, Ph.D., Purdue (Experimental Atomic Physics).

**Amitabha Chakrabarti,** Ph.D., Minnesota (Theoretical Condensed Matter Physics, Computational Physics).

**John Giese,** Ph.D., Kansas State (Experimental Atomic Physics).

**Hongxing Jiang,** Ph.D., Syracuse (Experimental Condensed Matter Physics).

**Bruce Law,** Ph.D., Victoria, New Zealand (Experimental Condensed Matter Physics).

**Martin Stockli,** Assistant Research Professor, Ph.D., Swiss Federal Institute of Technology (Experimental Atomic Physics).

**Gary M. Wysin,** Ph.D., Cornell (Theoretical Condensed Matter Physics, Computational Physics).

## Program description

The research programs of the Department of Physics are focussed in the areas of atomic physics, condensed matter physics, educational physics, computational physics, and high energy physics. We have purposely concentrated our major research commitments to a few areas to maintain strength and balance. The Department of Physics offers graduate programs leading to the Ph.D. degree. These are described here with the research interests of the faculty. Our graduate core curriculum is an excellent foundation for work in a large variety of specialties.

### Program requirements

For admission to the graduate program, a bachelor's degree in physics, a minimum upperclass GPA of 3.0, and the results of the GRE advanced test in physics are required. Candidates with degrees in mathematics, chemistry or engineering will also be considered. Students from non-English speaking countries are required to show proficiency in English via the TOEFL exam. The minimum acceptable score for admission is 550.

Applications for admission to the program in the fall semester should be completed by February 15.

### Careers

Graduate study in physics provides training for many varied academic and technological careers. Graduates in physics at all levels have found attractive careers in industrial and governmental laboratories and in academic departments. Graduates from K-State are presently engaged in communications research, x-ray laser development, genetic research, university teaching and research in various areas of physics, petroleum research, and industrial electronics, and many other fields. M.S. graduates generally occupy skilled technical positions and Ph.D. graduates generally occupy positions requiring independent work in a wide range of areas.

### Research facilities

The experimental atomic physics research is based in the James R. Macdonald Laboratory. The JRM lab contains a 7.5-million-volt Tandem Van de Graaff accelerator coupled with a superconducting linear accelerator, a Cryogenic Electron Beam Ion Source (CRYEBIS), a 3-million-volt Van de Graaff accelerator and an Electron Cyclotron Resonance (ECR) Ion source. With these facilities it is now possible to prepare fully stripped ions (bare) of atoms from hydrogen to chlorine at all energies between 100 eV and 200 MeV. The laboratory is well equipped with magnetic and electrostatic devices, various particle and photon detectors, and high-power pulsed and CW lasers. Data acquisition and analysis are done using three microVaxs, one Vax 8250 work station systems, and four VAX Stations 4000 connected in a cluster network.

For research in condensed matter physics, a number of laboratories for interdisciplinary studies have been established including a state-of-the-art x-ray diffraction laboratory and a laser laboratory equipped with argon ion, excimer, Nd:YAG, dye lasers and raman and correlation spectrometers. Well-equipped laboratories are available for a wide variety of condensed matter areas including magnetic materials, the optics and electronics of semiconductors, liquids and polymers, and aerosols and fine particles. Synthesis as well as characterization abilities are available.

The physics department has a cluster of SUNSparc 2 and ELC Workstations which are connected to the DOE and the NSF supercomputer networks and to the University's computers.

### Financial support

The department is continually awarded outside support for research and teaching. The extramural research support for the department is typically about $2 million per year. This support is important for the graduate student because it is an indication that the research conducted by the department is regarded highly by the research peers who review the department's proposals. It also indicates that a large number of graduate research assistantships are available in the department.

The stipend for graduate assistantships is $1,000 per month. Dean's scholarships of an additional $200 per month can be awarded to exceptional students. Exceptional students can compete for university graduate fellowships and graduate fellowships offered by the Graduate School. Applications must be complete by January 15 to be considered for a fellowship. The schedule for teaching assistants is about 8 to 10 hours per week in laboratory sections in the introductory physics courses. Summer appointments as research assistants are generally available. The stipend is sufficient for a comfortable life in Manhattan.

### Faculty contact

For additional information, please contact
Dr. James Legg, Head
Department of Physics
Cardwell Hall
Kansas State University
Manhattan, KS 66506–2601

Electronic Mail: LEGG@KSUVM.BITNET

### Research areas

#### Experimental atomic physics

The experimental atomic physics group is involved in a diverse program which investigates the interaction of highly-charged ions with various target media. The ions are created as beams by the several available ion sources and accelerators located in the J. R. Macdonald Laboratory for atomic physics located in the basement of Cardwell Hall. The characteristics of the ion beams used in the experiments are that they have a well-defined charge state and energy and are thus ideally suited to investigating the behavior of collisions under a variety of well-defined conditions. Single electron and multi-electron atomic processes are investigated by observing the final ionic species and their decay products. The results of these observations are compared to the theoretical predictions made by the K-State theory group as well as other available calculations. The important interplay between theory and experiment often leads to a better understanding of the collision and decay processes and in some cases suggest new phenomena in action or the need for new types of experiments or perhaps improved calculations. The combination of strong groups in theory and experiment make the K-State atomic group especially productive.

#### Experimental condensed matter physics

Condensed matter physics includes the study of particles in the solid and liquid states where collective (many-body) effects predominate. The experimental condensed matter group at K-State is doing research on a wide range of often inter-related topics.

#### High energy experimental physics

K-State is a member of the Rocky Mountain High Energy Physics Consortium. We are developing a program in high energy physics using current high energy facilities and looking forward to the SSC.

#### Theoretical and computational physics

The department offers a diversified program in theoretical and computational physics, including atomic physics, solid state physics, molecular physics, surface physics, and statistical mechanics. In both atomic physics and condensed matter physics there is significant interaction between experimentalists and theorists within the department and seminars are held weekly. A broad range of computational facilities is available in our department with the main computations being carried out using the Departmental cluster of SUN workstations. High-speed access to both the NSF supercomputer centers and the DOE supercomputers at Livermore and Los Alamos National Laboratories are available. Typically several hundred of these supercomputer CPU hours are being used each year by departmental researchers.

There is strong national and international collaboration with other colleagues. We have a steady exchange with scientists in Germany, Japan, Argentina, England, France, China, India, Taiwan, and Denmark. We actively participate in conferences ranging from regional to international. Not only are our professors invited, but also our graduate students and post-doctoral fellows actively participate in these meetings.

Some studies of mathematical methods in physics have also been carried out by our faculty and graduate students. These include: studies in group theory with application to atoms, molecules, and nuclei; development of the method of hyperspherical coordinates; and development of complex integration with application to Coulomb wavefunctions. Mathematical aspects of formulations of the few-body and many-body problem have also been developed in our department.

#### Theoretical atomic physics

In atomic physics, a broad range of topics in both scattering theory and atomic structure are studied. These studies are often initially motivated by the need to understand experimental

results; but they often provide broader perspectives on electronic interactions in atoms which are then further tested in experiments. Theoretical models for collisions between ions and atoms or molecules over a broad range of energies are being developed to understand the transfer of energy and momentum among the collision partners. These are necessary to understand the results of experiments performed at K-State and other laboratories. The study of atomic structure covers a detailed mapping of the de-excitation of atoms and ions produced in such collisions. Our studies of multiply excited states of atoms using hyperspherical coordinates are revealing the similarity between the collective electronic excitations of atoms and the rotational-vibrational modes of polyatomic molecules.

### Theoretical condensed matter physics

### Computational physics

Computational physics is being developed along with the solution of theoretical problems. Students are trained in accurate and efficient solution of problems in physics using a wide range of computational techniques. An equally important technique is the presentation of problem solutions in a way that can be easily visualized and understood. A number of faculty members and their students use supercomputers in their work, in addition to facilities housed on our own campus. Various algorithms for molecular dynamics, Monte Carlo, simulated annealing, and growth and aggregation models are being used and developed.

## Physics courses

### Undergraduate and graduate credit

**PHYS 611. Introduction to Quantum Mechanics.**(3) I. An introduction to quantum mechanics: wave mechanics, one-dimensional solutions, perturbation theory, time-dependent perturbation theory, the one electron atom. Pr.: PHYS 522, 551; MATH 240.

**PHYS 616. Advanced Physics Laboratory.** (1–3) II. A laboratory course that gives the advanced physics student an opportunity to perform experiments using modern data acquisition equipment and tools such as are used in current physics research. Pr.: PHYS 506 or equiv.

**PHYS 621. Mechanics II.** (3) II. Continuation of PHYS 522. Pr.: PHYS 522.

**PHYS 631. Electricity and Magnetism II.** (3) I. Continuation of PHYS 532. Pr.: PHYS 532.

**PHYS 635. Plasma Physics.** (3) I, in alternate years. Fundamental properties of plasmas; motion of ions and electrons in electromagnetic fields; plasmas as magneto-hydrodynamic fluids; plasma waves; diffusion phenomena in plasmas; electric resistivity of plasmas; equilibrium and plasma stability; kinetic theory of plasmas. Three hours rec. a week. See NE 635. Pr.: PHYS 532; or EECE 557 and PHYS 621.

**PHYS 636. Physical Measurements Instrumentation.** (4) II. A laboratory-oriented course to acquaint students with electronic circuits, their interfacing with measuring instruments, and their use in making physical measurements. Two hours lec. and six hours lab a week. Pr.: PHYS 214.

**PHYS 651. Introduction to Optics.** (3) I, in alternate years. Introduction to modern concepts in optics: electromagnetic waves, propagation of light through media, geometric optics of lenses and mirrors, interference, coherence, Fraunhofer and Fresnel diffraction. Three hours lec. a week. Pr.: PHYS 532 or EECE 557.

**PHYS 671. Thermodynamics and Statistical Physics.** (3) II, in alternate years. Pr.: PHYS 522; MATH 240.

**PHYS 681. Semiconductor Physics.** (3) I. Introduction to the properties of semiconducting materials; electron and hole transport; models of semiconductor devices. Pr.: PHYS 532 or EECE 557.

**PHYS 691. Astrophysics.** (3) A quantitative study of the sun and stars; structure and evolution; intrinsic properties; solar activity; galaxies; chemical evolution. Pr.: PHYS 522, 532.

**PHYS 707. Topics in Physics.** (Var.) I, II, S. Special topics courses. Topics and credits announced for the semester in which offered. May be given in conjunction with lecture series by visiting scientists. Pr.: Graduate standing or senior standing and consent of instructor.

**PHYS 742. Nuclear Physics.** (3) II, in alternate years. Modern theories of nuclear physics. Pr.: PHYS 611.

### Graduate credit

**PHYS 800. Problems in Physics I.** (1) II. 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.

**PHYS 801. Mathematical Methods of Physics.** (3) I. Mathematical techniques for the solution of physical problems. Mathematical topics employed include vector and tensor analysis, matrices, group theory, complex variable theory, differential equations, Sturm–Liouville theory, orthogonal functions, special functions, Fourier series, integral transforms, and the calculus of variations. Pr.: PHYS 621.

**PHYS 802. Computational Methods in Physics.** (4) II. Methods of solving physical problems using digital computers including numerical differentiation and integration, error analysis and curve fitting, interpolation, ordinary and partial differential equations, matrix operations, eigenvalues, special functions of mathematical physics. Monte Carlo simulations, and stability of solutions; a practicum is an integral part of the course. Two hours lec. each week, practicum self-paced. Pr.: CIS 580, CIS 675 or MATH 655, PHYS 801, and a working knowledge of FORTRAN.

**PHYS 806. Journal Club.** (Var.) I. Seminar in current topics in physics. Pr.: Graduate standing in physics.

**PHYS 807. Graduate Physics Seminar.** (1) I, II. Lecture by faculty and graduate students on topics of current research interest. Pr.: Graduate standing in physics. May be repeated.

**PHYS 808. Advanced Problems.** (Var.) I, II, S. Independent study in a special problem in physics at the graduate level chosen with the advice of a faculty mentor. Pr.: Graduate standing and consent of instructor.

**PHYS 811. Quantum Mechanics I.** (3) II. Pr.: PHYS 611, 801.

**PHYS 821. Advanced Dynamics.** (3) II. Pr.: PHYS 801.

**PHYS 831. Electrodynamics I.** (3) I, in alternate years. Pr.: PHYS 631.

**PHYS 841. Lasers and Quantum Optics.** (3) The theory of lasers and laser-matter interactions: rate equations, line broadening, mode structure, Q-switching, three and four wave mixing, linear and stimulated light scattering. Pr.: PHYS 611 or equiv.

**PHYS 850. Theory of Atomic Structure and Atomic Interactions.** (3) I, in alternate years. The quantum mechanics of atomic structure and spectra: one and two electron atoms, many electron atoms, molecular structure and spectra, atomic collision theory for electron-atom and ion-atom collisions. Pr.: PHYS 611.

**PHYS 860. Electron and Ion Impact Phenomena.** (3) II, in alternate years. Atomic collision phenomena; experimental techniques in accelerator-based atomic physics; charged particle and photon spectroscopy; elastic, inelastic, and rearrangement collisions; and applications. Pr.: PHYS 611.

**PHYS 881. Introduction to Solid State Physics.** (3) I, in alternate years. Introduction to the physics of condensed matter: crystal lattices; lattice dynamics; electron energy bands; fermi surfaces; optical, magnetic, and transport properties of insulators, semiconductors, and metals. Pr.: PHYS 611 or conc. enrollment.

**PHYS 899. Research in Physics.** (Var.) I, II. S. Master's level research. Pr.: Consent of instructor.

**PHYS 907. Advanced Topics in Physics.** (Var.) Critical studies of selected advanced topics. Pr.: Comparison of graduate introductory courses in the field of study or permission of the instructor.

**PHYS 910. 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 800 and consent of instructor.

**PHYS 911. Quantum Mechanics II.** (3)I. Pr.: PHYS 811.

**PHYS 912. Advanced Quantum Mechanics.** (3) Relativistic quantum mechanics; scattering theory; second quantization and the many-body problem; introduction to quantum electrodynamics. Pr.: PHYS 911.

**PHYS 913. Advanced Topics in Mathematical Physics.** (3) Critical studies of selected advanced topics. May be repeated once for credit. Pr.: PHYS 801.

**PHYS 914. Quantum Field Theory.** (3) On sufficient demand. Pr.: PHYS 901.

**PHYS 931. Electrodynamics II.** (3) II. Pr.: PHYS 831.

**PHYS 953. Advanced Topics in Atomic Interactions.** (Var.) Critical studies of advanced topics in atomic interactions. Pr.: PHYS 611.

**PHYS 971. Statistical Mechanics.** (3) I. Pr.: PHYS 611, 671, 821.

**PHYS 981. Solid State Physics.** (3) II, in alternate years. Continuation of PHYS 881. Quantized lattice vibrations, methods of band structure calculations, effective mass formulations, applications to optical absorption, excitons, magnetism, and superconductivity. Pr.: PHYS 811, 611.

**PHYS 982. Advanced Topics in Solid State Physics.** (3) Critical studies of selected advanced topics. May be repeated once for credit. Pr.: PHYS 782.

**PHYS 999. Research in Physics.** (Var.) I, II. S. Doctoral level research. Pr.: Consent of instructor.

# Political Science

**Head**
**William L. Richter,** Ph.D., University of Chicago.

**University Distinguished Professor**
**Michael W. Suleiman,** Ph.D., University of Wisconsin.

**Professors**
**Linda K. Richter,** Ph.D., University of Kansas.
**Krishna K. Tummala,** Ph.D., University of Missouri, Columbia.
**Alden Williams,** Ph.D., University of North Carolina.

**Associate professors**
**Margery M. Ambrosius,** Ph.D., University of Nebraska.
**James L. Franke,** Ph.D., Northern Illinois University.
**Aruna Michie,** Ph.D., Michigan State University.
**Joseph K. Unekis,** Ph.D., Indiana University.

**Assistant professor**
**Laurie M. Johnson,** Ph.D., Northern Illinois University.

**Emeritus professors**
**Merlin Gustafson**
**Joseph Hajda**

The Department of Political Science offers work leading to the master of arts and master of public administration degrees.

### Master of arts (30 hours)

The master of arts program meets the educational needs of three groups of students: (1) those planning to become high school teachers or instructors in two-year colleges; (2) work-

ing professionals and other adults desiring to improve their qualifications or seeking a greater understanding of political life; and (3) students wishing to prepare for Ph.D. or other advanced study. The degree requirements are structured, therefore, to provide students with an education which prepares them for a mature grasp of politics, a respect for intellectual integrity, and an ability to communicate effectively.

Graduate work in political science is offered in American government and politics, comparative government and politics, international relations, and political thought. All candidates for the master of arts degree are required to take the following:

Required courses

POLSC 700 Research Methods in Political Science ..... 3

At least three seminars from:
POLSC 805 Seminar: American Government Problems .. 3
POLSC 821 Seminar: Political Thought ..... 3
POLSC 811 Seminar: International Politics ..... 3
POLSC 841 Seminar: Comparative Politics ..... 3

No more than three hours of "non-class" seminars or courses (e.g., readings, problems, internships) are allowed to count toward the 30 hours required for the M.A.

Written comprehensive examinations
An oral defense of the thesis (Option A), report (Option B), or seminar papers (Option C).

Students may choose, in consultation with their advisers, one of three programs leading to the master of arts degree:

**Option A**
This option requires 30 hours of graduate credit, including 6 hours of credit for a thesis. Of the remaining 24 hours, at least 18 must be in political science.

**Option B**
This option requires 30 hours of graduate credit, including 2 hours of credit for a written research report. Of the remaining 28 hours, at least 19 must be in political science.

**Option C**
This option requires 30 hours of graduate credit in political science, of which at least four courses should be 800-level seminars taken from at least three different professors. In addition, students in this option should write four research seminar papers acceptable to the professors involved.

### M.A. with an international relations emphasis

This option is designed to serve the needs of students interested in the foreign service, international trade, communications or agriculture. It could also serve as a terminal degree for students planning to teach political science or a specialized sub-field in a related area in a community college setting. This emphasis also provides a more structured program of course work and a specialization in a specific area of expertise, international trade, or international agriculture. This emphasis will be highlighted or recognized by specifying the specialty in the student's transcript. The student will be required to take 9 hours of credit in the specialty area, which would be equivalent to a minor. For more information and in order to set up such a program, please consult your adviser.

### Comprehensive examination

All master of arts degree aspirants must successfully complete a comprehensive examination, normally between the end of the course work and execution of the master's thesis or report. Students shall receive evaluation of their performance approximately two weeks after the examination. Passing performance requires three-quarters majority of the committee. The committee will give as an overall grade one of the following: pass with honors; pass; fail.

If a candidate fails a master's examination, he or she may be allowed to take a second examination, which cannot take place fewer than two months or more than 15 months after the failed examination unless an extension is granted by the Dean of the Graduate School. No third examination will be allowed.

### Oral defense of thesis/report

The student's oral defense of the thesis/report is composed of two parts:

1. Defense of the thesis/report.
2. Questions of a general nature pertaining to the field of political science.

b. Prior to the defense, students must obtain approval forms from the Graduate School, and have them signed by the members of the examining committee. The Graduate School will then prepare notices and a ballot for each examination.

c. The oral examination is taken when the student's committee certifies that a satisfactory copy of the report/thesis/seminar papers has been presented. Passing performance requires three-quarters majority of the committee.

Students taking the nonthesis, nonreport option must complete their internships, reports, and related course requirements before they are eligible to receive their degrees.

Students must be enrolled for a minimum of 1 credit hour the semester they expect to receive their degrees.

Prior to the end of the second semester of graduate work, each student should meet with the graduate advisor to identify a major professor and supervisory committee. This committee (including the major professor) shall be composed of at least three members. One committee member may be from outside the political science department.

Each student should file a program of study prior to the end of the candidate's second semester. The program of study form must be obtained at the Graduate School Office in Fairchild Hall or from the department office in Kedzie Hall. After consultation with the supervisory committee, the student should type on the form the list of courses completed and/or to be completed. The form must be signed by all committee members and the department head. The form may then be photocopied and forwarded to the Graduate School.

The Graduate School has issued the following important statement concerning student responsibility:

Graduate students are held responsible for knowing the academic policies and degree requirements set forth in the Bulletin (General Catalog). They are likewise held responsible for knowing the regulations concerning the degree they plan to take and any special requirements within the department or academic unit. In addition, it is the student's responsibility to be informed regarding the university's policies as to the standard of work required for continued enrollment in the Graduate School. The Graduate Office should be consulted if additional information is needed.

### Master of public administration (42 hours)

The master of public administration degree is designed to be a professional degree for those who wish to hold administrative positions in the public sector. This degree prepares individuals for administrative careers in a wide range of environments by offering a program of study which is comprehensive, flexible, and interdisciplinary.

The program is committed to meeting the needs of both pre-service and in-service students. Pre-service students without administrative experience have enjoyed success in obtaining both valuable internships while pursuing their degree and challenging positions upon graduation. In-service students have found this program especially attractive since, through careful scheduling, courses required for the degree may be completed in the evenings.

### Degree requirements

The degree requires 42 hours of graduate credit including core public administration courses, an area of specialization, electives, and, for pre-service students, an internship. Full-time students are normally able to complete the degree in two years. The core courses are designed to familiarize all students with fundamental aspects of public administration. The six courses in this category are Research Methods, Public Personnel Administration, Policy Analysis and Evaluation, Public Organization Theory, Public Budgeting Techniques, and Seminar in Public Administration.

Each student is also required to develop an area of specialization, building on a particular interest through additional course work beyond the core courses. An appropriate, individualized, and frequently interdisciplinary area of specialization is developed in consultation with the public administration faculty. Recent examples include public budgeting and finance, labor relations and public personnel administration, gerontology, urban planning and administration, natural resource management, and administrative management.

Students also take three political science electives, one of which must be a seminar. This component of the curriculum helps students to gain a better appreciation of the political envi-

ronment in which public administrators operate. Students may choose from an extensive range of graduate courses and advanced seminars regularly offered by the Department of Political Science.

Pre-service students are required to complete an internship, involving a minimum of ten weeks of full-time employment in an administrative capacity. This may involve appointments with public and not-for-profit sector employers. Students in this degree program have been unusually successful in competitions for prestigious internships such as the Kansas Governor's Fellows Program and the U.S. Presidential Management Internship Program.

**Career**
The degree prepares students for employment in a variety of public sector administrative positions with state, federal, and local governments; not-for-profit corporations; public interest groups; international agencies; and private corporations that provide public services under government contract or franchise. Recent graduates of this program include those employed by the U.S. Office of Personnel Management, U.S. Department of Justice, the Kansas Departments of Commerce and Administration, and several Kansas communities.

## Admissions

**How to apply**
Additional information and application materials can be obtained by contacting:

Department of Political Science
Kedzie Hall
Kansas State University
Manhattan, KS 66506
913/532-6842

To be eligible for admission, a student must have a bachelor's degree with a minimum of 3.0 GPA (on a four point scale). Others with at least a 2.7 GPA may be admitted on probation, or on special student category. Application materials for admission to either the M.A. program or the MPA program must be returned to the department and should include a completed application form, two official transcripts from all colleges previously attended, three letters of recommendation (on official letterhead), and a statement of the candidate's personal objectives. Foreign students, in addition to the above materials, need to submit a TOEFL score (a minimum of 550) and a financial support form.

Admission to the MPA and MA programs and financial assistance are based on academic accomplishment and promise. Admission applications are welcome at any time.

**Financial assistance**
The Department of Political Science provides financial aid for assistance with teaching, or research, or both. Specific assignments to teaching or research depend on the needs and abilities of the graduate assistant, and the needs of the department.

**Selection criteria**
Awards reflect the following criteria:

a. Academic performance, promise, and intellectual ability.
b. Past performance as a departmental assistant, if applicable.
c. Teaching and research needs of the department faculty.
d. Financial need.
e. Minimum 6 hour enrollment during term of assistance, under ordinary circumstances.
f. Reasonable progress toward master's degree.

**Amount of assistance**
Graduate assistantships are measured in "tenths" time, ranging from one-tenth to four-tenths, each tenth corresponding to a dollar amount which changes annually with university and department appropriations. In addition, graduate assistants are eligible for waivers and reductions of tuition fees, depending on legal residence and amount of assistance.

**Duties**
Each tenth of assistance corresponds to an average of four hours of work each week, or 16 hours of work for a full four-tenths assistantship. Faculty supervisors are responsible for arranging an equitable correspondence of tenths' assistance and duties, and each graduate assistant is responsible for keeping his or her principal faculty supervisor informed on how this obligation is met.

**Supervision**
Each assistant is assigned to one or two faculty members, depending on the department's needs and the student's preference. Graduate assistants may be asked to help any member of the department faculty, subject to clearance with the student's principal advisers.

**Conditions of assistance**
All teaching assistants are expected to maintain a 3.0 GPA during the period of appointment with the department, and to perform their duties satisfactorily. The department reserves the right to withdraw support if academic performance falls below the 3.0 GPA or if the job performance is not satisfactory.

**Application procedure**
Applicants should submit the following to the head of the Department of Political Science not later than November 1 for the spring term, or April 1 for the fall term or for the nine-month academic year:

1. One copy of an application form available from the department secretary.
2. A formal covering letter of application. This letter may also be used to expand on items in the application form, and to document financial need.

All applicants will be notified of the department's decisions, and award recipients will be asked formally to acknowledge acceptance.

**Selection committee**
The department's Admissions and Assistance Committee consists of three faculty members.

**Announcement dates.**
Awards are announced on or about April 15, and November 15. Ordinarily, there are no summer term graduate assistantships.

## Graduate courses

### American government and politics

**POLSC 501. 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. Pr.: POLSC 110 or 325, or sophomore standing.

**POLSC 502. Television and Public Policy.** (3) I. Television as a political institution, emphasizing TV structure, contents, and effects for political thought and public policy; comparative analysis of television with other mass media and non-media influences on political behavior. Pr.: POLSC 110 or 325, and sophomore standing, or appropriate vocational experience with consent of instructor.

**POLSC 507. Introduction to Public Administration.** (3) I. The basic concepts of public administration, with emphasis on orientation for citizen understanding; the place of administration and the role of the administrator in the American political process; the organization and activities of government in carrying out public policy; administrative functions, organization, accountability, finance, and personnel. Pr.: POLSC 110 or 325 or ECON 110.

**POLSC 508. The Mass Media and Political Campaigns.** (3) I. Examines the role of the mass media in the electoral process. Dynamics of voter decision making and the impact of the media on voter attitudes and choices. Pr.: POLSC 325.

**POLSC 519. National Security Policy and Process.** (3) I. Formation and management of contemporary U.S. security establishment and policies with emphasis on arms control, competition for resources, civilian-military relations, and interaction among Congress, the president, and the bureaucracy. Pr.: POLSC 325.

**POLSC 520. State and Local Government.** (3) II. The American system of federalism with emphasis on the government and politics of the American states and their subdivisions. Pr.: POLSC 110 or 325 or sophomore standing.

**POLSC 603. Political Parties and Elections.** (3) I. Origins, structure and function of political parties. Dynamics of the two-party system. Roles of third parties. Analysis of election results and voting behavior. Pr.: POLSC 110, 325 or junior standing.

**POLSC 604. Interest Groups and Public Opinion.** (3) II. Group theory and politics. Structure, internal politics, and techniques of interest groups and their impact on public policy. Formation and measurement of public opinion. Pr.: POLSC 110 or 325 or junior standing.

**POLSC 605. The American Presidency.** (3) The presidency as an institution, its evolution, congressional relationships, executive organization. Pr.: POLSC 110, 325 or junior standing.

**POLSC 606. Gender and Politics.** (3) II. Analysis of the role of gender in political behavior, including gender differences in voting and political participation, legal and cultural restrictions on women's rights and political activity, and women's liberation and other gender-based political movements. Pr.: SOCIO 545 or POLSC 325.

**POLSC 607. Administrative Law.** (3) II. Legal analysis of the rule-making, adjudicatory, and enforcement functions of administrative agencies, with emphasis on constitutional framework, judicial review, requirements of procedural fairness, and rights of public employees. Pr.: One course in political science, U.S. history, or legal or political philosophy.

**POLSC 611 The Legislative Process.** (3) II. 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. Pr.: POLSC 110, 325, or junior standing.

**POLSC 613. Defendant's Rights.** (3) II. Constitutional provision of due process in criminal cases; statutory protections and judicial rules; analysis of U.S. Supreme Court opinions concerning the rights of persons accused of crimes at all stages in the criminal process. Pr.: One course in political science, U.S. history, or legal or political philosophy.

**POLSC 614. Constitutional Law I.** (3) I. Principles of the American political system as prescribed by the Constitution and interpreted by Supreme Court decisions, with emphasis on the institutions and powers of the national government. Pr.: One course in political science, U.S. history, or legal or political philosophy.

**POLSC 615. Constitutional Law II.** (3) II. The Constitution as a limitation of government power, with emphasis on Supreme Court decisions defining fundamental liberties, property rights, and the requirement of substantive due process. Pr.: One course in political science, U.S. history, or legal or political philosophy.

**POLSC 616. Discrimination and the Law.** (3) II. Equal protection under the law, as provided by the Constitution, statues, regulations, and judicial decisions, with special attention to discrimination on the basis of race and sex. Pr.: One course in political science, U.S. history, or legal or political philosophy.

**POLSC 618. Urban Politics.** (3) I. Fundamental problems of political power and decision making in urban-suburban governmental settings. Pr.: POLSC 110, 325, or junior standing.

**POLSC 619. Comparative Agriculture Politics and Policy.** (3) I. Comparative examination of agricultural politics and policy with emphasis on decision making processes and the socio-political impacts of agricultural policy. Pr.: POLSC 110 or 344.

**POLSC 708. Public Personnel Administration.** (3) I. Policy aspects of public personnel administration at all levels of government with specific attention given to personnel issues unique to the public sector. Court decisions on the rights of public employees, public unionism, civil service systems, and public service ethics in a democracy. Pr.: POLSC 325 or 507, or ECON 110 and junior standing.

**POLSC 709. The Politics of Intergovernmental Relations.** (3) I. An analysis of the dynamics of the federal system. Interactions among local, state, and federal governments will be examined with emphasis upon governmental policy and program management. Pr.: POLSC 507 or 520 or SOCIO 531.

**POLSC 710. Policy and Analysis and Evaluation.** (3) II. The relationship between public policy and the distribution of values, goods, and services in society, including a study of policy evaluation. Students analyze policies in an area of choice; e.g., agriculture, business, health, income, trade. Pr.: POLSC 325 or 507 or junior standing.

**POLSC 717. 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.

**POLSC 735. Public Organizational Theory.** (3) I. Theories on the structure and mission of public organizations. A focus on the role of administrative leadership in applying theory to solve organization problems. Pr.: POLSC 325 or 507 or GENBA 420 or ECON 110 and junior standing.

**POLSC 737. Public Budgeting Techniques.** (3) I. Budgeting as part of our political system and as a fiscal process that assists in planning and program management. Overview of various budgetary approaches and their managerial benefits. Pr.: POLSC 507 or MANGT 420.

## Comparative government and politics

**POLSC 504. Political Sociology.** (3) II, in even years. An introduction to the principles of political sociology. Processes of political socialization, participation within and outside established organizational channels, recruitment of elites, communication and influence, power, decision making, and policy outputs. Data are presented from a cross-national perspective. Pr.: SOCIO 211; POLSC 110. Same as SOCIO 504.

**POLSC 505. Introduction to the Civilization of South Asia I.** (3) I. Interdisciplinary survey of recent and contemporary civilization in India, Pakistan, Sri Lanka, Bangladesh, and Afghanistan, including consideration of the geographical and demographic context, dominant philosophical and social concepts, social and political institutions, literature and historical movements. Pr.: Same as HIST 505, ECON 505, SOCIO 505, ANTH 505.

**POLSC 506. Introduction to the Civilization of South Asia II.** (3) II. Interdisciplinary survey of recent and contemporary civilization in India, Pakistan, Sri Lanka, Bangladesh, and Afghanistan, including recent history, current economy, religion, culture, languages and literature, geography, social and political structures and ideas. Pr.: Same as ECON 506, HIST 506, SOCIO 506, ANTH 506.

**POLSC 511. Contemporary Chinese Politics.** (3) Principal components of Communist Chinese ideology, conditions determining organizational structure, composition of present leadership, role of social forces, impact of external relations on other Asian nations and on the major world powers.

**POLSC 545. The Politics of Developing Nations.** (3) II. Comparative analysis of politics in emergent states with emphasis on process of modernization and nation building. Pr.: POLSC 110 or 344 or sophomore standing.

**POLSC 602. Class, Power, and Public Policy.** (3) I. Public policy and socioeconomic equality. Wealth and income distribution, social insurance programs, and ethnic relations. Conditions and institutions conducive to equality with emphasis on elites and power. Pr.: POLSC 377 or 507 or junior standing.

**POLSC 621. European Politics.** (3) I. Comparative analysis of British democracy, totalitarianism, and contemporary continental European political systems. Pr.: POLSC 110 or 344 or junior standing.

**POLSC 622. Latin American Politics.** (3) I. Comparative analysis of selected political systems of Latin America emphasizing political inputs, political organization, and political outputs. special consideration is given to problems of political change. Pr.: POLSC 110 or 344 or junior standing.

**POLSC 623. South Asian Politics.** (3) Analysis of selected political systems of South Asia. Pr.: POLSC 344, 505, or junior standing.

**POLSC 624. Middle East Politics.** (3) II. 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. Pr.: POLSC 110, 344, or junior standing.

**POLSC 625. Southeast Asian Politics.** (3) Comparative analysis of selected political systems in Southeast Asia including consideration of problems of nationalism and political development. Pr.: POLSC 110, 344, or junior standing.

**POLSC 626. African Politics.** (3) Comparative analysis of selected political systems of sub-Sahara Africa, including consideration of problems of nationalism and political development. Pr.: POLSC 110, 344, or junior standing.

**POLSC 627. Eastern and Central European Politics.** (3) II. Examination of comparative politics and policy in the countries of Easter and Central Europe including the Soviet Union. Pr.: POLSC 110 or 344.

**POLSC 628. Comparative Security Establishments.** (3) I. Politics of conceiving, organizing, using, and reconciling military and related security forces as societal functions in the United States, selected other polities, and international organizations. Pr.: POLSC 333, 344, 541, or junior standing.

**POLSC 629. Development Policy and Administration.** (3) I. Comparative examination of development policy, politics, and administration. Pr.: POLSC 110, 344, 377, or 507.

**POLSC 707. Comparative Administrative Systems.** (3) I. This is a comparative analysis of public administration concepts and the morphology of administrative systems. Included are U.S., British, and French models and attempts by Third World countries to adapt these to their local cultures. Pr.: POLSC 344, or 507, or graduate standing or consent of instructor.

## International relations

**POLSC 541. International Relations.** (3) II. Analysis of the nature of international relations with emphasis on contemporary theories explaining the international behavior of states. Pr.: POLSC 333.

**POLSC 543. American Foreign Policy.** (3) II. 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. Pr.: POLSC 325 or 333.

**POLSC 642. International Conflict.** (3) II. The nature of political conflicts in the world and the "types" of such conflicts. Emphasis is on determining the "causes" of the various conflict types as well as providing the student with a better understanding of the conflict process from political dispute through the escalation stages to war. Pr.: POLSC 333 and junior standing.

**POLSC 645. International Politics of Europe.** (3) II. 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. Pr.: POLSC 333, 344, or junior standing.

**POLSC 647. International Law.** (3) Theories of international law, and general problems, such as: recognition, responsibility, war crimes, sources, evidence, codification, and settlement of disputes. Pr.: POLSC 333, 541, or junior standing.

**POLSC 649. International Defense Strategies.** (3) I. 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. Pr.: POLSC 333, 541, or junior standing.

**POLSC 651. International Organization.** (3) Structure, functions, values, and effectiveness of international organizations with emphasis on the United Nations, Common Market, and other regional arrangements. Pr.: POLSC 333, 541, or junior standing.

**POLSC 652. International Politics of South Asia.** (3) Consideration of regional problems of South Asia and international roles and foreign policies of South Asian states. Pr.: POLSC 344 or junior standing.

**POLSC 653. International Politics of the Middle East.** (3) I. 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. Pr.: POLSC 333, 344, or junior standing.

**POLSC 754. 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

**POLSC 661. Political Thought: Classical to Sixteenth Century.** (3) I. Systematic study of ideas about law, politics, and government of great philosophers of Western civilization from Greek antiquity to the sixteenth century. Pr.: POLSC 110, 301, or junior standing.

**POLSC 663. Political Thought: Since the Sixteenth Century.** (3) I. Study of the development of Western political thought from the sixteenth century to the twentieth century. Pr.: POLSC 110, 301, or 325.

**POLSC 667. American Political Thought.** (3) I. Political ideas underlying the American union, including the doctrine of rights, the nature of union, liberty, property, and democracy. Pr.: POLSC 110, 301, or junior standing.

**POLSC 671. Modern Political Thought.** (3) Study of contemporary political ideas and social thought. Pr.: POLSC 110, 301, or junior standing.

**POLSC 675. Religion and Politics.** (3) II. The history, theory, and development of church-state relationships in the United States. A theoretic and legal analysis of the relationship. Pr.: POLSC 110, 301, or junior standing.

**POLSC 676. 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. Pr.: Two social science courses or consent of the instructor.

**POLSC 711. Administrative Ethics.** (3) I. Ethical issues, approaches, and strategies in public service. Pr.: POLSC 325 or 507 or graduate standing, or consent of the instructor.

## Methods, seminars, readings, and problems

**POLSC 555. Senior Honors Seminar.** (3) Open to senior majors who have attained a 3.0 grade point average in political science.

**POLSC 601. Computer and Quantitative Analysis in Political Science.** (3) Advanced data management, data analysis, and computing skills involved in conducting political science and public research. Pr.: STAT 330 or equiv.; CIS 110 or equiv.; and POLSC 301, or 325, or 333, or 344, or 400.

**POLSC 700. Research Methods in Political Science.** (3) I. Principles of research design, measurements of political phenomena, methods for collecting and analyzing political data. Pr.: POLSC 301, 325, 333, or 344.

**POLSC 784. Internship in Government, Public Administration, and Politics.** (1–3, Credit/No Credit only) I, II, S. Supervised field work at the international, national, state, and local levels of government or with political parties or other politically oriented voluntary organizations. May be repeated once. Pr.: Consent of instructor and a minimum of two courses in political science, at least one of which must be relevant to the internship area.

**POLSC 785. Readings in Political Science.** (1–3) I, II, S. Students will undertake directed reading and discussion of a selected topic in political science.

**POLSC 790. Problems in Political Science.** (1–3) I, II, S. Students will complete a research project and prepare an original paper under the supervision of a faculty member.

**POLSC 791. Topics in Political Science.** (3) I, II. Extensive exploration of a specific problem in political thought. American government, comparative politics, international relations, and public administration. May be repeated for a total of 6 hours in two sub-fields. Since topics will cover different areas in political science, prerequisites will be determined by the department as appropriate when the course is offered.

**POLSC 799. Pro-Seminar in Political Science.** (3) I, II. Study and analysis in various areas of the discipline with emphasis on critical evaluation of political conflicts and issues.

## Graduate credit

**POLSC 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.

**POLSC 805. Seminar: American Government Problems.** (3) I.

**POLSC 811. Seminar: International Politics.** (3) I.

**POLSC 821. Seminar: Political Thought.** (3) II.

**POLSC 831. Seminar: Public Administration.** (3) II.

**POLSC 841. Seminar: Comparative Politics.** (3) II.

**POLSC 842. Seminar: Comparative Ideologies.** (3)

**POLSC 897. Internship.** (Var., C/NC) I,II,S. Directed off-campus employment experience. Must be taken for a total of 6 hours.

**POLSC 898. Master's Report.** (2, C/NC) I, II, S.

**POLSC 899. Master's Thesis.** (6, C/NC) I, II, S.

# Psychology

**Frank E. Saal,** Professor and Department Head, Ph.D. 1976, Pennsylvania State University. Industrial/Organizational: psychology of women in the workplace,especially sexual harassment and discrimination; pay and compensation issues;traditional industrial/organizational topics (e.g., performance appraisal, personnel selection and training, work motivation, etc).

**Mark A. Barnett,** Professor, Ph.D., 1975, Northwestern University. Developmental:'children's soclal-emotional development; role of empathy in development and expression of prosocial behavior.

**Thaddeus M. Cowan,** Professor, Ph.D., 1964, University of Connecticut. Perception: mathematical models.

**Catherine Cozzarelli,** Assistant Professor, Ph.D., 1991, State University of New York at Buffalo. Social: responses to negative life events.

**Ronald G. Downey,** Professor and Director of Educational Research, Planning and Evaluation Services, Ph.D., 1971, Temple University. Industrial/ Organizational: part-time employment; dual commitment; job security; control of work schedules; service orientation; performance evaluation; leadership; training.

**Jerome Frieman,** Professor, Ph.D., 1969, Kent State University. Animal Experimental; operant conditioning (pigeons); omission training; effects of motivation and alternative sources of rewards on learning and performance; human memory; skilled performance in memory.

**Clive J.A. Fullagar,** Assistant Professor, Ph.D., 1986. University of Witwatersrand. Industrial/Organizational: labor unions, including why workers join, become committed to, and participate.

**William B. Griffitt,** Professor, Ph.D., 1967, University of Texas. Social: interpersonal aspects of sexuality; perceptions of others' sexuality; influences of pornography on interpersonal behavior.

**Richard J. Harris,** Professor, Ph.D., 1974, University of Illinois. Psycholinguistics: applied cognitive psychology, especially studies of language (e.g., bilingualism, cultural knowledge, metaphors, inferential processes, discourse, deceptive advertising, mass communication); cross-cultural psychology.

**Stephen W. Kiefer,** Professor, Ph.D., 1978, Arizona State University. Behavioral Neuroscience; neural and sensory (taste, smell) determinants of fluid consumption, especially alcohol, and how experience (i.e., learning) modifies drinking behavior.

**Patrick A. Knight,** Associate Professor and Director of Industrial/Organizational Psychology Programs, Ph.D., 1981, Purdue University. Industrial/Organizational: part-time workers; multiple work and nonwork commitments; leadership; performance ratings.

**James C. Mitchell,** Professor, Ph.D., 1962, Ohio State University. Behavioral Neuroscience: comparative psychology; conditioning and learning; hunger and satiety; feeding patterns.

**Charles C. Perkins, Jr.,** Professor Emeritus, Ph.D., 1946, University of Iowa. Animal Experimental: animal learning and behavior; learning (behavior) theory; conditioned (secondary) reinforcement; stimulus generalization; effects of delayed rewards and punishments.

**E. Jerry Phares,** Professor Emeritus, Ph.D., 1955, Ohio State University. Personality: social learning theory; internal-external control of reinforcement (locus of control); selfism (narcissism).

**Leon Rappoport,** Professor, Ph.D., 1963, University of Colorado. Social: psychohistorical determinants of consciousness in areas of adult development/aging, personal health, and food cognition.

**Franz Samelson,** Professor Emeritus, Ph.D., 1956, University of Michigan. Social/History of Psychology: historical development of conformity, attitude change, authoritarianism, and political behavior.

**James Shanteau,** Professor, Ph.D., 1970, University of California at San Diego. Judgment and Decision Making: cognitive decision-making processes involved in health-care judgments, business and consumer decision making, and behavioral economics; mathematical models of problem solving; impression formation; information processing.

**Charles P. Thompson,** Professor, Ph.D., 1962, University of Wisconsin. Human Memory:telescoping time in remembering personal events; language effects in voice identification; skilled performance in memory.

**John J. Uhlarik,** Professor, Ph.D., 1970, University of Washington. Sensation/Perception: human factors; vision; information processing; visual displays; human-computer interaction.

**Connie R. Wanberg,** Ph.D., 1992, Iowa State University. Industrial/Organizational: unemployment and psychological well-being; vocational psychology; self-appraisal; traditional industrial/organizational topics.

## Program

Graduate programs in psychology provide professional training leading to the master of science and doctor of philosophy degrees.

Doctoral programs are offered in several broad areas including: (1) animal learning/physiological psychology (with concentrations in animal learning/behavior or physiological psychology/behavioral neuroscience), (2) information processing (with concentrations in human learning and memory, psycholinguistics, human judgment, human factors, or sensation and perception), (3) social-personality (with concentrations in social, personality, or developmental psychology), and (4) industrial/organizational (with concentrations in human-resources/personnel issues and procedures or organizational behavior and theory).

At the master's level, students may specialize in most of the traditional areas of psychology. Although the department emphasizes graduate work leading to the doctoral degree, a structured "terminal" M.S. degree is offered in industrial/organizational psychology. Students who complete the doctoral program are eligible for a variety of teaching, research, and professional positions in colleges and universities, governmental agencies, and business and industry.

In 1981 the department moved into newly constructed Bluemont Hall, which houses all departmental facilities on the top two floors. These include offices, a reading room, conference and seminar rooms, equipment storage facilities, photographic space, calculating and computer space, numerous individual research rooms, group testing rooms, one-way observation suites, an undergraduate laboratory suite, shop facilities, animal running and recording rooms, colony rooms, surgery, histology and microscopy facilities, and a variety of other specialized laboratories, rooms and support space. (The College of Education and some general classrooms occupy the bottom four floors.) Numerous microcomputers (IBM-compatible, Apple) as well as printers and terminals connected with the university mainframe computer are also available in the department. The university is equipped with an IBM 3084Q computer system for data processing and modeling or simulation studies; remote facilities are readily accessible within the department and at various points across

campus. In addition to its own "in-house" facilities, the department has access to a variety of campus woodworking, electronic, metal, and other specialized shops. The University library contains most of the important monographs in psychology, and subscriptions are maintained to most English-language periodicals and a sample of foreign-language journals. The department subscribes to some of the more widely used psychology journals and makes them available to students and faculty in the department's reading room.

### Admission

For most students, the master's program requires two years beyond the bachelor's degree, the doctorate typically requires two or three additional years (beyond the master's degree). Prerequisites to admission into the doctoral program are a superior academic record and background work essentially equivalent to the undergraduate psychology degree at Kansas State University, especially in 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 additional information about financial support, can be obtained by writing to the department head.

For admission to graduate study, the university requires an undergraduate grade point average of B or better during the junior and senior years. As additional evidence of competence, the Department of Psychology requires the applicant to submit scores on the Graduate Record Examination (verbal and quantitative scores are required; score on the advanced test in psychology is highly recommended) and three letters of recommendation (preferably from faculty members at a previously attended institution). Under special, prearranged circumstances, scores on the Miller Analogies Test may be substituted for the GRE. Students for whom English is not a native language will not be considered for admission unless they receive a score of 550 or higher on the Test of English as a Foreign Language.

The Department of Psychology expects all applicants to have met the minimum standards for the bachelor's degree in psychology as recommended by the American Psychological Association. These include 18 semester hours of psychology, or its equivalent, in such courses as experimental psychology, statistics, history of psychology, personality, and so forth. Students who wish to concentrate in behavioral neuroscience must have the necessary background in the physical and biological sciences. In some prearranged cases, deficiencies can be made up after enrollment.

All doctoral candidates, regardless of special areas of interest, are expected to obtain a thorough grounding in general psychology, including theory, content, and methods. Such grounding is accomplished in part by requiring all students to take a series of basic core courses in both quantitative and substantive areas of psychology. The first two years of graduate study are typically devoted to a broad survey of the major areas of psychology, and to acquisition of certain basic research techniques. The first year of this period is spent primarily in basic courses. During the second year, students begin to satisfy related requirements, complete work on their master's thesis, and begin to develop a major area of professional interest. The third and fourth years of the doctoral program constitute a period of special training during which students are occupied to an increasing extent with pursuing their special research and professional interests. Most of their time is spent in small seminars and directed study. During this time, students must pass a final written examination that covers their major areas of interest, and complete a doctoral dissertation that constitutes an original contribution to the research literature in those areas.

Our graduate training includes an opportunity to gain supervised experience in teaching at the college level. This program provides both course work on pedagogical methods and actual experience as an instructor for introductory level psychology courses and, later, one or more of the department's core or service courses. Close interaction between the graduate student and a skilled faculty member is maintained to provide an optimum learning environment. Because most academic positions taken by our graduates involve teaching to a greater or lesser extent, this type of formal training makes our students highly competitive in the job market.

### Performance standards

Graduate students' performance is evaluated twice each year in the domains of classroom work, research, and (when appropriate) teaching or research assistantship activities. Each faculty member who has had significant contact with a graduate student during the preceding semester completes a standard evaluation instrument. These are then made available to the student, who is encouraged to consult with faculty and discuss their evaluations. Finally, faculty meet as a group to formally assess each student's individual performance and progress toward a graduate degree.

### Financial assistance

Departmental graduate teaching assistantships are awarded on a competitive basis. They provide stipends ranging from $6,580 to $7,280 for a nine-month period, and carry tuition and fee reductions. They require a commitment to work a maximum of 20 hours each week, assisting one or more faculty members with their classroom duties. This allows students to carry a normal load of 10–12 hours of course work each semester. Graduate research assistantships are comparable to GTAs, except they are funded by individual faculty members' grant or contract funds. The student is assigned to a particular staff member's research project. Course loads and stipends are similar to those of GTAs.

Students not supported by the Department of Psychology are often successful in obtaining assistantships elsewhere on campus. For example, recent graduate students have found employment in the Affirmative Action Office, the Center for Student Development, the Division of Continuing Education, the Office of Admissions, the Midwest Desegregation Center, the Department of Management, the Department of Marketing, the College of Business Administration, and the Office of Planning and Evaluation Services.

To receive application forms for graduate study in psychology at Kansas State University, and for financial support in the form of graduate teaching or research assistantships, write to the Department Head, Department of Psychology, 492 Bluemont Hall, Kansas State University, 1100 Mid-Campus Drive, Manhattan, KS 66506–5302, or call (913) 532-6850.

## Psychology courses

### Undergraduate and graduate credit in minor field

**PSYCH 505. Abnormal Psychology.** (3) I, II, S. An introductory study of behavior pathologies, with emphasis on their etiology and treatment. Pr.: Junior standing; PSYCH 110.

**PSYCH 510. Introduction to Behavior Modification.** (3) II. Study of the principles of behavior modification and applications to human behavior. Emphasis on the learning principles and research in behavior modification. Pr.: PSYCH 505.

**PSYCH 518. Introduction to Health Psychology.** (3) II. Psychosocial factors relevant to general health maintenance, recovery from disease or injury, and the achievement of health. Topics include stress-management techniques, personality characteristics associated with disease, cognitive-emotional effects of diet and exercise, and theories of pain and pain management. Concepts of prevention and behavioral medicine are also included. Pr.: PSYCH 110.

**PSYCH 520. Life Span Personality Development.** (3) I, II, S. Theories and research in the development of personality from infancy through old age. Origins of personality in heredity and early experience, socialization practices, life crises and choices at various stages throughout life, and problems of aging. Pr.: PSYCH 110; sophomore standing.

**PSYCH 530. Psychology of Mass Communications.** (3) II. The psychological effects of mass communication on behavior and thought, including advertising, stereotyping of women and minorities, effects on children, violence and sex in the media, effects of news on behavior, and the promotion of prosocial behavior through the media. Pr.: PSYCH 110.

**PSYCH 535. Social Psychology.** (3) I, II. Psychology of the individual in society. Survey of empirical studies and theoretical models of social perception, attitudes, and social behavior (e.g., attribution, ethnic and gender prejudice, conformity). Relationship of these topics to personal and media influence, social mores, and social systems is also included. Pr.: PSYCH 110.

**PSYCH 540. Psychology of Women.** (3) II. Investigation of psychological processes of women. A developmental sequence with emphasis on major life events for women. Female physiology, early socialization into sex roles, friendship, achievement motivation, sexuality, marriage, childbearing, work, and mental health. Pr.: PSYCH 110.

**PSYCH 543. Women's Mental Health Issues.** (3) II. Investigates prevalent women's mental health issues such as incidence of depression/anxiety, eating disorders, sexual-

ity, relationship concerns. Also covers the efficacy of traditional treatment modalities and newer therapies that target women's unique mental health needs such as feminist or nonsexist therapies. Pr.: PSYCH 505.

**PSYCH 545. Consumer Psychology.** (3) I. Survey of psychological principles and facts in perception, learning, attitude formation, personality, etc., as they apply to behavior of consumers. Pr.: PSYCH 110 and junior standing.

**PSYCH 550. Group Dynamics.** (3) II. Interaction in small groups: interpersonal sensitivity, communication, decision making, development of group structure and norms. May be organized as laboratory "process" group and require some flexibility in scheduling. Pr.: Six hours in psychology.

**PSYCH 558. Varieties of Consciousness.** (3) I, S. Traditional and contemporary approaches of both Western science and Eastern metaphysics to study of ordinary mind consciousness, unusual states of awareness, and efforts to expand the powers of mind. Topics include sleep, dreaming, biofeedback, meditation, psychoactive drugs, brain area dominance, and other factors influencing relationships. Pr.: PSYCH 110.

**PSYCH 559. Psychological Testing.** (3) II. Principles of psychological testing in industrial, clinical/counseling, and research environments. Topics include technical issues such as reliability, validity, norming, selection, placement, discrimination, etc. Also covers procedures for selecting, administering, and interpreting psychological tests. Pr.: PSYCH 110.

**PSYCH 560. Industrial Psychology.** (3) I, S. Survey of human behavior and psychological principles in an industrial/personnel context. Topics include: recruiting, selecting, and training personnel; evaluating their job performance; conducting job analyses; and implementing compensation strategies. Pr.: PSYCH 110.

**PSYCH 561. Laboratory in Industrial Psychology I.** (2) I. Supervised experience in personnel psychology including classifications, analysis, and evaluation of jobs. Pr.: PSYCH 560 or conc. enrollment.

**PSYCH 562. Laboratory in Industrial Psychology II.** (2) II. Additional supervised experience in personnel psychology including interviewing, EEOC regulations, training, and performance appraisal. Pr.: PSYCH 561.

**PSYCH 563. Gender Issues in the Workplace.** (3) I. Psychological experiences of women and men in the world of work, with emphasis on traditional and nontraditional sex-role behavior, sexual discrimination and harassment, and relevant socialization experiences. Pr.: PSYCH 110.

**PSYCH 564. Psychology of Organizations.** (3) II. Relationships between individuals, groups, and organizations. How organizational factors contribute to individual behavior, and how individuals affect groups and organizational functioning. Emphasis is on such traditional topics as work motivation, job satisfaction and other attitudes, leadership, communication, socialization, and organization and job design. Pr.: PSYCH 110.

**PSYCH 580. Psychology of Sexual Behavior.** (3) I, II. Study of psychological determinants and consequences of human sexual behavior; roles of personality, attitudinal and emotional factors will be emphasized. Pr.: PSYCH 110, sophomore standing.

**PSYCH 585. Basic Concepts in Clinical Psychology.** (3) I. Critical analysis of the profession. Review of theoretical and empirical bases of such areas as intelligence and its measurement, personality and diagnosis, psychotherapy, and other modes of behavioral change. Pr.: PSYCH 110, 505, and 3 additional hours of psychology.

**PSYCH 586. Laboratory in Clinical Concepts.** (2) I. May be taken only in conjunction with PSYCH 585. Supervised practice in, demonstration of, and orientation to selected psychological techniques and practices. Pr.: Conc. enrollment in PSYCH 585.

**PSYCH 587. Field Placement.** (1–6) I, II, S. Supervised field experience in an agency or institutional setting in the application of psychological techniques to individuals, groups, or organizations. Regular supervision emphasizes relationship between theory and application and the evaluation of outcomes. Pr.: PSYCH 585 and 586, or 560 and 561 and consent of psychological technician training committee.

**PSYCH 599. Problems in Psychology.** (Var.) I, II, S. Investigation of selected problems. Pr.: PSYCH 110 and consent of instructor.

## Undergraduate and graduate credit

**PSYCH 605. Foundations of Social Behavior.** (3) II. Analysis of fundamental psychosocial processes underlying selected problems in contemporary society (e.g., effects on personality and interpersonal relations of changing sex roles, technological innovations, and historical events). Pr.: PSYCH 535 and either PSYCH 460, 475, or 480.

**PSYCH 620. Psychology of Personality.** (3) I. Discussion of different approaches to the study of personality. Pr.: PSYCH 350.

**PSYCH 625. Engineering Psychology.** (3) I. The role of behavioral factors in the design and operation of machines and equipment. Pr.: PSYCH 110, STAT 330, or 707.

**PSYCH 630. Human Neuropsychology.** (3) II. Study of brain-behavior relationships in humans. Brief review of human neuroanatomy followed by a major emphasis on brain function in learning, memory, language, and other cognitive behaviors. Also includes an examination of behavioral alterations following brain damage. Pr.: BIOL 198 and PSYCH 110, or consent of instructor.

**PSYCH 650. Psychology of Language.** (3) I. Experimental study of language, including sentence comprehension and memory, language acquisition and development, speech perception, and effects of context, perception, reasoning, and linguistic structure on processing of language. Pr.: PSYCH 110 and junior standing.

**PSYCH 715. Psychology of Aging.** (3) II. The psychological aspects of human aging. An analysis of the contributions of experimental, developmental, and personality-social psychology to the study of aging. The psychopathology of aging and psychological intervention strategies are also covered. Pr.: PSYCH 110 or DAS 315 and junior standing.

**PSYCH 775. History of Current Trends.** (3) II. 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 and 9 additional hours of psychology; senior standing.

**PSYCH 790. Topics in Psychology.** (Var.) I, II, S. Pr.: PSYCH 110 and consent of instructor.

**PSYCH 799. Problems in Psychology.** (Var.) I, II, S. Pr.: PSYCH 110 and consent of instructor.

## Graduate credit

**PSYCH 802. Quantitative Methods in Psychology.** (3) I. Examination of the nature of statistical inference in psychological research: hypothesis testing and statistical estimation, including a survey of nonparametric methods; consideration of correlational techniques useful with different kinds of psychological data. Pr.: STAT 330 or equiv.

**PSYCH 803. Physiological Psychology.** (3) I. An advanced survey of basic technique, theory, and research in the field of behavioral neuroscience, including memory and learning, sensory and motor processes, motivation, and sexual behavior. Pr.: BIOL 198 and PSYCH 110.

**PSYCH 804. Industrial/Organizational Psychology.** (3) I. Advanced survey of theory and research pertaining to human behavior in work organizations. Topics include selection, training, and evaluation of employees, job analysis and evaluation, work motivation and satisfaction, organizational structure and development, and working conditions. Pr.: PSYCH 560 or 564.

**PSYCH 805. Experimental Design in Psychology.** (3) II. Introduction to techniques of research planning and experimental design, including critical evaluation of selected experiments. Pr.: PSYCH 802.

**PSYCH 806. Psychological Measurement.** (3) I. The logic and methodology underlying the construction of psychological measuring instruments from the psychophysical estimate of threshold to the scaling of complex psychological variables. Pr.: PSYCH 110 and STAT 330.

**PSYCH 810. Learning.** (3) II. In-depth study of empirical and theoretical research on basic learning principles and their effects on behavior. Pr.: PSYCH 350 or equiv.

**PSYCH 812. Perception.** (3) II. 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 350 or equiv.

**PSYCH 814. Advanced Cognitive Psychology.** (3) I. Study of contemporary trends and research in cognition, including memory, language, problem solving, decision making, and human learning. Pr.: PSYCH 350 or equiv.

**PSYCH 820. Personality Theory and Research.** (3) II. A comparative examination of contemporary theories of personality as well as research findings relevant to such theories. Pr.: PSYCH 620 or equiv.

**PSYCH 825. Judgmental Processes.** (3) I. Examination of empirical findings and theoretical approaches to decision making and judgment with emphasis on higher cognitive processes. Pr.: PSYCH 350 and 802.

**PSYCH 830. Pro-Seminar in Social Psychology.** (3) I. 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 535.

**PSYCH 860. Practicum in Psychology.** (Var.) I, II, S. Supervised practical experience in applied psychology. Pr.: Consent of instructor.

**PSYCH 870. Practicum in Teaching Psychology.** (1–4) I, II. Supervised experience regularly teaching a college psychology course. May be repeated with consent of supervisory committee. Pr.: Graduate standing in Department of Psychology.

**PSYCH 875. Industrial Psychology: Personnel Training.** (3) II. An examination of the training of personnel in an organization. Topics include: determination of an organization's training needs, selection and motivation of trainees, design and evaluation of training programs, and examination of several specific strategies for accomplishing the training function. Pr.: PSYCH 560 or equiv.

**PSYCH 876. Industrial Psychology: Work Motivation.** (3) I. An examination of empirical findings and theoretical approaches to understanding the relationship between worker motivation and job outcomes. Pr.: PSYCH 560 or GENBA 520.

**PSYCH 877. Industrial Psychology: Leadership.** (3) I. Examination of current leadership theories, research, and practice in the work setting, focusing on situational approaches to leadership, leadership styles, and interactions between personal characteristics and organizational factors. Pr.: PSYCH 560 or equiv.

**PSYCH 878. Industrial Psychology: Personnel Selection.** (3) II. Examination of theoretical and practical issues in staffing industrial organizations, including recruitment, test validation, and other equal employment opportunity issues (test fairness, adverse impact, etc.). Pr.: PSYCH 560 or equiv.

**PSYCH 879. Organizational Psychology.** (3) I. An examination of the individual's role in industrial organizations and the effects of organizational variables on the individual worker. Topics include organizational communication, employee socialization, psychological climates of organizations, psychological stress in organizations, group processes and employee performance, and organizational change. Pr.: PSYCH 560.

**PSYCH 880. Industrial Psychology: Performance Appraisal.** (3) II. Examination of data sources, rating procedures, psychometric criteria for evaluating performance appraisal systems, and models/theories of the performance evaluation process. Pr.: PSYCH 560 or equiv.

**PSYCH 899. Master's Research in Psychology.** (Var.) I, II, S. Pr.: Consent of supervisory committee.

**PSYCH 922. Psychopathology.** (3) I. A systematic review of behavior disorders, their etiology and treatment. Pr.: PSYCH 505 and 620.

**PSYCH 951. Seminar in Physiological Psychology.** (I–3) Selected topics in physiological psychology. May be repeated with consent of supervisory committee. Pr.: Consent of instructor.

**PSYCH 952. Seminar in Sensory Processes.** (1–3) Selected topics in sensory psychology. May be repeated with consent of supervisory committee. Pr.: Consent of Instructor.

**PSYCH 953. 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.

**PSYCH 954. Seminar in Experimental Psychology.** (Var.) 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 810 or consent of instructor.

**PSYCH 956. Seminar in Psychological Measurement.** (Var.) 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.

**PSYCH 957. 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.

**PSYCH 958. Seminar in Mathematical Models of Behavior.** (1–3) Selected topics in mathematical psychology, and applications of mathematical models to behavior. May be repeated with consent of supervisory committee. Pr.: MATH 501 and consent of instructor.

**PSYCH 959. 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.

**PSYCH 960. Seminar in Industrial Psychology.** (3) I. Intensive examination of current empirical and theoretical issues in industrial and organizational psychology. May be repeated with consent of supervisory committee. Pr.: PSYCH 560 or equiv.

**PSYCH 968. 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.

**PSYCH 990. Internship in Psychology.** (Var.) I, II, S. Pr.: Consent of the supervisory committee.

**PSYCH 999. Ph.D. Research in Psychology.** (Var.) I, II, S. Pr.: Consent of supervisory committee.

# Sociology, Anthropology, and Social Work

**Sociology**

**Donald J. Adamchak,** Ph.D. (Bowling Green State 1978) Social Demography; Demographic Methods; Comparative Development and Social Change; Sub-Saharan Africa.

**Leonard Bloomquist,** Ph.D. (Wisconsin 1986) Sociology of Community; Research Methods; Political Economy; Social Change.

**Richard M. Brede,** Ph.D. (Illinois 1971) Juvenile Delinquency; Deviance; Race and Ethnic Relations; Social Psychology; Sport.

**Henry J. Camp,** Ph.D. (Nebraska 1974) Community Organization; Social Welfare; Rural Economic Development; Sport.

**Lelah Dushkin,** Ph.D. (Pennsylvania 1974) Social Stratification; Comparative Social Organization and Social Movements; Social Change; South Asia .

**R. Scott Frey,** Ph.D. (Colorado State 1980) Policy Analysis; Research Methods; Comparative Social Change; Environmental Policy.

**W. Richard Goe,** Ph.D. (Ohio State 1988) Community; Research Methods; Technology, Economic Restructuring and Urban Development; Political Economy.

**Lin Huff–Corzine,** Ph.D. (Washington 1986) Criminology/ Delinquency; Sociology of Women's Issues; Food and Foodways; Social Psychology.

**James D. Miley,** Ph.D. (Tulane 1970) Theory; Human Ecology; Family Social Change.

**Berkeley Miller,** Ph.D. (Brown 1986) Political Sociology; Sociology of Work; Stratification; Labor Laws and Movements; Political Economy.

**Harold L. Orbach,** Ph.D. (Minnesota 1974) Theory; Gerontology; Social Control; History of Sociology; G. H. Mead Life and Writings; Nationalism.

**George R. Peters,** Ph.D. (Nebraska 1968) Social Psychology; Formal Organizations; Social Gerontology.

**M. Antonio Riquelme,** Ph.D. (California–Santa Barbara 1975) Ethnic Relations; Political Sociology; Demography; Social Change; Latin American Studies.

**Dennis W. Roncek,** Ph.D. (Illinois 1975) Urban Sociology; Research Methods; Criminology; Statistics; Urban Crime.

**Michael F. Timberlake,** Ph.D. (Brown 1979) Comparative Development and Social Change; Urbanization; Rural Poverty; Political Economy.

**Anthropology**

**Walter R. Adams,** Ph.D. (Michigan State 1988) Cultural Ecology; Medical Anthropology; Physiological Bases of Behavior; Change; Central and North America.

**Janet E. Benson,** Ph.D. (Brandeis 1975) Gender Roles; Ethnic Relations; Complex Societies; the New Immigration; North America; South Asia.

**Michael Finnegan,** Ph.D. (Colorado 1972) Osteology; Forensic Science; Primatology Paleo; Recent Middle East, and Europe.

**Patricia J. O'Brien,** Ph.D. (Illinois 1969) Midwest and Central Plains Archaeology; Old World; Mexican and South American Archaeology; South American Ethnology.

**Harriet J. Ottenheimer,** Ph.D. (Tulane 1973) American Ethnic Studies; Linguistic Anthropology; Ethnomusiocology; Afro-American Music; Comoro Islands.

**Martin Ottenheimer,** Ph.D. (Tulane 1971) Social Anthropology; Kinship; African Ethnography; Seafaring and Society; Religion in Culture.

**Harald Prins,** Ph.D. (New School 1988) Doctoral (Nijmegen, Netherlands 1976) Theory; Visual Anthropology; Ethnohistory; North and South American Indian Ethnography; Fourth World Advocacy.

## Objectives

Sociology is concerned with patterns of social life and the ways people organize their activities and environment. A degree in sociology provides a wide array of career possibilities emphasizing human behavior, knowledge of group interaction, and skills in research. The Department of Sociology, Anthropology, and Social Work offers work leading to the degrees of master of arts and doctor of philosophy in sociology. The graduate program in sociology allows opportunities to develop skills and interests in specific speciality areas while obtaining a solid grounding in sociological theory and methods of research. It offers a high level of student–faculty interaction and the opportunity to participate in supervised research.

### Master's degree program

The master's program offers a full range of sociological specialties and a broad sociological background. It is primarily intended to prepare students desiring to continue into Ph.D. programs. However, it is also appropriate for students who want to work in areas of applied research.

### Ph.D. program

The Ph.D. program offers specialized training in community organization, societal change and development, demography and human ecology, social psychology, social organization, and social gerontology. All students take core courses in sociological theory and research methods. Graduates will be prepared for academic teaching and research as well as for applied social research careers.

## Admission

### Types of admission

Students are admitted to graduate study in one of four categories: (1) full standing; (2) provisional standing; (3) probationary standing; and (4) special standing. Graduate students in the first three classifications are working toward an advanced degree. Special standing students take non-degree course work.

1. Admission with full standing
Applicants must have been graduated from an institution whose requirements for the bachelor's degree are equivalent to those of Kansas State University and must have had an undergraduate GPA of B or better in their junior and senior years. Ph.D. applicants must have completed a master's degree. The student's preparation should include courses in Sociological Theory, Methods of Research, and Statistical Methods.

2. Admission with provisional standing
Applicants who do not meet requirements for admission with full standing will be advised of any deficiencies or other conditions to be met for admission to full standing.

3. Admission with probationary standing
Master's degree applicants whose level of undergraduate achievement is below that required by the department and the Graduate School, but who show promise for successfully completing graduate work in sociology will be admitted with probationary standing. Their progress will be reviewed each semester.

4. Admission with special student standing
This admission status is given to students taking graduate level course work not leading to an advanced degree. Change from special student status to provisional or full standing requires the permission of the department. A maximum of 9 hours taken as a special student may be applied toward an advanced degree upon acceptance by the department.

### Application procedures

Applicants must submit the following:

1. Two copies of appropriate university and departmental application forms.

2. A letter requesting financial assistance if such support is sought.

3. A statement of the applicant's academic objectives.

4. Two copies of official transcripts from all colleges and universities attended.

5. Three letters of recommendation from professors or supervisors acquainted with the applicant's scholarly achievement and potential.

6. An exemplary item of previous written work. Acceptable examples include a term paper, an honors paper, a seminar paper, a paper presented at a professional meeting, a thesis, a publication, a research proposal, or other scholarly work which the applicant believes provides evidence of ability and scholarly commitment.

7. Foreign students must submit current scores on the Test of English as a Foreign Language. Students who do not achieve a score of 550 on the TOEFL must enroll in the Kansas State University summer intensive English Language Program. Foreign students are also required to submit a statement of financial support for the school year.

Students completing their master's degree in sociology at Kansas State University who desire admission to the Ph.D. program must formally apply by submitting current information on the items listed above.

Application deadline for financial support is March 1. Announcements of awards of financial support are made in early April. Application for admission without financial support will be considered until June 15.

Application materials should be submitted to:
Graduate Coordinator
Department of Sociology,
Anthropology and Social Work
204 Waters Hall
Kansas State University
Manhattan, KS 66506–4003

## Master of arts in sociology

The master of arts degree normally requires two years of full-time work for completion. The master's degree is offered under two plans: (1) thesis option; and (2) nonthesis option. Under the thesis option a minimum of 30 credit hours, including a 6-credit-hour thesis, is required. The nonthesis option requires a minimum of 30 credit hours of course work. M.A. students must decide by the end of their second semester in residence whether they will pursue the thesis or nonthesis option.

**Thesis option** (30 hours)
1. Theory (6 hrs.): SOCIO 710 Systematic Analysis of Social Theory and SOCIO 810 Contemporary Sociological Theory.

2. Methods (6 hrs.): STAT 702 Statistical Methods for the Social Sciences and SOCIO 725 Intermediate Methods of Social Research.

3. Substantive areas: 3 hrs. Sociology Graduate Seminar (900 level); 9 hrs. of 700-level or above sociology courses. One 600-level sociology course may be included with permission of advisor, and one 500-level course may be taken in a supporting field with permission of advisor.

4. Thesis (6 hrs).

**Non-thesis option** (30 hours)
1. Theory (6 hrs.): SOCIO 710 Systematic Analysis of Social Theory and SOCIO 810 Contemporary Sociological Theory.

2. Methods (6 hrs.): STAT 702 Statistical Methods for the Social Sciences and SOCIO 725 Intermediate Methods of Social Research.

3. Substantive areas: 3 hrs. Sociology Graduate Seminar (900 level); 12 hrs. of course work, including 9 hrs. of 700-level or above sociology courses and 3 hrs. in a supporting field (500 level or above). Of the 9 700-level sociology hours, one 600-level sociology course may be taken with permission of advisor.

4. Directed study: Either a 3-credit-hour directed study (SOCIO 701) or a second 900-level sociology seminar is required.

## Ph.D. in sociology

### Overview

1. Residence requirements
Candidates for the Ph.D. degree are required to spend one full academic year in residence (a minimum of 24 credit hours of course work).

2. Program requirements
a. Students must complete a minimum of 66 hours of Ph.D. work beyond the master's: 36 hours of course work and 30 dissertation hours.

b. Students with a master's degree at another institution or in another field will have master's level courses evaluated to determine if they are equivalent to courses required in the Ph.D. curriculum. If the student has taken courses required in the theory core prior to admission to the Ph.D. program, alternate courses are available to meet core requirements.

c. Elective courses (beyond required hours in the core and two areas of concentration) may be taken to strengthen one's background in any core or concentration area to broaden one's training as determined by the student, the major professor, and the supervisory committee. Also included might be tool courses such as computer courses or language study or support courses in other fields.

d. All students will take four preliminary examinations: Theory, Methods of Social Research, and two areas of concentration, including either Societal Change and Development or Community Organization.

e. Up to 6 hours of M.A. work may count toward each of the Ph.D. areas of concentration. The assignment to areas of concentration of any unprescribed hours will be determined by the student, the major professor, and the supervisory committee.

### Core

All Ph.D. students must fulfill the 24-hour core requirement. The hours may be taken at either the master's or Ph.D. level. Six hours of theory must be taken at K-State.

SOCIO 710 Systematic Analysis of Social Theory
SOCIO 810 Contemporary Sociological Theory
SOCIO 725 Intermediate Methods of Social Research
SOCIO 825 Advanced Quantitative Methods I

One additional methods course from among the following:
SOCIO 724 Qualitative Methods
SOCIO 737 Methods in Human Ecology*
SOCIO 922 Specialized Techniques of Social Research
SOCIO 923 Methods of Social Policy Research*
SOCIO 925 Advanced Quantitative Methods II
SOCIO 931 Seminar in Demographic Methods*

A minimum of 9 hours is required in social organization and social psychology with at least one course in each area. Social psychology courses are listed under additional areas of concentration.

*These courses may also count in areas of specialization.

### Areas of concentration

Students may take at least 9 hours (or more, if recommended by the supervisory committee) in each of two of the areas of concentration. Each student must select either Societal Change and Development and/or Community Organization. At least 6 of the hours in each area of concentration must be taken at K-State.

**Societal change and development (9 hour minimum)**
SOCIO 633 Gender, Power, and Development
SOCIO 734 Sociology of Rural Development
SOCIO 740 Comparative Social Systems
SOCIO 751 Social Change
SOCIO 951 Seminar in Societal and Institutional Dynamics (required)

An appropriate 3 hour course outside the department or SOCIO 901 Research Problems in Sociology.

**Community organization (9 hour minimum)**
SOCIO 732 Sociology of Community
SOCIO 734 Sociology of Rural Development
SOCIO 923 Methods of Social Policy Research
SOCIO 932 Seminar in Comparative Community Organization (required)

An appropriate 3 hour course outside the department or SOCIO 901 Research Problems in Sociology.

**Demography and human ecology (9 hour minimum)**
SOCIO 730 Social Demography (required)
SOCIO 735 Human Ecology
SOCIO 737 Methods in Human Ecology
SOCIO 931 Seminar in Demographic Methods (required)
SOCIO 935 Seminar in Demography

An appropriate 3 hour course outside the department or SOCIO 901 Research Problems in Sociology.

**Social organization/social gerontology (9 hour minimum)**
SOCIO 640 Sociology of the Family
SOCIO 647 Sociology of Work
SOCIO 740 Comparative Social Systems
SOCIO 741 Social Differentiation and Stratification
SOCIO 744 Social Gerontology
SOCIO 750 Social Control
SOCIO 940 Seminar in Social Organization
SOCIO 944 Seminar in Sociology of Aging

An appropriate 3 hour course outside the department or SOCIO 901 Research Problems in Sociology.

*Students may combine work in social gerontology with the interdisciplinary graduate emphasis in gerontology (See K-State Undergraduate Catalog under Secondary Majors—Gerontology.)

### Additional areas

Students, with the permission of their major professor and supervisory committee, may take courses and an examination in an area of concentration in other areas of the discipline in which the faculty teach and do research. This area would substitute for the area of concentration other than Societal Change and Development or Community Organization. The student would be required to take a minimum of 9 hours in the approved area. Such areas include (but are not limited to): social psychology, sociology of gender, sociology of the family, sociology of work, and criminology.

**Additional courses available**
**Theory**
SOCIO 911 Topical Seminar in Sociological Theory

**Social Psychology**
SOCIO 750 Social Control
SOCIO 752 Social Roles and Relationships
SOCIO 767 Social Reactions to Deviance
SOCIO 950 Seminar in Social Interaction

## Assistantships

Teaching and research assistantships are available each year. They require approximately 16 hours of work per week. All assistants must be enrolled in 12 hours of course work per semester, including the hours of thesis or dissertation research.

Research assistants at both M.A. and Ph.D. level are assigned to specific research projects and work directly under the supervision of the project leader.

Teaching assistants at the M.A. level work under the supervision of faculty members. At the Ph.D. level, teaching assistants teach their own sections of courses, either on campus or at Old Trooper U, Fort Riley. In their first fall semester all teaching assistants are required to take the departmental teaching seminar (1 hour).

Students awarded assistantships who make normal degree progress can expect to receive support for two years at the M.A. level and three years at the Ph.D. level. To remain eligible for this support, assistants must do work at the grade level to remain in the program (an average of B or better), remove incompletes within a year of taking the course, and perform their assignments in a satisfactory manner.

## Proseminar

All entering graduate students are required to enroll in the departmental proseminar during their first fall semester on campus. The proseminar is conducted by the graduate coordinator and consists of discussions designed to orient the graduate student to the discipline of sociology as a profession and to the department. During the semester, all graduate faculty members participate in the proseminar, thereby introducing graduate students to the teaching and research interests of the graduate faculty.

## Graduate handbook

Details of the procedures, deadlines, and policies of the department and the graduate school on all matters pertaining to graduate study in Sociology are available in the graduate handbook, Sociology Graduate Study. This is mailed to prospective applicants and is available from the graduate coordinator.

## Undergraduate and graduate credit in minor field

**SOCIO 500. Sociological Perspectives on Contemporary Issues.** (Var.) I, II, S. Analysis of a selected topic of contemporary interest. Topics vary from semester to semester and might include: impact of public policy on rural life; white collar crime; student-athlete education; social change in the Third World. Pr.: SOCIO 211.

**SOCIO 501. Proficiency Development.** (1–3) Integrative review of sociological concepts and skills under faculty supervision. For single students or groups of students. Not applicable to major field requirements. Not repeatable. For undergraduate credit only. Pr.: Consent of instructor and superior performance in relevant course.

**SOCIO 504. Political Sociology.** (3) II, in even years. An introduction to the principles of political sociology. Processes of political socialization, participation within and outside established organizational channels, recruitment of elites, communication and influence, power, decision making, and policy outputs. Data are presented from a cross-national perspective. Same as POLSC 504. Pr.: SOCIO 211, POLSC 110.

**SOCIO 505. Introduction to the Civilizations of South Asia I.** (3) I. Interdisciplinary survey of the development of civilizations in India, Pakistan, Sri Lanka, Bangladesh, and Afghanistan; geographical and demographic context; philosophical and social concepts; social and political institutions; literature; and historical movements. Same as HIST 505, ECON 505, POLSC 505, ANTH 505, GEOG 505. Pr.: SOCIO 211.

**SOCIO 506. Introduction to the Civilizations of South Asia II.** (3) II. Interdisciplinary survey of recent and contemporary civilizations in India, Pakistan, Sri Lanka, Bangladesh, and Afghanistan, including literature, geography, social and political structure, ideas. Same as HIST 506, ECON 506, POLSC 506, ANTH 506, GEOG 506. Pr.: SOCIO 211.

**SOCIO 510. Social Welfare as a Social Institution.** (3) I, 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. Same as SOCWK 510. Pr.: SOCIO 211.

**SOCIO 511. Comparative Social Theories.** (3) I, II. Investigations of a range of current sociological theories concerning the socialization process, group behavior, and social organization. Pr.: SOCIO 211.

**SOCIO 520. Methods of Social Research I.** (4) I, II. Treatment of the logic and procedures involved in the formulation of a research problem and the difficulties encountered in conducting research. Examines problems of explanation and prediction, the process of inquiry, elements of the scientific method, the design of research, and analysis in the social sciences.Pr.: SOCIO 211, STAT 330 or equiv. To include 1 credit hour of lab and field research experience.

**SOCIO 522. Sociological Field Methods.** (3) I, II. Introduction to field/qualitative methods. Includes collection and analysis of data using techniques such as interviewing, observation, and unobtrusive measures. Taking field notes, report writing, and ethical issues are also stressed. Pr.: SOCIO 520.

**SOCIO 531. Urban Sociology.** (3) II. 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.: SOCIO 211.

**SOCIO 532. Community Organization and Leadership.** (3) I, II. The analysis of community organization and change in American communities, with special emphasis on nonmetropolitan places. Issues include the analysis of internal community organizational ties, the interaction between the local community and its external environment, and the exploration of various methods affecting community development and social change within communities. Pr.: SOCIO 211 and 520 or 519, or equiv., or graduate standing.

**SOCIO 533. Rural Society.** (3) I. A survey of U.S. rural society, including change in agricultural structure, rural demographic shifts, growth of the rural service sector, rural class structure, decline and transformation of rural communities, and linkages to urban society. Examination of selected rural institutions such as education and religion. Pr.: SOCIO 211 or consent of instructor.

**SOCIO 535. Population Dynamics.** (3) II, in odd years. World population trends and their implications for economic development, public policy, and social and cultural change. The interaction of fertility, mortality, and migration with the size, distribution, and structure of populations in nations and world regions. Pr.: SOCIO 211.

**SOCIO 536. Environmental Sociology.** (3) II, in even years. The interrelations among human societies, social institutions, and the biophysical environment. Emphasis on the reciprocal links among technological change, economic structure, and the ecological basis of human societies. Pr.: SOCIO 211.

**SOCIO 540. Social Organization.** (3) II. Principles and processes of the organization and structure of human societies. Analysis of social groups and institutions and theories of social structure. Pr.: SOCIO 211.

**SOCIO 541. Wealth, Power, and Privilege.** (3) II. Distribution of resources and rewards in American society. Various explanations of the causes, persistence, and effects of inequality in American life. Discussion of social mobility and current issues. Pr.: SOCIO 211.

**SOCIO 542. The Social Organization of the Future.** (3) On sufficient demand. Examination of alternative social arrangements presented in speculative and science fiction. Consideration of fictional extrapolations of social, scientific, and technological trends in terms of specific institutions. Analysis of possible social and interpersonal structures imaginatively conceived. Pr.: SOCIO 211.

**SOCIO 545. The Sociology of Women.** (3) I. The positions of women in the United States and cross-culturally are studied in order to understand what women and girls do and how that is perceived and responded to by different groups. Pr.: SOCIO 211.

**SOCIO 546. Bureaucracy in Modern Societies.** (3) I. The nature and types of bureaucratic organizations in modern societies. Selected aspects of their internal structure, such as peer group and hierarchical relations in organizations, processes of communication, management, and impersonal mechanisms of control. Pr.: SOCIO 211.

**SOCIO 550. Introduction to Social Interaction.** (3) I. A survey of theories of social interaction and social psychology with special attention to research on principles of interpersonal relations in social situations, group formation, maintenance, and change. Pr.: SOCIO 211.

**SOCIO 560. Juvenile Delinquency.** (3) I, II, S. Nature, extent, and causes of delinquency; characteristics of delinquents; means of prevention and treatment. Pr.: SOCIO 211.

**SOCIO 561. Criminology.** (3) I, II. Theoretical foundations of research on the nature, extent, and causes of crime; programs for prevention and treatment. Pr.: SOCIO 361 or 511.

**SOCIO 565. Program and Policy Formulation and Analysis.** (3) I, II. Examination of policies and programs developed to cope with various social problems. Emphasis will be on analysis of existing programs and policies and the formulation of alternative policies. Attention will be given to policy change through legislative action. Same as SOCWK 565. Pr.: SOCIO 260, 510.

**SOCIO 567. Pre-Internship Orientation.** (1) I, II. Society and criminal justice option major's take this course in the semester prior to enrollment in SOCIO 568 Society and Criminal Justice Internship. Students, in consultation with

faculty internship coordinator, select internship sites and undergo agency orientation. Pr.: SOCIO 522 and senior standing. Society and criminal justice option majors only.

**SOCIO 568. Society and Criminal Justice Internship.** (9) I, II, S. Supervised field experience in various agencies within the criminal justice system. To be taken concurrently with SOCIO 569. Pr.: SOCIO 567 and 522. Society and criminal justice option students only.

**SOCIO 569. Society and Criminal Justice Professional Seminar.** (3) I, II, S. Integrates field experience and everyday practices in working with offenders in the criminal justice system with sociological theory. To be taken concurrently with SOCIO 568. Pr.: SOCIO 567 and 522. Society and criminal justice option students only.

**SOCIO 570. Race and Ethnic Relations in the U.S.A. (3) I, II.** This survey of racial and ethnic relations focuses on discrimination and conflict now as well as on background factors of the past to enlarge understanding of dominant and minority groups. Pr.: SOCIO 211.

## Undergraduate and graduate credit

**SOCIO 618. Religion in Culture.** (3) II, in odd years. The nature of religion and its manifestations in different cultural systems. Same as ANTH 618. Pr.: ANTH 200 or SOCIO 211.

**SOCIO 633. Gender, Power, and Development.** (3) II, in even years. Examination of various models of development and their impact on roles of women and men in various cultures. Emphasis upon Africa, Asia, and Latin America. Comparisons of public, service, and economic sectors, including agriculture, marketing, and industry. Examination of policy issues. Pr.: SOCIO 211 or ANTH 200 and 3 additional hours in sociology or cultural anthropology. Same as ANTH 633.

**SOCIO 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.: SOCIO 211.

**SOCIO 643. Sociology of Religion.** (3) I. On sufficient demand. The role of religion as an institution in American society. An assessment of the functions of religion and an exploration of contemporary trends and movements, including information on traditional denominations and emerging sects and cults. Pr.: SOCIO 211.

**SOCIO 647. Sociology of Work.** (3) II. The social nature of work and related phenomena; occupational structures; career lines; adjustment and interpersonal relations at work; significance of work in the life cycle. Pr.: SOCIO 211.

**SOCIO 661. Corrections.** (3) I, II. The historical development and current status of the correctional system. Major institutional components: jails, prisons, probation, parole and other forms of community corrections. Modern issues such as offender and victim rights and electronic monitoring. Pr.: SOCIO 561.

**SOCIO 665. Women and Crime.** (3) I, in odd years. Nature, extent, and causes of crime among women; victimization of women including domestic assault, rape and incest; women who work in the criminal justice system. Pr.: SOCIO 361 or junior standing.

**SOCIO 701. Problems in Sociology.** (Var.) I, II, S. Pr.: SOCIO 211 and junior standing.

**SOCIO 709. Development of Social Thought.** (3) On sufficient demand. 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.: SOCIO 211.

**SOCIO 710. Systematic Analysis of Social Theory.** (3) I. Examination of sociological theory with reference to the nature of scientific explanation and the function of scientific theory. Critical study and analysis of selected social theory and major social theorists with the objective of clarifying the conceptual and logical structure of underlying theoretical models and their assumptions about man and society. Pr.: SOCIO 511 or equiv.

**SOCIO 724. Qualitative Methodology.** (3) On sufficient demand. Collection, analysis, and presentation of sociological data using such methods as participant observation, ethnomethodology, community analysis, documentary research and historiography, case study, and life history. Emphasis upon formulation of problems and the execution of research. Pr.: SOCIO 520 and STAT 330 or equiv.

**SOCIO 725. Intermediate Methods of Social Research.** (3) II. Current sociological research techniques, strategies of research design, construction of research instruments, logic of sociological inquiry, conceptualization, problem formation, and preparation of research proposals. Pr.: SOCIO 520 and STAT 330.

**SOCIO 730. Social Demography.** (3) I. The study of human population, including the social, economic, political, ecological, and cultural determinants and consequences of changes in fertility, mortality, and migration. Pr.: Nine hours of sociology or equiv. Pr.: SOCIO 211.

**SOCIO 732. Sociology of Community.** (3) II, in odd years. A survey of theoretical perspectives and current research on the sociology of community in the U.S. and other countries. Examples of issues covered include community growth and decline, social inequality, community power and politics, social implications of community economic change, urbanization, and the global context of local change. Pr.: SOCIO 532 or permission of instructor.

**SOCIO 734. Sociology of Rural Development.** (3) I, in even years. A survey of theoretical perspectives and research on changes in the social organization of rural areas, both international and in the U.S. Examples of issues covered include relationship of agriculture to other social structures and the biosphere, implications of the limits to growth for the development of rural economies, peasants and other rural social groups, and the transnational organization of food production, distribution, and consumption. Pr.: SOCIO 533 or permission of instructor.

**SOCIO 735. Human Ecology.** (3) II, in even years. The interrelationships among population, technology, environment, and social organization. An examination of the origins and development of human ecology in sociology, and recent attempts to redefine the area. Special emphasis on current theoretical and research efforts. Pr.: SOCIO 211 and consent of instructor.

**SOCIO 737. Methods in Human Ecology.** (3) Techniques for accessing, manipulating, and creating aggregate, ecological data from private and public sources including the U.S. Census through address matching or location identification, aggregation, and calculation of ecological potentials. Prepares students for doing basic and applied research in human ecology, sociology, and other related fields. Pr.: SOCIO 520 or equiv.

**SOCIO 740. Comparative Social Systems.** (3) I, in even years. Compares social systems in different regions of the world. Examines models of comparative and historical sociology. Provides students with a background for conducting and evaluating comparative research. Treats such issues as socioeconomic development, group relations, and age and sex roles from a cross-cultural perspective. Pr.: SOCIO 211 or ANTH 200 and a 500-level course in social or cultural change and development.

**SOCIO 741. Social Differentiation and Stratification.** (3) I, in odd years. Analysis of societal organization based on age, sex, residence, occupation, community, class, caste, and race. Pr.: SOCIO 211.

**SOCIO 742. Society and Change in South Asia.** (3) II, in even years. Examines recent studies of family and community, population, mobility, urbanization, and modernization in the India-Pakistan region, with focus on social change. Pr.: SOCIO 211 or ANTH 200 and either a 500-level course in South Asian studies or one in social change and development.

**SOCIO 744. Social Gerontology: An Introduction to the Sociology of Aging.** (3) II. Analysis of the phenomenon of human aging in its individual, social, and cultural aspects with special attention to the problems of aging populations in Western societies. Pr.: SOCIO 211.

**SOCIO 750. Social Control.** (3) Analysis of social and institution processes and mechanisms of social control: socialization, role allocation, systems of social sanctioning, growth and dynamics of institutional systems of social control emphasizing its character at the institutional and societal level of analysis. Pr.: SOCIO 211.

**SOCIO 751. Social Change.** (3) II, in odd years. Examination of the processes and mechanisms of societal change. Attention centers on current theoretical, methodological, and research issues. Pr.: SOCIO 211.

**SOCIO 752. Social Roles and Social Relationships.** (3) II, in odd years. Analysis of the processes of interpersonal perception, attraction, and social interaction in the formation, maintenance, and change of social relationships and social roles. Particular emphasis is placed on the importance of such processes for the formation of social groups and social interaction in a variety of social contexts. Consideration of major theoretical approaches and their empirical foundations. Pr.: SOCIO 211 and 550.

**SOCIO 767. Social Reactions to Deviance.** (3) Selected topics in the sociology of deviance, such as (1) public reactions to deviant persons and groups, (2) the nature and extent of formally organized responses to deviance, and (3) deviance considered from the perspective of deviant actors. Pr.: SOCIO 561 or graduate student standing.

## Graduate credit

**SOCIO 808. Advanced Issues in Sport Sociology.** (3) On sufficient demand. An in-depth analysis of the sociology of sport literature with special interest in critiquing the theoretical frameworks and methodologies employed. Pr.: PE 745 or SOCIO 745.

**SOCIO 810. Contemporary Sociological Theory.** (3) II. Comparative analysis of contemporary schools of sociological thought showing their development, current status, and possible future trends. Emphasis on structural functionalism, Marxism and neo-Marxism, symbolic interactionism, phenomenology and ethnomethodology, and exchange theory. A working knowledge of classical sociological theory is assumed. Pr.: SOCIO 710 or equiv.

**SOCIO 825. Advanced Quantitative Methods.** (3) I. Prepares students to carry out sophisticated research, to understand current quantitative sociological journals, and to apply advanced statistical techniques to sociological data. Pr.: SOCIO 725; STAT 702 or equiv.

**SOCIO 898. Master's Report Research.** (Var.) I, II, S.

**SOCIO 899. Master's Thesis Research.** (Var.) I, II, S.

**SOCIO 901. Research Problems in Sociology.** (Var.) I, II, S. Individual study and research for students admitted to doctoral standing in the Graduate School. Pr.: M.A., consent of instructor.

**SOCIO 911. Seminar in Sociological Theory.** (3) II. Selected topics in sociological theory. May be repeated with consent of supervisory committee. Pr.: SOCIO 710 and 810.

**SOCIO 922. Specialized Techniques of Social Research.** (3) On sufficient demand. Intensive examination of the problems and techniques of design, data collection, analysis, and interpretation which accompany a particular strategy of basic or applied research. Topics announced for the semester in which the course is offered. May be repeated with consent of department. Pr.: SOCIO 211 or equiv.

**SOCIO 923. Methods of Social Policy Research.** (3) Examination of principles, techniques, and design of retrospective and prospective social policy research. Pr.: SOCIO 725 or equiv.

**SOCIO 925. Advanced Quantitative Methods II.** (3) II, in odd years, on sufficient demand. Application of advanced quantitative analysis techniques in Sociology. Includes complex single-equation models and multi-equation linear and non-linear models in sociology. Pr.: SOCIO 825 or STAT 705.

**SOCIO 931. Seminar in Demographic Methods.** (3) II, in odd years. Demographic processes such as fertility, mortality, and migration, with emphasis on measurements, methods, and analytical techniques. Includes the construction of life tables and population estimates and projections. Pr.: SOCIO 725 and 730.

**SOCIO 932. Seminar in Comparative Community Organization.** (3) I, in odd years. Recent developments in theory and research on processes affecting community organization. Topics will vary. Possible emphases include world urbanization, community linkages to regional and global systems, technology and local economic develop-

ment, rural community development, and community-based collective action. Pr.: SOCIO 732 or 734 or equiv.

**SOCIO 935. Seminar in Demography.** (3) on demand. Consideration of selected topical areas in demography such as fertility and family planning, migration, population and development, and regional demography. May be repeated with different topic. Pr.: SOCIO 730 or equivalent.

**SOCIO 940. Seminar in Social Organization.** (3) II, in even years. Consideration of selected approaches to the study of societal organization, organizational theory, and analysis. Pr.: Consent of instructor.

**SOCIO 944. Seminar in the Sociology of Aging.** (3) Consideration of selected topics and issues in the sociology of aging such as retirement and institutional change, societal reactions to aging, population structure and socioeconomic consequences of aging populations, the social organization of leisure, the impact on social organization of services for older people, the structural and organizational consequences of widowhood, age-grading and stratification in aging populations, analysis of the impact on community structure, and organization of special institutions for older people. Pr.: SOCIO 744.

**SOCIO 950. Seminar in Social Interaction.** (3) II, in even years. Examination of current theoretical, methodological, and research issues and topics. Pr.: SOCIO 550, 752, or equiv.

**SOCIO 951. Seminar in Societal and Institutional Dynamics.** (3) 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.: SOCIO 751 or equiv.

**SOCIO 962. Seminar in Deviant Behavior and Social Disorganization.** (3) I, in odd years. Analysis in detail and depth of selected forms of deviant behavior and their relevance to social disorganization. Pr.: Consent of instructor.

**SOCIO 999. Ph.D. Dissertation Research.** (Var.)

# Speech

**Harold J. Nichols, Head**

## Rhetoric/communication

**John O. Burtis,** Associate Professor, Ph.D., 1987, University of Minnesota: leadership communication, small group communication, communication theory, classroom pedagogy.

**Nancy R. Goulden,** Assistant Professor, Ed.D., 1989, Northern Arizona University: instructional communication, assessment, nineteenth century rhetoric.

**Charles J. G. Griffin,** Associate Professor, Ph.D., 1983, University of Missouri–Columbia: classical rhetorical theory, rhetoric of social movements, history of public address, rhetoric of religion in American life.

**David E. Procter,** Associate Professor, Ph.D., 1989, University of Nebraska–Lincoln: political communication, language and culture, rhetorical criticism, qualitative methods.

**William J. Schenck-Hamlin,** Associate Professor, Ph.D., 1976, University of Oregon: persuasion, communication research methods, communication theory, language and social interaction.

## Speech pathology/audiology

**Program director**

**Ann Bosma Smit,** Ph.D. University of Maryland. CCC-SLP. Assoc. Prof. (Child phonologic development; intervention strategies for phonologic disorders).

**Professor**

**Bruce C. Flanagan,** Ph.D., University of Florida. CCC-SLP. (Measurement of stuttering severity and treatment efficacy).

**Associate professor**

**Harry Rainbolt,** Ph.D. University of Indiana. CCC-AUD. (Hearing assessment; perception of complex auditory signals in noise).

**Assistant professors**

**Linda Hoag,** Ph.D. University of Illinois-Champaign. CCC-SLP. (Communicative competence in users of augmentative communication devices; voice disorders).

**Larry C. Solberg,** Ph.D. Florida State University. CCC-SLP. (Discourse comprehension and production of adults and children with language disorders).

**Instructors**

**Caroline Salva Romero,** M.A., Kansas State University. CCC-SLP. (Clinic director).

## Theatre

**Norman J. Fedder,** University Distinguished Professor, Ph.D. 1962, New York University: playwriting, drama therapy;

**Carl M. Hinrichs,** Associate Professor, M.A. 1960, University of North Carolina: playwriting, scene design;

**Marci E. Maullar,** Assistant Professor, M.F.A. 1986, Pennsylvania State University: theatre management;

**Harold J. Nichols,** Professor, Ph.D. 1971, Indiana University: theatre history, dramatic literature and theory;

**Lewis E. Shelton,** Associate Professor, Ph.D. 1971, University of Wisconsin: directing;

**Judith Zivanovic,** Professor, Ph.D. 1968, University of Wisconsin: playwriting, dramatic literature, theatre history.

The department of speech offers the master of arts degree with emphases in rhetoric/communication, speech pathology and audiology, and theatre. The requirements for each emphasis are described below. The Department offers a number of Graduate Teaching Assistantships. Graduate assistants receive a waiver of tuition and a stipend. Most Graduate assistants teach the basic speech course, but there are also assistantships available which include coaching duties in debate and forensics and teaching/construction duties in scenery and costumes. Students interested in an assistantship should submit their application by April 1 for the coming academic year.

## Rhetoric/communication

The graduate program in rhetoric/communication within the Speech Department offers students a broad-based education in the theory and criticism of human communication. The objective of the program is to provide students with a program of instruction that exposes them to diverse perspectives within the field of speech communication in preparation for careers in teaching, business, law, ministry, government, and community service.

The rhetoric/communication program is housed in Nichols Hall, one of the architectural showpieces of the K-State campus. Facilities include semi-private office accommodations for graduate teaching assistants, a departmental library, seminar room, and practice facilities for debate and forensics activities. The K-State campus is ideally situated for students interested in the study of political communication because of the proximity of the Eisenhower and Truman presidential libraries and the prestigious Alfred M. Landon Lectures on Public Policy, which are delivered several annually.

The graduate program in rhetoric/communication has been recognized as one of the top graduate programs in speech communication in the midwest region. The graduate faculty is committed to providing every student with individual attention in the planning and conduct of his or her program of study. Classes are small, allowing faculty and students to work closely together on projects of mutual interest. Graduate students may also work with K-State's nationally recognized debate and forensics programs.

### Master's degree requirements

Students become eligible for the master of arts in speech upon recommendation of the graduate faculty and completion of the following requirements:

1. SPCH 720, 730, 821, and 822. (12 credit hours total)

2. An additional 18 credit hours in rhetoric/communication courses numbered at the 600 level or above, including six credit hours of SPCH 899 (for students electing the thesis option); or an additional 20 credit hours, including 2 credit hours of SPCH 899 (for students electing the nonthesis (report) option).

3. Submission of an acceptable thesis or report.

4. Completion of an oral examination which includes a defense of the thesis or report.

In consultation with his or her advisor, a student may develop a minor emphasis of up to 9 credit hours at the 500 level or above in academic areas outside the rhetoric/communication program.

Students may elect either a thesis or nonthesis (report) program of study. A master's thesis identifies an original research problem, implements an appropriate methodology and reports and interprets its findings. Completion of a thesis project demonstrates the student's ability to carry out sustained, independent research that makes an original contribution to the discipline. A master's report is an academic essay that reviews and analyzes research literature within the discipline. Completion of a report project demonstrates the student's ability to interpret and synthesize scholarly literature in a given subject area.

Both the master's thesis and research report require prospectus approval by the graduate faculty and adherence to Graduate School and departmental guidelines.

### Admission

Students enter the graduate program in rhetoric/communication from a variety of undergraduate majors. However, applicants should possess a strong academic record and a minimum of background work in the field speech communication. Students whose undergraduate record reflects deficiencies in either of these areas may be granted admission on a provisional basis.

Admission is based upon review of the applicant's undergraduate transcript, three letters of recommendation, and performance on the Graduate Record Examination.

### Progress through the program

Continuation in the program is contingent upon the student making satisfactory progress towards the degree. Satisfactory progress is defined as follows: (1) The student must maintain an overall grade point average of 3.0 (on a 4.0 scale). (2) The student must earn a grade of B or better in all required courses. A student who receives a grade below B in a required course must retake the course as a condition for continuation in the program. A student whose overall grade point average falls below 3.0 will be placed on probationary status. Continuation in the program will be contingent upon the student raising his or her grade point average to the minimum (3.0) within one semester.

## Rhetoric/communication courses

### Undergraduate and graduate credit

**SPCH 630. Special Topics in Rhetoric and Communication.** (3) II Intensive study of selected topics in communication and rhetoric. Repeatable with change in topic. Pr.: Junior standing and consent of instructor.

**SPCH 720. Perspectives on Communication.** (3) Analysis of current perspectives on the communication process. Materials cover assumptions, principles, implications and selected research within each perspective. Pr.: SPCH 320.

**SPCH 721. Language and Social Interaction.** (3) II. Study of the epistemological, social, and behavioral functions of language in communication. Examination of the processes by which language functions to construct one's worldview and guide individual action. Pr.: SPCH 320 or LING 280 or ANTH 220; junior standing.

**SPCH 725. History of American Public Address.** (3) Study of American speakers, from the time of Jonathan Edwards to the present, including their education, major speeches, and contributions to the rhetorical history of the United States. Pr.: Junior standing and consent of the instructor.

**SPCH 726. Seminar in Persuasion.** (3) II, in odd years. Survey and analysis of advanced theory and experimental studies in persuasion. Pr.: Junior standing.

**SPCH 730. Classical Rhetorical Theory.** (3) Study of rhetorical theory and criticism from early Greek to Roman times. Pr.:SPCH 330 or graduate standing.

**SPCH 732. Contemporary Rhetorical Theory.** (3) II. Study of major European and American contributors to rhetorical theory in the twentieth century. Pr.: SPCH 730.

**SPCH 733. Rhetorical Criticism.** (3) II. Study of traditional and contemporary approaches to the analysis of public discourse. Pr.: SPCH 330.

**SPCH 799. Problems in Speech.** (Var.) Open to students in any speech area. Pr.: Junior standing and consent of instructor.

### Graduate credit

**SPCH 810. Research Writing in Rhetoric/Communication.** (1) A study of the problems of writing and rewriting the results of scholarly investigations in rhetoric/communication.

**SPCH 820. Seminar in Rhetoric/Communication.** (3) Selected topics in rhetoric/communication research. May be repeated for credit with change in topic.

**SPCH 821. Communication Research Methods I.** (3) I. Descriptive and experimental methodologies pertinent to investigation in rhetoric/communication. Topics will include such techniques as content analysis, attitude scaling, and stylistic analysis. Pr.: SPCH 520 or equivalent.

**SPCH 822. Communication Research Methods II.** (3) II. Historical and critical methodologies pertinent to investigations in rhetoric/communication. Topics will include participant observation, unstructured interviewing, historical research, and discourse analysis. Pr.: SPCH 330 or equivalent.

**SPCH 823. Competitive Forensic Theory.** (30 Theory and study of current research in competitive debate and individual events. Pr.: SPCH 125 and 426.

**SPCH 899. Research in Speech.** (Var.) Pr.: Sufficient training to carry on the line of research undertaken and consent of instructor.

## Speech pathology/audiology

The program in speech pathology/audiology is a unit of the department of speech, and it offers M.A. degrees in speech-language pathology (SLP) and in audiology (AUD). It has clinical affiliations with a variety of professional sites including public school systems, hospitals, and specialized settings such as The Capper Foundation for Crippled Children and Kansas Neurological Institute. The program has approximately 20 Master's and 90 undergraduate students. The speech-language pathology degree program is accredited by the Educational Standards Board of America Speech-Language-Hearing Association. Graduates of the program are eligible for clinical certification by ASHA. These programs also meet the requirements of the Kansas Department of Education certification guidelines for speech clinicians.

The objectives of the professional education program are:

1. To prepare speech-language pathologists to fill diverse roles in the broad area of speech-language pathology;

2. To provide the student with knowledge about the changing role of the speech-language pathologist within our society;

3. To facilitate an interdisciplinary view of disorders of human communication; and,

4. To provide speech-language pathologists with the coursework and practicum needed to earn the Certificate of Clinical Competence awarded by the American Speech-Language-Hearing Association.

In order to foster excellence, the programs are designed to allow a great deal of individualized teaching. Students may choose their advanced clinical practicum according to their professional goals. Students also have the opportunity to participate in research as part of their program.

The program maintains an active clinic which serves clients of all ages with a wide range of disabilities. The program also has equipment and laboratory facilities for research in normal and disordered speech, language and hearing. Students are strongly encouraged to undertake a thesis project for the MA degree.

### Degree requirements

The program at Kansas State University has been designed to meet the current requirements for Certificate of Clinical Competence of the American Speech-Language-Hearing Association and to meet the State of Kansas Department of Education requirements for speech–language pathologists.

For the master of arts degree, the following requirements must be met:

A. Completion of a minimum of 28 academic graduate credit hours with the remaining credits from practica and externships (See: Graduate Required Courses for Speech-Language Pathology).

B. Completion of two externships, each of which includes at least 40 full days and 50 clinical clock hours of practicum at an approved off-campus site.

C. Completion of a minimum of 350 clinical contact hours in the appropriate categories.

D. Demonstration of clinical proficiency as judged by the program's faculty.

*Students selecting the nonthesis option must also:*

A. Complete three SLP graduate seminars (9 of the 28 minimum academic graduate credit hours).

B. Successfully complete written and oral comprehensive examinations.

*Students selecting the thesis option must also:*

A. Complete one SLP graduate seminar (3 of the 28 minimum academic graduate hours).

B. Design, implement, and produce a written thesis on a research topic (6 of the 28 minimum academic graduate hours).

C. Successfully defend the thesis orally.

A student who has not had adequate undergraduate preparation in speech-language pathology or audiology will be required to complete the following core courses or their equivalent. Students who wish to obtain Kansas public school certification may need to complete up to 15 additional academic hours.

**Normal communication processes (15 credits)**
LING 601 General Phonetics (3)
SPPAT 442 Developmental Psycholinguistics (3)
SPPAT 350 Anatomy of the Speech Mechanism (3)
SPPAT 351 Fundamentals of Hearing (3)
SPPAT 550 Speech Physiology (3)

**Clinical process (9–11 credits)**
SPPAT 443 Language Assessment and Intervention I (3)
SPPAT 446 Disorders of Articulation and Phonology (3)
SPPAT 449 Clinical Procedures in Speech Pathology and Audiology (3)

**Research methods (3 credits)**
SPPAT 545 Clinical Research in Speech-Language Pathology and Audiology (3)

### ASHA certification requirements

The graduate program in speech pathology prepares the student with the basic course requirements for certification by the American Speech-Language-Hearing Association, which are as follows:

I. At least 75 semester hours of professional training including a master's degree in speech–language pathology from an ESB ac-

credited program. At least 30 of these hours must be at the graduate level. These hours should be distributed as indicated below:

A. At least 15 semester hours in courses that provide information about the normal development and use of speech, hearing and language.

B. A minimum of 36 semester hours (including 30 hours at the graduate level) in courses that provide information about the nature, prevention, evaluation, and treatment of speech, hearing, and language disorders in children and adults.

1. At least 30 of the 36 minimum semester hours (21 of the 30 graduate hours) must be in the primary professional area (speech and language).

2. At least 6 of these 36 hours must be in the other area (audiology).

3. No more than 6 of these 36 hours can be in courses that provide academic credit for clinical practice obtained during academic training.

C. Credit for study of information about related fields that augment the work of the clinical practitioner of speech-language pathology or audiology may also apply toward the total 75 semester hours.

### Required graduate courses for speech-language pathology

**Academic courses**

| | | |
|---|---|---|
| SPPAT 741 | Fluency Disorders (3) | Fall |
| SPPAT 750 | Voice and Resonance Disorders (3) | Spr |
| SPPAT 720 | Audiology I (3) | Fall |
| SPPAT 721 | Laboratory in Audiology (1) | Fall |
| SPPAT 744 | Aural Rehabilitation (3) | Spr |
| SPPAT 840 | Neuropathologies of Speech (3) | Fall |
| SPPAT 841 | Acquired Language Disorders (3) | Spr |

**Nonthesis option (three of the following seminars): thesis option (one of the following seminars and SPCH 899):**

| | | |
|---|---|---|
| SPPAT 810 | Seminar in Articulation and Phonology (3) | Alt. Yrs., Spr |
| SPPAT 815 | Seminar in Voice and Resonance (3) | Alt. Yrs., Fall |
| SPPAT 846 | Seminar in Fluency Disorders (3) | Alt. Yrs., Spr |
| SPPAT 855 | Seminar in Language (3) | Alt. Yrs., Fall |
| SPCH 899 | Research in Speech (Variable credit) (Thesis option only) | Var |

**Clinical courses**

| | | |
|---|---|---|
| SPPAT 705 | Practicum in Speech–Language Pathology (Variable credit) | Fall, Spr, Su |
| SPPAT 706 | Graduate Practicum in Audiology (Variable credit) | Fall, Spr, Su |
| SPPAT 847 | Professional Issues and Externship in Audiology and Speech Pathology (Variable credit) | Fall, Spr, Su |

All students are required to enroll in SPPAT 705 and/or SPPAT 706 or SPPAT 847 during each semester of graduate work.

### Practicum experience requirements

For speech-language pathology majors, a minimum of 350 hours of practicum must be completed, including 250 hours required at the graduate level. 250 of the 350 hours must also be in the major area (speech–language pathology). At least 20 of those 250 major-area clock hours must be completed in each of the categories listed below:

1. Evaluation: Speech disorders in children
2. Evaluation: Speech disorders in adults
3. Evaluation: Language disorders in children
4. Evaluation: Language disorders in adults
5. Treatment: Speech disorders in children
6. Treatment: Speech disorders in adults
7. Treatment: Language disorders in children
8. Treatment: Language disorders in adults

Additionally, SLP majors must accrue 35 clock hours in audiology. Of the 35 hours, at least 15 must involve evaluation or screening for hearing disorders, and at least 15 hours must involve habilitation/rehabilitation of hearing-impaired persons.

Some current off-campus sites at which students may take an externship include the following:

Children's Mercy Hospital (Kansas City)
Irwin Army Hospital (Fort Riley)
Kansas Neurological Institute (Topeka)
Meyer Children's Rehabilitation Center (Omaha)
Parsons State Hospital and Training Center (Parsons)
Public schools of Manhattan, Salina, Topeka, and elsewhere
St. Francis Hospital and Medical Center (Topeka)
The Capper Foundation for Crippled Children (Topeka)
Veterans Administration Hospitals (Kansas City or Topeka)

### School certification requirements

The student who desires certification to work in the Kansas public schools must be admitted to the Teacher Education Program. The student must also take the following courses or their approved equivalents:

| | | |
|---|---|---|
| PSYCH 280 | Psychology of Childhood and Adolescence (3) | |
| HDFS 110 | Introduction to Human Development | |
| | or | |
| EDCIP 410 | Foundations of Education (3) (Preferably section for secondary majors) | |
| EDCIP 455 | Teaching in a Multicultural Society (1) | |
| EDCEP 525 | Interpersonal Relations in the Schools (1) | |
| EDSP 722, 723, or 323 | Exceptional Child (3 or 2) | |
| SPPAT 349 | Experimental Analysis of Vocal Behavior (3) | |
| | or | |
| EDAF 315 | Educational Psychology | |
| SPPAT 742 | Language Assessment and Intervention II (2) | |
| SPPAT 847 | Professional Issues and Externship in Audiology or Speech Pathology (Public School Placement) | |

### Admission

To be considered for admission with full standing, the applicant must have: (1) a bachelor's degree, (2) adequate undergraduate preparation in speech-language pathology or audiology or equivalent evidence of an appropriate background for undertaking an advanced degree program, (3) an undergraduate average of B or better in the junior and senior years, (4) Graduate Record Examination (GRE) scores or an equivalent agreed to by the Program faculty, and (5) three letters of recommendation from instructors and other people who can attest to the applicant's suitability for graduate study in speech-language pathology or audiology. An applicant who lacks the required background course work can be admitted provisionally if the other admission requirements are met.

### Assistantships/scholarships

The Speech Pathology/Audiology Program provides some financial aid for graduate students. A number of graduate teaching assistantships are usually available each semester through the Department of Speech and they are awarded on the basis of merit. The amount of the assistantship varies, but the student is generally appointed to a four-tenths time instructor position with partial remission of tuition. This position requires the student to teach up to 6 credit hours of Public Speaking I or IA. The GTA's academic enrollment is limited to 12 credit hours to allow for the teaching load. GTA awards may be renewed for a second year contingent on satisfactory performance.

At times, the speech pathology/audiology program may have other funds available for graduate student stipends. These funds vary from year to year depending upon the granting agency. Knowledge of the amount of funds available for a given fiscal year is usually available by May 1. Students are awarded stipends based on merit. They are generally required to commit 6 to 10 hours per week to assist faculty members in various activities.

## Speech pathology and audiology courses

### Graduate credit in minor field

**SPPAT 520. Augmentative and Alternative Communication.** (2) This course is concerned with an introduction to augmentative and alternative communication (AAC) to provide the student with an overview of characteristics, evaluation, and management information serving permanently or temporarily nonspeaking individuals. Course emphasis will be on direct hands-on experience with electronic communication devices.

**SPPAT 545. Clinical Research in Speech-Language Pathology/Audiology.** (3) Logic and methods of clinical research with emphasis on those most frequently used in Speech-Language Pathology and Audiology. Experience formulating, doing and evaluating research. Pr.: STAT 330 or equiv.

**SPPAT 550. Speech Physiology.** (3) Physiology of the structures involved in speech production. This course includes methods of investigation and recent research in experimental phonetics. Pr.: SPPAT 350.

**SPPAT 555. Language Development.** (3) Survey of the development of speech and language skills in children. Pr.: HDFS 310 or EDCI 300.

### Graduate and undergraduate credit

**SPPAT 600. Manual Communication II.** (3) Instruction in an additional 400 to 500 signs in the SEE system. Introduction to elementary ASL techniques. Discussion of other augmentative communication systems. Research will be conducted into the use of various manual communication systems with special populations, including aphasic, language disabled, mentally handicapped, and others. Pr.: SPPAT 400 or basic sign language skills.

**SPPAT 605. Communication Disorders and Aging.** (3) An introduction to the most common communication disorders of older persons. Appropriate service delivery models and special needs of the elderly are discussed. Pr.: Consent of instructor.

**SPPAT 705. Practicum in Speech–Language Pathology.** (1–3) Supervised practice in the use of the methods and materials of speech-language pathology. Pr.: SPPAT 449.

**SPPAT 706. Graduate Practicum in Audiology.** (1–3) Supervised practice in the use of equipment, materials, and methods of audiology. Pr.: SPPAT 720 or concurrent enrollment.

**SPPAT 720. Audiology I.** (3) Fundamental topics in audiology. Included are monitoring of equipment calibration, pure tone measurements, masking, and speech testing. Laboratory practice is required. Pr.: SPPAT 351.

**SPPAT 721. Audiology I Laboratory.** (1) Student must be concurrently enrolled Audiology I. Two hours of lab a week. Pr.: SPPAT 351.

**SPPAT 740. Hearing Conservation.** (3) II or on sufficient demand. Effects of noise on hearing. Development, management, and control of community hearing conservation programs. Pr.: SPPAT 720.

**SPPAT 741. Fluency Disorders.** (3) Research and theory concerning etiology characteristics, assessment, and treatment of individuals with disfluency problems. Pr.: SPPAT 545.

**SPPAT 742. Language Assessment and Intervention II.** (2) Theory and research concerning language disorders in school-aged children are presented. Specific language assessment and intervention methodologies for this population are reviewed. Dialectal and bilingual considerations for assessment and intervention are addressed. Pr.: SPPAT 443.

**SPPAT 743. Amplification in Hearing Rehabilitation.** (3) Analysis of electroacoustic characteristics of hearing aids. Earmold acoustics. Selection and use of amplification. Pr.: SPPAT 720 or concurrent enrollment. SPPAT 743-1-1220.

**SPPAT 744. Aural Rehabilitation.** (3) I. Study of and techniques for the habilitation or rehabilitation of speech and language problems of the hearing impaired. Pr.: SPPAT 720.

**SPPAT 750. Voice and Resonance Disorders.** (3) Research and theory concerning etiology, characteristics, assessment, and management of individuals with laryngeal disorders and orofacial anomolies. Pr.: SPPAT 550.

**SPPAT 760. Audiology II.** (3) Study of differential diagnostic audiometric procedures in the classification of hearing loss. Topics include middle ear measurement procedures, site of lesion testing, and procedures applicable to the pediatric population. Pr.: SPPAT 720.

## Graduate credit

**SPPAT 810. Seminar In Articulation and Phonology.** (3) Examination and discussion of advanced topics of current interest in phonology, articulation, motor programming, and acquired/developmental disorders of speech sound production. Pr.: SPPAT 446.

**SPPAT 815. Seminar in Voice and Resonance.** (3) Review of research in voice and resonance. Topics in assessment and intervention will also be discussed. Pr.: SPPAT 750.

**SPPAT 840. Neuropathologies of Speech.** (3) Research and theory concerning nature, etiologies, evaluation, and principles of neuropathologies. Pr.: SPPAT 350.

**SPPAT 841. Acquired Language Disorders.** (3) Research and theory concerning the nature, etiologies, evaluation, and treatment of aphasia and language disorders associated with right hemisphere damage, dementia, and traumatic brain injury. Pr.: SPPAT 840.

**SPPAT 846. Seminar in Fluency Disorders.** (3) Intensive study of selected current issues in the fluency disorder literature. Pr.: SPPAT 741.

**SPPAT 847. Professional Issues and Externship in Audiology and Speech Pathology.** (3–12) Class meetings will focus on discussions of professional issues related to audiology and speech pathology. Clinical educational experiences will occur at off-campus sites. In audiology, supervised experience in screening and diagnostic hearing examinations, management procedures for hearing-impaired persons, and hearing aid selection will be obtained. In speech pathology, supervised experience in evaluation and treatment of children and adults with communication disorders will be obtained. May be repeated. Pr.: Graduate standing in audiology or speech pathology and consent of instructor.

**SPPAT 849. Topics in Speech-Language Pathology or Audiology.** (1–3) Critical review of recent research related to measurement and modification of speech, hearing, or language deficits. May be repeated for a maximum of 9 hours with change in topic. Pr.: Graduate standing.

**SPPAT 855. Seminar in Language.** (3) Review of research and theory of current topics in language and cognition. Assessment and intervention methodology will be discussed. Pr.: SPPAT 443.

**SPPAT 865. Seminar in Audiology.** (3) I. Study of selected areas of audiology. May be repeated for a maximum of 6 credit hours with change in subject matter. Pr.: SPPAT 720 and 760.

**SPPAT 868. Seminar in Aural Rehabilitation.** (3) Principles and methods of maximizing receptive communication skills of the hearing impaired. Study of selected areas in aural rehabilitation. May be repeated for maximum credit of 6 hours with change in subject matter. Pr.: SPPAT 744.

# Theatre

The department offers a master's degree with an emphasis in theatre, providing general education on an advanced level with the opportunity to specialize in a particular area—such as acting, costuming, directing, developmental drama, dramatic literature, stage lighting, playwriting, stage design, technical theatre, theatre history, or theatre management. The program prepares students for MFA or PhD study, training in drama therapy, teaching on the secondary or junior college level, or employment in the community or professional theatre. The theatre program is an accredited institutional member of the National Association of Schools of Theatre.

## Requirements

Students are admitted on the basis of their undergraduate transcripts and three letters of recommendation. A major in theatre is expected, but students with degrees in other areas may take undergraduate courses to make up deficiencies. A 3.0 overall undergraduate average is required, but students who do not meet this requirement may be admitted on probation.

There are three categories to the degree requirements:

1. Course work (30 credits): theatre history/dramatic literature (9 credits); acting, directing, or playwriting (3 credits); technical theatre (3 credits); electives (15 credits). At least 15 credits must be in 800-level courses.

2. Project, report, or thesis
a. Project: Demonstration of competence in a specific area of theatre. (No credit)
b. Report: Writing of a research paper for the purpose of gathering and assimilating information on a particular theatre topic. (2 credits)
c. Thesis: Writing of a lengthy research paper making an original contribution to the field of theatre study. (6 credits)

3. Oral examination on project, report, or thesis.

## Facilities

The theatre program boasts three outstanding production facilities—a 250-seat thrust/arena stage, an 1,800 seat proscenium theatre, and a 100-seat student production space. This enables us to produce an extensive and varied season of plays, musicals, and operas—classic, modern, and original.

## Theatre courses

### Undergraduate and graduate credit

**THTRE 660. Professional Theatre Tour.** (2–3) Intersession, S. Supervised viewing and analysis of professional theatre productions. Travel to one or more theatre centers such as New York, London, or Los Angeles. Students are charged an additional fee to cover travel expenses. Written critical reviews of the productions are required. May be repeated once by undergraduates. Pr.: Six hours of credit in theatre.

**THTRE 661. Professional Development.** (1) I. Study of audition techniques including supervised preparation of appropriate material. Business aspects of professional theatre, including unions, contracts, and professional ethics. Pr.: 12 hours in theatre, music, and/or dance.

**THTRE 664. Creative Dramatics.** (3) The development of creative imagination and personal well-being through theatre games, improvisation, role playing, and simulation. The use of drama in recreational and educational settings. Improvisation in performing scripted drama. Pr.: Junior standing.

**THTRE 665. Theatre for Special Populations.** (3) Theory and practice of creative dramatics and theatre production for special populations; individualized reading and projects for particular populations such as the handicapped or the elderly. Pr.: Junior standing.

**THTRE 666. Stage Management.** (3) I, II. Theory and practice of stage management in the professional and nonprofessional theatre. Emphasis is on the organization of all areas of theatre knowledge needed for the running of theatrical productions. Pr.: THTRE 368.

**THTRE 667. Period Styles for the Theatre 1.** (3) II. Survey of historical styles of architecture, furnishings, and clothing in relation to theatrical design and the history of the theatre from the Greeks to 1800. Pr.: THTRE 572 or concurrent enrollment.

**THTRE 668. Period Styles for the Theatre 2.** (3) I. Survey of historical styles of architecture, furnishings, and clothing in relation to theatrical design and the history of the theatre from 1800 to present. Pr.: THTRE 573 or concurrent enrollment. THTRE 668-0-1007

**THTRE 671. History of Opera.** (3) A study of selected masterpieces of musical drama, with emphasis on the relationship of music and drama, and on the unique qualities of opera as a collective artwork. Pr.: MUSIC 201 or MUSIC 250 or THTRE 370. Same as Music 650.

**THTRE 672. American Ethnic Theatre.** (3) Drama and stagecraft of ethnic groups in the United States, including the theatre of African, Asian, Hispanic, Jewish, and Native Americans. Pr.: Junior standing. THTRE 672-0-1007

**THTRE 710. Practicum in Theatre.** (0–6) Supervised participation in a position of major responsibility. May be repeated for a maximum of 12 hours credit. Pr.: THTRE 160 or 261 or 368; junior standing; consent of supervising faculty member and approval of faculty members are required.

**THTRE 711. Topics in Technical Theatre.** (3) Selected topics in creative techniques and investigation for technical theatre. May be repeated for credit with change in topic. Pr.: THTRE 368 and consent of instructor.

**THTRE 712. Theatre Management.** (3) Theatre management, promotion, finance, organization; emphasis on contract negotiations and use of facilities.

**THTRE 760. Principles of Drama Therapy.** (4) Study of theory and practice in the use of Drama as therapy, including assessment and treatment, individual and group practice, and Psychodrama. Pr.: THTRE 664 or 665.

**THTRE 761. Advanced Acting.** (3) Studies in style, technique, and characterization. May be repeated once. Pr.: THTRE 361 and consent of instructor.

**THTRE 762. Advanced Playwriting.** (3) Further study in the writing of drama; emphasis on problems of writing full-length plays. May be repeated for a total of 9 hours credit by qualified students. Pr.: Consent of instructor. Same as ENGL 762.

**THTRE 763. Reader's Theatre.** (3) The nature, purpose, and production of oral interpretation of literature in the theatre; emphasis on monologue, lecture-recital, and play reading. May be repeated for a total of 6 hours credit by qualified students. Pr.: Consent of instructor.

**THTRE 764. Early American Theatre.** (3) Studies in the drama and stagecraft of the colonies and the United States from the beginnings to 1900. Pr.: Junior standing.

**THTRE 765. Practice in Directing.** (3) A lec.-lab course with emphasis on directing dramatic productions under performance conditions. May be repeated for a total of 9 hours credit by qualified students. Pr.: Consent of instructor.

**THTRE 777. Aesthetics of the Theatre.** (3) Principal emphasis on theoretical problems of dramatic art.

**THTRE 778. History of the Physical Stage.** (3) A survey course in the emergence and development of the theatre building as a distinct architectural form, with particular emphasis on the effect of the physical environment on the play. Pr.: THTRE 368.

**THTRE 779. Repertory Theatre.** (3) Concentrated studies in theory and practice of repertory theatre productions. Reading, demonstrations, study of play scripts; play selection and production methods; operation of and assistance in production of plays in repertory. May be repeated for a total of 12 hours credit by qualified students. Pr.: Consent of instructor.

**THTRE 780. Theatrical Design Studio.** (0–3) I, II. Advanced problems in conceptualization and realization of design, including sets, costumes, lights and technical production. Emphasis on advanced techniques in research, analysis, and production problems. May be repeated to a maximum of 6 credits. Pr.: THTRE 567, 568, 579, or 569.

**THTRE 782. Women in Theatre.** (3) A history of the contributions made by women in theatre as playwrights, managers, directors, and performers; contemporary women in theatre and their experiments in expressing women's consciousness.

**THTRE 783. Practice in Acting.** (3) Advanced studies in characterization with emphasis on communicating with the director. Taught in conjunction with the Practice in Directing workshop. May be repeated once. Pr.: THTRE 361 and consent of instructor.

### Graduate credit

**THTRE 862. Workshop in Playwriting.** (3) Advanced writing of drama. May be repeated once for credit. Same as ENGL 862. Pr.: THTRE 762 (or ENGL 762) or proof of equiv. proficiency.

**THRE 870. Greek and Roman Theatre.** (3) Studies in the drama and stagecraft of the Greek and Roman period. Pr.: THTRE 572.

**THTRE 871. Medieval and Baroque Theatre.** (3) Studies in the drama and stagecraft of the Medieval and Baroque periods. Pr.: THTRE 572.

**THTRE 873. Modern European Theatre.** (3) Studies in the European drama and stagecraft of the period from 1876 to the end of World War II. Pr.: THTRE 573.

**THTRE 874. Avant-Garde Theatre.** (3) Studies in avant-garde drama and stagecraft since World War II to 1968. Pr.: THTRE 573.

**THTRE 875. Contemporary Theatre.** (3) Studies in drama and stagecraft since 1968. Pr.: THTRE 573.

**THTRE 876. Seminar in Theatre.** (3) Selected topics in theatre research. May be repeated for credit with change of topic. Pr.: THTRE 572 or 573.

# Statistics

**Head**

**James Higgins,** Professor and Department Head. Ph.D. 1970, University of Missouri–Columbia. Nonparametric Statistics, Reliability.

**John Boyer,** Associate Professor. Ph.D. 1976, Michigan State University. Nonparametric Statistics.

**Arlin Feyerherm,** Professor. Ph.D. 1952, Iowa State University. Climatology, Operations Research.

**Holly Fryer,** Professor Emeritus. Ph.D. 1940, Iowa State University.

**Dallas Johnson,** Professor. Ph.D. 1970, Colorado State University. Linear Models, Experimental Design, Multivariate Analyses, Nonreplicated Experiments.

**Sallie Keller–McNulty,** Associate Professor. Ph.D. 1983, Iowa State University. Statistical Computing, Environmental Statistics, Survey Sampling.

**Kenneth Kemp,** Professor. Ph.D. 1967, Michigan State University. Statistical Computing.

**George Milliken,** Professor. Ph.D. 1969, Colorado State University. Biostatistics, Design of Experiments, Linear and Nonlinear Models, Bioassay.

**Raja Nassar,** Professor. Ph.D. 1963, University of California–Davis. Biostatistics, Stochastic Processes, Modelling, Statistical Genetics.

**James Neill,** Associate Professor. Ph.D. 1982, Kansas State University. Linear Models.

**Paul Nelson,** Professor. Ph.D. 1969, Rutgers University. Stochastic Processes.

**William Noble,** Assistant Professor. Ph.D. 1991, Michigan State University. Sampling.

**S.K. Perng,** Professor. Ph.D. 1967, Michigan State University. Decision Theory, Foundations of Statistics.

**James Schwenke,** Associate Professor. Ph.D. 1982, Kansas State University. Biostatistics, Design of Experiments.

**Winston Yang,** Professor. Ph.D. 1976, Iowa State University. Survival Analysis, Nonparametric Statistics, Time Series.

## Careers

To solve problems we need information. But, what kind? How much? And after we get it, what do we do with it? Statisticians deal with numerical information — data. Their job is to match the data with the problem, and to figure out what to collect and how to make the numbers manageable so that other people can understand them. All areas that involve the collection and analysis of data can benefit from the skills of the statistician. Monitoring the environment, developing new vaccines, making more reliable products, growing crops more efficiently, and setting insurance rates are just some endeavors in which statisticians have had a significant impact. Statistics is a field in which experts have virtually unlimited opportunities.

Perhaps the most recognizable careers in statistics are those in the state and federal governments. Professionals are not only hired into such areas as the Bureau of Labor Statistics and the Bureau of the Census, but are in demand in many service agencies.

Universities hire statisticians in many academic departments, including mathematics, management sciences, economics, genetics, history, and psychology, and at the administrative and service levels, including business affairs, research support, and personnel.

Private industry is a heavy user of the skills of the statistician. For example, the pharmaceutical industry employs many statisticians to design studies and analyze data to show the safety and effectiveness of new drug compounds. Manufacturing industries are increasingly using statisticians to help them improve quality and productivity. Private consulting can be lucrative for the experienced statistician who works with both private industry and government. Companies of all sizes employ staff statisticians to keep the business progressing and competitive.

## Preparation

The Department of Statistics accepts students from many different disciplines. Students entering the M.S. program should have a background of calculus, matrix algebra, computer programming, and introductory statistics. Students entering the Ph.D. program should have additional course work in statistics and mathematics.

## Programs

The Department of Statistics offers studies leading to a master of science or a doctor of philosophy degree. A master's degree is recommended for a career in industry or government. The Ph.D. degree is usually required for post-secondary teaching and higher level positions. The department offers concentration in applied and mathematical probability and statistics.

### Master's degree

The most common option for the M.S. degree is the report option. Students take 30 hours of course work and write a report for 2 additional credit hours. There is great flexibility in the topic the student may choose for a report. It may be an investigation of some property of a statistical procedure, a review of literature, an application of an existing method to some real-world problem, or other topic approved by the student's major professor. Other options are the thesis option and the 36 hour course option. Your choice should be made in consultation with your major professor. All M.S. students must take STAT 770, STAT 771, STAT 850, STAT 860, and either STAT 851 or STAT 861.

### Ph.D. degree

Students are required to have 90 hours of course work. A typical program consists of 30 hours from the master's program, 30 hours of course work and 30 hours of research. Students are required to pass a qualifying exam, which is given in January each year. For students entering with an M.S. degree, the exam must be taken no later than the end of 3 semesters of study. Students who begin with a bachelor's degree must take the exam no later than the end of 5 semesters of study. The qualifying exam consists of material from STAT 704, STAT 705, STAT 720, STAT 770, STAT 771, and STAT 860. It will test your

knowledge of basic methods and introductory theory. Students who fail the exam may, upon recommendation of the faculty, be allowed to take it a second time, but approval of a second opportunity is not automatic.

Upon completion of course work, normally in the third year of Ph.D. study, students who have passed the qualifying exam must take a preliminary exam. This exam is required by the university and is intended to test the student's breadth and depth of knowledge in the chosen field of study. The exam is prepared in consultation with the student's major professor and advisory committee. It consists of three parts: (1) a departmental exam consisting of material from STAT 840, STAT 850, STAT 861, STAT 995, and STAT 996; (2) an exam over the student's area of specialization which is prepared by the student's major professor and advisory committee; and (3) a seminar on a topic approved by the major professor and advisory committee in which the student is to demonstrate an ability to read and communicate information in the research literature.

## Consulting opportunities

The department does a tremendous amount of consulting work both for researchers and students on campus and for individuals and agencies off campus. Projects vary in length of time and sophistication of methods needed to complete them. Students may contact the department head to find out what is available. Those who wish to do consulting will be assigned a faculty member to direct the work. At the student's discretion, up to 2 hours credit may be earned for consulting by registering for STAT 945.

## Application

Application forms and additional information may be obtained from:

Department of Statistics
101 Dickens Hall
Kansas State university
Manhattan, KS 66506–0802

## Statistics courses

### Undergraduate and graduate credit in minor field

**STAT 510. Introductory Probability and Statistics I.** (3) I, II. Descriptive statistics, probability concepts and laws, sample spaces; random variables; binomial, uniform, normal, and Poisson; two-dimensional variates; expected values; confidence intervals; binomial parameter, median, normal mean, and variance; testing simple hypotheses using CIs and X2; goodness of fit. Numerous applications. Pr.: MATH 222.

**STAT 511. Introductory Probability and Statistics II.** (3) I, II. Law of Large Numbers, Chebycheff's Inequality; continuation of study of continuous variates; uniform, exponential, gamma, and beta distribution; Central Limit Theorem; distributions from normal sampling; introduction to statistical inference. Pr.: STAT 510.

**STAT 550. Basic Elements of Statistical Theory.** (3) I. The mathematical representation of frequency distributions, their properties, and the theory of estimation and hypothesis testing. Elementary mathematical functions illustrate theory. Pr.: MATH 220.

### Undergraduate and graduate credit

**STAT 702. Statistical Methods for Social Sciences.** (3) I, II. Statistical methods applied to experimental and survey data from social sciences; test of hypotheses concerning treatment means; linear regression; product-moment, rank, and bi-serial correlations; contingency tables and chi-square tests. Pr.: MATH 100.

**STAT 703. Statistical Methods for Natural Scientists.** (3) I, II, S. Statistical concepts and methods basic to experimental research in the natural sciences; hypothetical populations; estimation of parameters; confidence intervals; parametric and nonparametric tests of hypotheses; linear regression; correlation; one-way analysis of variance; t-test; chi-square test. Pr.: Junior standing and equiv. of college algebra.

**STAT 704. Analysis of Variance.** (2) I, II, S. Computation and interpretation for two- and three-way analyses of variance; multiple comparisons; applications including use of computers. Meets four times a week during first half of semester. Pr.: One previous statistics course.

**STAT 705. Regression and Correlation Analyses.** (2) I, II, S. Multiple regression and correlation concepts and methods; curvilinear regression; applications including use of computers. Meets four times a week during second half of semester. Pr.: One previous statistics course.

**STAT 708. Use of Statistical Computer Packages.** (1) Intersession only. Processing data sets using SAS (Statistical Analysis System) for analysis of variance, regression and correlation analysis, chi-square, multivariate statistical analyses, and graphic displays using both the line printer and Calcomp plotter. Pr.: STAT 704, STAT 705, or consent of instructor.

**STAT 710. Sample Survey Methods.** (2) II, in even years. Design, conduct, and interpretation of sample surveys. Pr.: STAT 702 or 703. Meets four times a week during first half of semester.

**STAT 716. Nonparametric Statistics.** (2) II, in even years. Hypothesis testing when form of population sampled is unknown: rank, sign, chi-square, and slippage tests; Kolmogorov and Smirnov type tests; confidence intervals and bands. Meets four times a week during second half of semester. Pr.: One previous course in statistics.

**STAT 717. Categorical Data Analysis.** (2) II. Analysis of categorical data arranged in two and higher-dimensional contingency tables using classical methods and log linear models. Various measures of association are discussed. Meets four times a week during first half of semester. Pr.: STAT 704, 705.

**STAT 720. Design of Experiments.** (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 704 and 705.

**STAT 722. Statistical Designs for Product Development and Process Improvement.** II. A study of statistically designed experiments which have proven useful in product development and process improvement. Topics include randomization, blocking, factorial treatment structures, fractional factorial designs, screening designs, Taguchi methods, response surface methods. Pr.: STAT 511 or STAT 704 and 705.

**STAT 725. Digital Statistical Analysis.** (3) II. Techniques of programming in algorithmic languages for statistical applications. Topics include efficiency and numerical accuracy of algorithms, random number generation, Monte Carlo methods, techniques of simulation, and some basic principles of numerical analysis. Pr.: CIS 200 or equiv., STAT 704 and 705.

**STAT 730. Multivariate Statistical Methods.** (3) I. 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 704, 705.

**STAT 735. Statistics in Health Related Industries.** (2) I, in odd years. Case studies and selected literature of applications of statistics to problems in the pharmaceutical and health-related industries are discussed. Topics include pharmacokinetic analysis, covariance analysis, crossover studies, bioequivalence. Meets four times a week during first half of semester. Pr.: STAT 704, 705, 720.

**STAT 736. Bioassay.** (2) I, in odd years. Direct assays; quantitative dose-response models; parallel line assays; slope ratio assays; experimental designs for bioassay; covariance adjustment; weighted estimates; assays based on quantal responses. Meets four times a week during second half of semester. Pr.: STAT 704, 705.

**STAT 740. Nonlinear Models.** (3) S, in even years. Methods of estimating parameters of nonlinear models; procedures for testing hypotheses; construction of confidence intervals and regions; nonlinear analysis of covariance; quantal dose response and probabilistic choice models. Pr.: MATH 222, STAT 720.

**STAT 745. Advanced Regression Analysis.** (2) I, in even years. Tests of linear restrictions; residual diagnostics; test and corrections for heteroscedasticity, autocorrelated errors, errors in variables; consequences of stochastic regressors and multicollinearity; alternatives to least squares; instrumental variable estimators and systems of equations; random coefficients. Meets four times a week during first half of semester. Pr.: STAT 705.

**STAT 746. Graphical Methods for Data Analysis.** (2) I, in even years. This is a study of visual portrayals of quantitative information. Topics include graphical display of raw data and quantitites derived from the data, the use of statistical graphics to analyze data, exploratory methods, multidimensional methods, and methods for studying data in the context of statistical models. Meets four times a week during second half of semester. Pr.: STAT 704 and 705 or equiv.

**STAT 770. Theory of Statistics I.** (3) I. 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 510 and 511. Pr.: MATH 222.

**STAT 771. Theory of Statistics II.** (3) II. Introduction to multivariate distributions; sampling distributions, derivation, and use; estimation of parameters, testing hypothesis; multiple regression and correlation; simple experimental designs; introduction to nonparametric statistics; discrimination. Pr.: STAT 770.

**STAT 799. Topics in Statistics.** (Var.) I, II, S. Pr.: STAT 703 or 770 and consent of instructor.

**STAT 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.

**STAT 818. Theory of Life-Data Analysis.** (3) II, in odd years. A study of models and inferential procedures important to life-data analysis. Comparison of estimators (MLE, BLUE, etc.). Pivotal quantities. Design and regression models for non-normal distributions. Analysis of censored data. Pr.: STAT 771.

**STAT 839. Probability and Asymptotic Theories I.** (3) I, in even years. Probability spaces and random variables; distribution functions; moments and inequalitites; characteristic functions; stochastic independence; convergence of a sequence of distribution functions; the four types of convergence; convergence of the sum of independent random variables; laws of large number; central limit theorems; conditional expections. Pr.: STAT 771 and MATH 633.

**STAT 840. Probability and Approximation Theorems II.** (3) II. Central limit theorems, delta method, asymptotic properties of least square estimators, maximum likelihood estimators, likelihood ratio tests, sample moments, order statistics, sample quantiles, empirical distribution function, U-statistics, linear rank statistics, L-statistics. Pr.: STAT 839.

**STAT 850. Stochastic Processes I.** (3) II. Generating functions; conditional probability and conditional expectations; normal processes and covariance stationary processes; Poisson processes; renewal processes; Markov chains, discrete time. Pr.: STAT 770.

**STAT 851. Stochastic Processes II.** (3) I. Markov chains, discrete time; Markov chains continuous time; birth-death processes; Kolmogorov differential equations; diffusion processes, foward and backward Kolmogorov equations; applications. Pr.: STAT 850.

**STAT 860. Linear Models I.** (3) I. Subspaces, projections, and generalized inverses; multivariate normal distribution, distribution of quadratic forms; optimal estimation and hypothesis testing procedures for the general linear model; application to regression models, correlation model. Pr.: STAT 704, 705, 771; course in matrices.

**STAT 861. Linear Models II.** (3) II. Continued application of optimal inference procedures for the general linear model to multifactor analysis of variance, experimental design models, analysis of covariance, split-plot models, repeated measures models, mixed models, and variance component models; multiple comparison procedures. Pr.: STAT 860.

**STAT 870. Analysis of Messy Data.** (3) II. Design structures; treatment structures; equal and unequal variances; multiple comparisons; unequal subclass numbers; missing cells; interpretation of interaction; variance components; mixed models; split-plot and repeated measures; analysis of covariance; cross-over designs. Pr.: STAT 720.

**STAT 880. Time Series Analysis.** (3) I, in odd years. Autocorrelation function; spectral density; autoregressive integrated moving average processes; seasonal time series; transfer function model; intervention analysis; regression model with time series error. Pr.: STAT 705 and 770.

**STAT 898. Master's Report.** (2) I, II, S. Pr.: Consent of instructor.

**STAT 899. Master's Thesis Research.** (Var.) I, II, S. Pr.: Consent of instructor.

**STAT 916. Nonparametric Theory and Robustness.** (3) I, in even years. Hodges-Lehman estimators; L-estimator; M-estimator; distribution-free confidence, prediction, and tolerance intervals; jackknife and bootstrap methods; U-statistics; linear rank statistics; two-sample problems; Pitman's asymptotic relative efficiency; k-sample problems; testing independence; simple regression problem. Pr.: STAT 840.

**STAT 920. Experimental Design Theory.** (3) II, in odd years. Incomplete block designs; theory of the construction and analysis of experimental designs. Pr.: STAT 720 and 861.

**STAT 925. Computational Statistics.** (3) I, in odd years. Seminumerical and numerical methods used in computational statistics. Application areas include linear and nonlinear least squares methods, unconstrained and constrained nonlinear function optimization, robust estimation, and classical multivariate analysis. Emphasis on the most recent advances in these and other areas supported by computational statistics. Pr.: STAT 725 and 861.

**STAT 930. Theory of Multivariate Analysis.** (3) II, in even years. The multivariate normal distribution, the Wishart distribution, Jacobians of vector and matrix transformations, Hotelling's T2-statistic, the union-intersection principle, tests on mean vectors and covariance matrices, Box's approximations to critical points, the multivariate general linear model, discriminant analysis, and principal component analysis. Pr.: STAT 730 and 861.

**STAT 945. Problems in Statistical Consulting.** (Var.) I, II, S. Principles and practices of statistical consulting. Supervised experience in consultation and consequent research concerning applied statistics and probability associated with on-campus investigations. Pr.: STAT 704, 705, and 771.

**STAT 950. Advanced Studies in Probability and Statistics.** (Var.) I, II, S. Theoretical studies of advanced topics in probability, decision theory, Markov processes, experimental design, stochastic processes, or advanced topics. May be repeated. Pr.: STAT 771.

**STAT 995. Advanced Inference I.** (3) I. Statistical decision rules; utility, loss, and risk functions; Bayes and minimax analyses; admissibility, complete classes; sufficiency, completeness, unbiased estimation; equivariance, location-scale families; maximum likelihood estimation; information inequality. Pr.: STAT 771, 840.

**STAT 996. Advanced Inference II.** (3) II. Neyman-Pearson lemma, monotone likelihood ratio, uniformly most powerful tests; confidence bounds; unbiasedness and invariance for hypothesis testing; sequential probability ratio tests. Pr.: STAT 995.

**STAT 999. Research in Statistics.** (Var.) I, II, S. Pr.: Consent of instructor.

# Business Administration

**David M. Andrus,** Associate Professor of Marketing. B.S. 1976, Oklahoma State University; M.S. 1978, University of Hawaii; Ph.D. 1981, University of Iowa. Research Interests: International Marketing; Professional Services Marketing.

**Richard P. Coleman,** Professor of Marketing. B.A. 1948, University of Tulsa; M.A. 1949, University of Iowa; Ph.D. 1959, University of Chicago. Research Interests: Consumer Behavior.

**Dan Deines,** Associate Professor of Accounting. B.A. 1970, Fort Hays State University; M.S. 1974, Emporia State University; CPA 1984; Ph.D. 1985, University of Nebraska. Research Interests: Perceptions of Accounting; Recruitment to the Accounting Profession; Information Content of Earnings Forecasts.

**David P. Donnelly,** Professor of Accounting. B.A. 1973, MBA 1977, Kansas State University; Ph.D. 1983, University of Illinois; CPA 1973, Kansas. Research Interests: Taxpayer Compliance; Moral Development; Ethic Issues in Tax and Auditing; Job Satisfaction.

**Stephen Dukas,** Assistant Professor of Finance. B.S. 1981, B.A. 1989, Ph.D. 1989, Florida State University. Research Interests: Investments; International Finance; Corporate Finance.

**Yar M. Ebadi,** Professor of Management. B.S. 1968, Kabul University; M.S. 1970, Georgia Institute of Technology; MBA 1974, Ph.D. 1977, Indiana University. Research Interests: Quality Management; Just-In-Time Production Systems and Technological Innovation.

**Stan Elsea,** Assistant Professor of Management. B.S. 1954, MBA 1981, Kansas State University; DBA 1984, Indiana University. Research Interests: Public and Private Labor Relation.

**Ali Fatemi,** Professor of Finance. B.A. 1972, Tehran Business College; MBA 1975, Ph.D. 1979, Oklahoma State University. Research Interests: Corporate Finance; International Financial Management.

**Cynthia Fraser Hite,** Professor of Marketing. B.A. 1974, University of Missouri–Kansas City; Ph.D. 1980, University of Pennsylvania. Research Interests: Adaptive Managerial Decision-Making; International Joint Venture Decision-Making; Children's Consumer Behavior; Social Psychology of Consumer Behavior; Economic Theories of Consumer Behavior.

**Robert E. Hite,** Associate Professor of Marketing. B.S. 1970, Indiana University; MBA 1977, Indiana State University; Ph.D. 1982, University of Arkansas. Research Interests: Advertising; International Marketing; Services Marketing; Marketing Strategy.

**Robert D. Hollinger,** Professor of Finance. B.S. 1964, M.S. 1968, Ph.D. 1973, Kansas State University. Research Interests: Corporate Finance and Investments.

**Cynthia S. McCahon,** Associate Professor of Management. B.S. 1978, Purdue University; M.S. 1980, Ph.D. 1987 Kansas State University. Research Interests: Total Quality Management; Scheduling Methods in Manufacturing; Multiple Attribute Decision Making.

**Brian Niehoff,** Associate Professor of Management. B.S. 1977, St. Joseph College; MBA 1986, Ph.D. 1988, Indiana University. Research Interests: Leadership Behavior and Its Relationship To Employee Justice Perceptions and Citizenship Behavior.

**Wayne Norvell,** Professor of Marketing and Director of International Trade Institute. B.S. 1964, Arkansas Polytechnic College; MBA 1965, University of Arkansas; DBA 1973, Mississippi State University. Research Interests: International Marketing Strategy; Strategic World Marketing.

**Richard L. Ott,** Assistant Professor of Accounting. B.A. 1969, University of St. Thomas; MBA 1980, University of Houston at Clear Lake City; MAcc 1982, Ph.D. 1986, Texas Technical University. Research Interests: Accountant Advertising; Identifying Ethical Dilemmas of Accountants; Job Selection Factors.

**Robert J. Paul,** Professor of Management. BBA 1954, University of Wisconsin; M.S. 1962, Oklahoma State University; Ph.D. 1966, University of Arkansas. Research Interests: Employee Discrimination; Employee at Will; Employee Health Insurance.

**Daniel G. Short,** Professor of Accounting and Dean. B.S. 1967, Boston University; MBA 1974, Ph.D. 1977, University of Michigan. Research Interests: Financial Accounting, General Price-Level Accounting.

**Maurice A. Stark,** Professor of Accounting. B.S. 1959, CPA 1961, M.S. 1966, Kansas State University; Ph.D. 1972, University of Missouri. Research Interests: Accounting Education; Accounting Program Administration.

**Lynn Thomas,** Associate Professor of Accounting. B.A. 1971, MBA 1973, Kansas State University; Ph.D. 1980, University of Kansas. Research Interests: Financial Reporting; Stock Prices.

**James B. Townsend,** Professor of Management. B.A. 1945, U.S. Military Academy; M.A., 1964, DBA 1976, George Washington University. Research Interests: Extraterritorial Antitrust; Government Regulations of Business; Selected Aspects of International Business.

**David R. Vruwink,** Associate Professor of Accounting. B.S. 1973, University of Wisconsin–Steven's Point; MBA 1976, University of Wisconsin–Oshkosh; Ph.D. 1982, University of Arkansas. Research Interests: Accounting Information and Its Effect on Stock Prices; The Effect of FASB No. 87 on Pension Reporting.

## Programs

The College of Business Administration at Kansas State University provides graduate work leading to a master of business administration degree and a master of accountancy degree.

These programs will prepare future generations of business leaders for positions of executive responsibility and authority in the dynamic world environment. We are committed to providing students with necessary knowledge and skills to meet these needs of the international business community.

The master of business administration program is designed to provide professional managerial education to individuals who wish to pursue administrative careers in both the private and public sectors. The program seeks to combine practical and conceptual approaches to business to help students develop important administrative skills and expand their intellectual ability. On a solid foundation of the tools of quantitative analysis, the program builds a management model that emphasizes creative decision making, risk taking, strong interpersonal skills, and good business values.

The objective of the master of accountancy program is to provide candidates with a greater breadth and depth in accounting than is possible in the baccalaureate or master of business administration program in preparation for careers as professional accountants in financial institutions, government, industry, nonprofit organizations, and public practice.

## Support facilities

The College of Business Administration houses several outreach services aimed at providing support to students and faculty as well as members of the community. Specific services are provided/coordinated through the following centers and institutes.

### Center for Leadership

The Center for Leadership is an interdisciplinary fellowship of individuals who are interested in research in, and applications of, organizational leadership. The fellowship is composed of university faculty from management, industrial and organizational psychology, industrial engineering, hotel and restaurant management, and extension services, as well as staff in a number of administrative departments. Activities of the center focus on disseminating information about leadership and management related topics, and providing funding for faculty research in the field of leadership. Past activities have included sponsoring panel discussions and campus speakers, developing and administering a number of management training programs (e.g., quality management, team building), and providing survey analysis.

### International Trade Institute

The ITI is committed to increasing trade opportunities for Mid-American businesses by providing strategic information for decision-makers and by sponsoring innovative and meaningful international trade programs. The ITI's program of research, service, and education provides an integrated and systematic approach to supporting the concerns of both the academic community and area businesses and to the development of projects relevant to current international problems and opportunities.

The ITI functions as a regional contact center for a variety of international trade interests. The dissemination of information on current trade questions and issues is a vital service provided by the ITI. It supplies assistance on marketing research and export development and provides referrals of local competence on transportation, legal aspects, and financing to hundreds of Midwestern firms. It furnishes trade leads and information on foreign or domestic markets, different cultures, marketing strategies, and export questions. Upon request, the ITI conducts needs assessments and feasibility for individual firms.

### International Trade Resource Center

Because information is the keystone of the ITI's operations, efforts were focused on the establishment of an international trade information center. Initially, a trade library was inaugurated in 1985 containing materials not found elsewhere in the region. In 1991, the ITI renamed the center the International Trade Resource Center and added a considerable number of current resources. Reference topics include trade policy, marketing, trade financing, technology licensing, trading practices, country-specific information, political and

monetary risk, international economics, and import/export procedures. Along with a number of text and periodical references, the ITRC will provide users with computerized access and personalized assistance to export inquiries.

**Small Business Development Center**
The Small Business Development Center is one of 10 regional centers in Kansas. The SBDC offers free one-on-one confidential business counseling for small businesses that wish to start or purchase a new business, as well as, existing businesses that wish to develop and market new and existing products. The SBDC also offers low-cost education programs on a variety or business topics, information and referral services, and provides advocacy of small business and its importance in our economy.

**Robert G. Chapman Small Business Computing Center**
Housed in the Small Business Development Center, the computing center is a free service for students, entrepreneurs, and small businesses. It provides individual counseling on computer hardware and software selections including a wide selection available for demonstration. Assistance is also available on financial forecasting using several computer analysis programs.

**Kansas Rural Enterprise Institute**
Another service housed in the SBDC, the Kansas Rural Enterprise Institute conducts research and educational programs focused on business development strategies for rural Kansas. The KREI provides statewide and national programs in starting a home-based business, bed and breakfast operations, and business and economic development strategies for small communities.

**Small Business Institute**
The Small Business Institute links teams of senior business students working under the supervision of a faculty member, with local small business owners seeking research and analysis of business problems. The teams then work closely with the business owner and faculty member to provide assistance in solving those problems.

## Faculty
The College of Business Administration is made up of an experienced and diverse faculty. Most have their work published in scientific business journals, newspapers, and magazines on a regular basis. Many of the faculty are authors of textbooks in accounting, management, and marketing. The faculty at Kansas State University is very student-oriented. They enjoy seeing students develop their intellectual capabilities and succeed in the job market.

## Accreditation
Kansas State University's College of Business Administration is accredited by the American Assembly of Collegiate Schools of Business at both the undergraduate and graduate levels.

The American Assembly of Collegiate Schools of Business is a national organization that requires that its members maintain high educational standards. The AACSB is recognized as the sole accrediting agency for baccalaureate and master's degree programs in business administration by the U.S. Office of Education and the Council on Post-Secondary Accreditation. Members of the organization have established high standards for the professional achievement of the faculty, their teaching effectiveness and research productivity, proper balance in the curriculum, and effective student job placement. AACSB-accredited programs meet the rigorous standards of quality set by the organization. Only 15 percent of the approximately 1,300 Colleges of Business Administration in the United States are accredited by the AACSB. The Department of Accounting became the first in Kansas to receive accreditation by the AACSB for both undergraduate and graduate programs. Approximately 50 graduate accounting programs are accredited in the United States, which places the master of accountancy program among the top in the nation.

## Application requirements
Applications are welcomed from outstanding students with baccalaureate degrees in any field of study. Many students with liberal arts, humanities, engineering, and other backgrounds are currently enrolled in the MBA program.

A complete application file must be received in this office before the deadlines indicated below in order to be considered for admission. The following items constitute a complete application:

A completed application and information blank.

A nonrefundable application fee of $25 for American applicants and $30 for international applicants is in effect. Please make checks payable to Kansas State University.

An official record of your score on the GMAT sent by the ETS directly to the College of Business Administration. Acceptable scores are typically 500 or above.

Two official copies of your transcript(s), showing courses taken, grades received, and degrees awarded, sent directly from all undergraduate and graduate institutions you have attended. A U.S. bachelor's degree or its equivalent is required.

Three letters of reference from former professors or employers.

A one-page statement of your objectives in pursuing the program.

For applications from foreign students, the official report of the TOEFL and TSE (for MAcc applicants only) scores sent by ETS and a completed Kansas State University financial statement form. K-State offers intensive English training for students who have at least 400 on the TOEFL and below the 590 required score for entrance into the graduate program.

**Deadlines**
Deadlines for completed international applications are:

| Requested enrollment date | Deadline for completed application |
|---|---|
| Fall semester | June 1 |
| Spring semester | November 1 |
| Summer school | April 1 |

## Assistantships
Many graduate teaching and research assistantships are available each year. Assistantships vary between two-tenths and four-tenths time (40-hour per week basis) for the nine-month academic year. The amount of such stipends is reviewed annually. Some assistantships also carry a partial fee waiver, and a small number of the assistantships receive partial funding through the College Work-Study Program. A student on a four-tenths time appointment may not carry more than 12 credit hours per semester.

In recent years, graduate assistants have done research with professors, taught courses, advised undergraduate students, proctored exams, and assisted in the college's computer laboratory. An applicant interested in obtaining an assistantship should request an application form from to the director of graduate studies. When possible, all assistantship positions will be granted immediately following the application deadlines.

## Fellowships
Certain companies in or near Manhattan, Kansas, offer fellowships providing interested and qualified MBA students with a varied array of research, study, and analysis in selected business functional areas through working with company officers and the appropriate department of the college.

These fellowships, through a combination of special course work and high-level research and analysis experience solving real business problems, afford the recipients valuable practical experience in business administration. During the term of appointment, fellows earn graduate credit as well as a monthly fellowship stipend of substantially the same amount as a four-tenths time assistantship.

The fellowship will normally begin in the fall and extend until the end of the spring semester. Applications made to the respective fellowship selection committee for each fellowship and must be received no later than July 15 to be considered for the following fall semester. Applications will be accepted only from those who meet all admission requirements to graduate study in the College of Business Administration.

Fellows are selected on the basis of undergraduate preparation and performance, score on the Graduate Management Admission Test, and the applicant's ability to express herself/himself orally as well as on written exercises. A personal interview with the fellowship selection committee is required.

### Financial assistance

For inquiries concerning forms of financial assistance other than graduate assistantships, fellowships, or college scholarships, write to:

Student Financial Assistance
104 Fairchild Hall
Kansas State University
Manhattan, KS 66506
(913) 532-6420

For specific information about graduate assistantships, fellowships, or College of Business scholarships, write to:

Director of Graduate Studies
College of Business Administration
110 Calvin Hall
Kansas State University
Manhattan, KS 66506

# Master of Business Administration

The MBA curriculum is a 48-hour program of study that is typically completed in two years. Before fully beginning the MBA curriculum, students must acquire basic competency in the following areas: oral and written communication, math, computers, statistics, and economics. These competencies may be acquired through specific undergraduate course work. The specific number of courses required depends on the applicant's prior academic work but generally should require no more than 19 credit hours. This basic competency course work may be taken after admission to the MBA program during the student's first semester.

The 48-hour curriculum is divided into two major sections: a 36-hour business core and a 12-hour concentration. In addition, a comprehensive examination is required, normally taken in the final term of the students' program. The four elective courses for the concentration may be taken at any time after admission. Concentrations are available in agribusiness, management, marketing, finance, and international business.

### Core courses (36 hours)

| | |
|---|---|
| ACCTG 710 | Accounting Concepts and Analysis |
| ACCTG 812 | Accounting Controls for Business |
| ECON 840 | Managerial Economics |
| FINAN 710 | Managerial Finance |
| FINAN 850 | Advanced Managerial Finance |
| MANGT 820 | Behavioral Management Theory |
| MANGT 821 | Advanced Operations Management |
| MANGT 866 | Advanced Information Systems |
| MANGT 888 | Administrative Strategy |
| MANGT 891 | Legal and Social Environment of Business |
| MANGT 893 | Business Operations Analysis |
| MKTG 840 | Advanced Marketing Management |

### Area of concentration (12 hours)

K-State's MBA offers its students the opportunity to gain general business knowledge as well as develop a focus in a particular area of interest. Concentration areas are available in agribusiness, finance, international business, management, and marketing.

Graduate students must take 12 hours of concentration courses aimed at improving general competence for overall management. Specific courses have been carefully developed to complement one another and best meet the needs of our students. Students wishing to complete specific concentrations will be restricted to designated course work. MBA students may not take a concentration in accounting. Students interested in accounting should enroll in the MAcc program.

### Agribusiness

Agribusiness is the study of the economics and management of agribusiness firms with attention given to the aspects unique to agribusiness. Some of those aspects are the risks and uncertainties of agricultural production, the heavy reliance on natural resources, the uniqueness of the institutions that govern food and agriculture, the competitive structures within the agribusiness sector, the technology of commercial agriculture and food processing, and the international dimensions of food and agriculture.

The agricultural economics department has productive research, innovative teaching, and renowned extension programs. The faculty is diverse and has many areas of expertise. The department has a well established and active graduate program recognized nationally for student achievements both during their graduate program and after graduation in successful careers. With sincere faculty, supportive administration, and dedicated students the agribusiness emphasis in the MBA program can provide a bright future. All faculty have published extensively including articles and research in American Journal of Agricultural Economics, Western Journal of Agricultural Economics, Journal of Agricultural Economics, North Central Journal of Agricultural Economics, Journal of Futures Markets, Agribusiness, Journal of Production Agriculture, Journal of Agricultural Cooperation, Cereal Foods World, and the Journal of the American Society of Farm Managers and Rural Appraisers.

**Course work**

The following two courses will be required for all students concentrating in agribusiness:

| | |
|---|---|
| AGEC 805 | Agricultural Marketing |
| AGEC 823 | Production Economics II |

Additionally, students in consultation with their advisory committees will choose two of the following courses:

| | |
|---|---|
| FINAN 654 | Futures and Options Markets |
| AGEC 710 | Advanced Agribusiness |
| AGEC 736 | Natural Resource Policy |
| AGEC 750 | Agricultural Economics and Agribusiness Problems |
| AGEC 810 | Price and Income Policies for Agriculture |
| AGEC 812 | Advanced Farm Economics |
| AGEC 831 | Agricultural Marketing Management and Analysis |
| AGEC 840 | International Markets and Agricultural Trade |
| AGEC 901 | Research Methods in Economics |

### Finance

The finance concentration will allow students to combine the broad MBA education with specific skills necessary to be a successful financial manager. These students will specialize in controlling the resource investments required to support an enterprise's operating activities, planning and negotiating appropriate financing arrangements to support these investment requirements, and managing the risks inherent in an enterprise's investment and financing activities.

**Course work**

The following two courses will be required for all students concentrating in finance:

| | |
|---|---|
| FINAN 810 | Financial Market Theory |
| FINAN 820 | Advanced International Financial Management |

In addition, students will be able to choose, in consultation with their advisory committee, two of the following six courses:

| | |
|---|---|
| FINAN 652 | Working Capital Management |
| FINAN 653 | Securities and Portfolio Analysis |
| FINAN 654 | Futures and Options Markets |
| FINAN 655 | Commercial Bank Management |
| FINAN 660 | Intermediate Finance |
| FINAN 670 | Financial Management |

### International business

The international studies concentration will promote in-depth understanding of the international community and its characteristics. K-State's program is best suited to those students who have acquired some background knowledge on a country other than the United States and who are proficient in a modern foreign language. Students will explore general business concepts as they relate specifically to the international arena.

**Course work**

Four of the following five courses will comprise a concentration in international business:

| | |
|---|---|
| MKTG 844 | Advanced International Marketing |
| FINAN 820 | Advanced International Financial Management |
| ECON 681 | International Trade |
| MANGT 690 | International Management |
| MANGT 892 | International Operations Analysis |

### Management

The management concentration offers courses to develop integrative skills as well as top management skills in corporate strategy and institutional leadership. This background provides individuals with excellent opportunities for rapid advancement in management careers. Concentration courses can be chosen from broad management areas including production, human resources and computer usage in business.

**Course work**

The following course will be required for all students concentrating in management:

| | |
|---|---|
| MANGT 897 | Topics in Management: Contemporary Issues in Management |

In addition, students must select at least one of the following courses:

| | |
|---|---|
| MANGT 867 | Management of Information Resources |
| MANGT 892 | International Operations Analysis |

Students, in consultation with their committees, will choose the balance of their 12 hours from the following courses:

| | |
|---|---|
| MANGT 620 | Organizational Design |
| MANGT 622 | Decision Analysis |
| MANGT 623 | Compensation Management |
| MANGT 630 | Labor Relations Law |
| MANGT 633 | Advanced Personnel Management |
| MANGT 641 | Management of Quality |
| MANGT 651 | Operations Strategy |
| MANGT 661 | Management of Services |
| MANGT 666 | Applications of Data Models in Business |
| MANGT 690 | International Management |
| MANGT 696 | Computer Applications in Management |

### Marketing

Students who choose an emphasis in marketing will be skilled in a wide range of opportunities including consumer behavior, international marketing, marketing strategy, and marketing research. This diversity allows students to develop sufficient expertise to promote quickly to upper marketing positions.

**Course work**

Students wishing to pursue a concentration in marketing will be required to complete the following four courses:

| | |
|---|---|
| MKTG 640 | Marketing Research |
| MKTG 690 | Marketing Management |
| MKTG 841 | Special Topics in Marketing |
| MKTG 844 | Advanced International Marketing |

# Master of Accountancy

The MAcc curriculum is a 30-hour program of study that may be completed in two regular semesters and a summer term or in three semesters. Before fully beginning the MAcc curriculum, students without prior or complete business and accounting training must acquire basis competency in the following business core foundation areas: accounting, statistics, management information systems, economics, finance, marketing, and management. These competencies may be acquired through specified business core foundation course work. The specific number of business core foundation courses required depends on the applicant's prior academic work. This basic competency course work may be taken after admission to the MAcc program, but certain business core foundation courses must be completed prior to taking MAcc courses that are in the same subject or that otherwise require a knowledge of the business core foundation material.

Generally, each candidate must complete the following 30-hour program. Any exceptions must be arranged with the student's major professor. In addition to the course work, a comprehensive examination is required in the final term of the student's program.

## Curriculum

### Required

The following course will be required for all students completing the MAcc:

| | |
|---|---|
| ACCTG 831 | Advanced Financial Reporting |

### Electives

Students will choose 4 courses from the following accounting electives:

| | |
|---|---|
| ACCTG 832 | Advanced Auditing |
| ACCTG 833 | Corporate Taxation |
| ACCTG 834 | Partnership Taxation |
| ACCTG 835 | Advanced Management Accounting |
| ACCTG 841 | Advanced Accounting Theory |
| ACCTG 842 | Estate Accounting and Gift Taxation |
| ACCTG 843 | Management Accounting and Behavior |
| ACCTG 844 | Advanced Accounting Information Systems |

In addition, students will choose 15 additional hours electives from the following general areas:

Business electives (6 to 9 hours): These courses may be selected from non-accounting courses numbered 700 or above in the College of Business.

Non-Business electives 6 to 9 hours): These courses may be selected from courses numbered 500 or above outside the College of Business.

### MAcc prerequisite courses

Graduate study builds upon certain basic areas of competency that all degree candidates must satisfy. These basic areas constitute the business core foundation. The K-State course or courses which satisfy the business core foundation are as follows:

| | |
|---|---|
| ACCTG 231 | Accounting for Business Operations |
| ACCTG 241 | Accounting for Investing and Financing |
| STAT 702 | Statistical Methods for the Social Scientist |
| FINAN 450 | Essentials of Finance |
| MKTG 400 | Marketing |
| MANGT 420 | Management Concepts |
| MANGT 421 | Production and Operations Management |
| MANGT 466 | Introduction to Management Information Systems |
| MANGT 596 | Business Government and Society |
| ECON 510 | Intermediate Macroeconomics |
| | or |
| ECON 520 | Intermediate Microeconomics |
| | or |
| ECON 530 | Money and Banking |
| MANGT 695 | Business Strategy* |

*Not required if MANGT 888 is taken in the MAcc curriculum.

In addition to business core foundation prerequisites, applicants must complete or have completed a minimum of 18 credit hours of foundation course work in the accounting discipline beyond principles of financial and managerial accounting. The 18 semester credits must include study in each of the following subjects:

**Financial accounting and accounting theory**
Intermediate Accounting I
Intermediate Accounting II
Advanced Accounting

**Management accounting**
Cost Accounting
Managerial Accounting

**Management information systems**
Accounting Information Systems

**Financial and operational auditing**
Auditing I

**Taxation**
Taxation I

**Governmental and not-for-profit accounting**
Governmental Accounting
Advanced Accounting

# Accounting

## Accounting courses

### Undergraduate and graduate credit

**ACCTG 631. Accounting Internship.** (3) I, II. Provides a full semester of practical accounting experience prior to entering graduate accounting program. Pr.: 24 hours of accounting and admission to MAcc program.

**ACCTG 710. Accounting Concepts and Analysis.** (3) II. The accumulation, presentation, interpretation, and quantitative applications of accounting for business use. Pr.: MATH 100 and ECON 120 may be taken concurrently.

**ACCTG 731. Advanced Financial Reporting.** (3) I. An examination of the reporting requirements of large (often multinational) corporations, e.g., foreign currency translation, interim and segment reporting, and business combinations. Pr.: ACCTG 433.

### Graduate credit

**ACCTG 832. Advanced Auditing.** (3) I. An in-depth exposure to authoritative auditing pronouncements and specialized topics, e.g., statistical methods, EDP auditing, internal auditing, operational auditing, and audit management. Pr.: ACCTG 442 and 642.

**ACCTG 833. Corporate Taxation.** (3) I. A study of federal and state taxation of corporations with emphasis on case analysis and tax planning. Pr.: ACCTG 342 and 642.

**ACCTG 834. Partnership Taxation.** (3) II. Intensive study of the federal taxation of partnerships and S corporations. Pr.: ACCTG 342 and 642.

**ACCTG 835. Advanced Management Accounting.** (3) I. A study of traditional management accounting systems and their limitations with emphasis on newly developed systems. Pr.: ACCTG 432.

**ACCTG 842. Estate and Gift Taxation.** (3) II. Intensive examination of the federal taxation of estates and gifts. Emphasis on research and tax planning. Pr.: ACCTG 342 and 642.

**ACCTG 843. Management Accounting and Behavior.** (3) II. An investigation of human behavior effects on the collection and use of management accounting information. Pr.: ACCTG 432.

**ACCTG 844. Advanced Accounting Information Systems.** (3) II. An in-depth study of accounting information systems focusing on current means of capturing, storing, processing, and retrieving accounting data. Important issues include: designing data base structures for control, access, and auditability; design and analysis of the system controls found in complex EDP systems, decision support, and expert systems in accounting. Pr.: ACCTG 331.

# Finance

## Finance courses

### Undergraduate and graduate credit in minor field

**FINAN 550. Financial Institutions and Markets.** (3) I, II. The role of financial intermediaries and markets in facilitating the efficient financing of economic activity. Primary emphasis is on financial management concepts that underlie the operation of commercial banks and nonbank institutions in the financial system. Pr.: FINAN 450.

**FINAN 551. Introduction to Investments.** (3) II, S. 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.: FINAN 450.

**FINAN 552. Real Estate.** (3) I, II. Principles and practices including legal, economic, and social implications from the viewpoint of the real estate practitioner, investor, and society. Pr.: Junior standing.

**FINAN 554. International Financial Management.** (3) I. An application of financial management concepts to investment, financing, and managerial control decisions undertaken by the multinational firm within its institutional environment of monetary arrangements, financial intermediary organizations, and balance of payments considerations that affect the international flow of capital. Pr.: FINAN 450.

### Undergraduate and graduate credit

**FINAN 652. Working Capital Management.** (3) I. Application of the concepts of managerial finance to evaluate a firm's short-term investment and financing decisions. Pr.: FINAN 710.

**FINAN 653. Securities and Portfolio Analysis.** (3) I. A theoretical and empirical study of financial management techniques employed by the professional investor to evaluate the underlying risk-return tradeoff on a particular financial asset investment opportunity and the implications of efficient portfolio management techniques for modifying this risk-return tradeoff experience. Pr.: MATH 220 or 205, STAT 351, and FINAN 710.

**FINAN 654. Futures and Options Markets.** (3) II. An application of the option pricing theory to the valuation of speculative securities such as financial futures, stock options, index options, and futures option contracts. Pr.: FINAN 551.

**FINAN 655. Commercial Bank Management.** (3) II. An application of financial management concepts to the liquidity management, investment portfolio analysis, capital budgeting, and capital structure decision-making process required by a commercial bank to perform effectively its financial intermediation role within the financial system's institutional, regulatory, and competitive environment. Pr.: FINAN 710.

**FINAN 660. Intermediate Finance.** (4) I, II. In-depth study of a firm's long-term financing, capital investment, and working capital decisions. Topics include cash-flow analysis, capital asset valuation, business, financial, and market risk, dividend policy, capital structure theory, and short-term financial management. Pr.: MATH 205 and FINAN 710.

**FINAN 670. Financial Management.** (4) I, II. A case-oriented analysis of current topics in Financial Management, designed as a capstone course in corporate finance. Pr.: FINAN 551 and FINAN 660.

**FINAN 710. Managerial Finance.** (3) I. An intensive coverage of the fundamentals of financial management applicable to the management of nonfinancial institutions. Pr.: MATH 100 and ECON 120. A departmental exam may be substituted for this course provided the student has shown reasonable competency based on prior course work or work experience.

### Graduate credit

**FINAN 810. Financial Market Theory.** (3) I. Development and analysis of a conceptual framework for understanding (1) the functions performed by financial markets and their associated institutional arrangements, and (2) the contractual claims in transferring savings among business, household, and governmental participants in the economic system. Pr.: FINAN 551.

**FINAN 820. Advanced International Financial Management.** (3) II. A study of the international dimensions of corporate financial management with an applied orientation. Pr.: FINAN 710.

**FINAN 850. Advanced Managerial Finance.** II. A study of the concepts necessary to analyze economic flexibility and risk of investment proposals, cost of capital, and capital structure within the context of a dynamic financial and economic environment. Pr.: FINAN 710.

**FINAN 890. Seminar in Finance.** (3) On sufficient demand. In-depth study of selected contemporary issues in finance. Pr.: FINAN 710.

**FINAN 898. Advanced Problems in Finance.** (Var.) I, II, S. Independent study of selected advanced topic(s) in finance. Pr.: Consent of department head.

# General Business

### Undergraduate and graduate credit

**GENBA 506. Theories of Gender.** (3.) I. Surveys major contemporary U.S. theories of gender and their development, including impact of feminist movement on the development of theory, interactions of race and gender, women's culture and men's roles. Compares approaches of social sciences and humanities. Pr.: Six hours of women's studies.

# Management

## Management courses

### Undergraduate and graduate credit in minor field

**MANGT 520. Organizational Behavior.** (3) I, II. Examination of psychological and sociological variables important in understanding individual motivation, group functioning, change, creativity, and leadership in organizations. Pr.: MANGT 420.

**MANGT 521. Quantitative Management.** (3) I, II. Quantitative techniques, models, and the integrative nature of management systems. Includes PERT, CPM, linear programming, and inventory models. Pr.: CIS 110 or 200 and lab, MANGT 420, MATH 205, and STAT 350.

**MANGT 522. Operations Planning and Control.** (3) I. Development of concepts and understanding of planning and control systems for allocating resources and scheduling activities in business firms. To guide and coordinate the flow of materials, labor inputs, and goods and services through physical productive systems. Topics include: aggregate planning, master production scheduling, production activity planning and control, operations information systems, inventory control, material requirements planning, and total quality control. Pr.: MANGT 421.

**MANGT 530. Industrial and Labor Relations.** (3) I. Basic course in industrial and labor relations. Broad coverage of the institution of collective bargaining and its environment, the goals and operation of labor unions, the impact of unions on management, and labor relations law. Pr.: Junior standing.

**MANGT 531. Personnel and Human Resources Management.** (3) I, II. The personnel program and its operational processes of manpower planning, recruiting, testing, developing, and evaluating. Analysis of the personnel department's role in the organization with emphasis on problem solving. Pr.: MANGT 420.

**MANGT 566. Systems Analysis and Design.** (3) I. Development of a basic understanding of the systems approach and an examination of the systems impact on managerial decision making. Evaluation of systems analysis alternatives from a manager's point of view to formalize complex managerial situations effectively. Management issues associated with each stage of the systems development life cycle—especially identification of management information requirements and implementation and maintenance strategies. Relationship of systems design and organization structure. Pr.: MANGT 466 and 520.

**MANGT 596. Business, Government, and Society.** (3) I, II, S. The interrelationships and interactions of business with the social, political, and economic institutions. The impact of changes in the external environment on business and the managerial task. Pr.: FINAN 450, MANGT 420, and MKTG 400.

### Undergraduate and graduate credit

**MANGT 620. Organizational Design.** On sufficient demand. An in-depth analysis of theories and research organizational structure and climate. Includes the impact of the strategic environment; organizational size, complexity, volatility and culture; technology task design and specialization of labor; and organizational change. Pr.: MANGT 520.

**MANGT 622. Decision Analysis.** (3) I, II. Application of decision-making models and quantitative techniques to business problems and policy. Pr.: MANGT 421.

**MANGT 623. Compensation Management.** (3) On sufficient demand. An in-depth analysis of theories, research, and practices of performance appraisal and compensation systems. Includes study of the impact of economic, behavioral, legal, and political forces on compensation management. Pr.: MANGT 531.

**MANGT 630. Labor Relations Law.** (3) II. Detailed examination of the development and current status of labor relations law governing the private sector in interstate commerce. Topics to be discussed include antitrust prosecution of unions, injunctions, unfair labor practices, NCRR policies, employee rights, union rights, employer rights, and contract enforcement.

**MANGT 631. Collective Bargaining.** (3) On sufficient demand. Study of the unionized labor market. The goals, strategies, and tactics of unions and management will be examined in detail. Other topics include the environment of collective bargaining, contract negotiations, administration, and enforcement. Pr.: MANGT 530; or ECON 120 and MANGT 630.

**MANGT 633. Advanced Personnel Management.** (3) On sufficient demand. An in-depth analysis of selected topics in personnel management and employment legislation including study of current research and literature. Pr.: MANGT 531.

**MANGT 637. Industrial Conflict Resolution.** (3) On sufficient demand. Examination of causes and nature of conflict in business and between organizations. The resolution of dysfunctional conflict and management of functional conflict. Special emphasis on resolution techniques, including mediation, arbitration, negotiation, and litigation avoidance. Pr.: MANGT 530 and 630.

**MANGT 639. Advanced Labor Relations.** (3) On sufficient demand. Research methods, model building, economics of the unionized labor markets, and the behavioral theory of negotiations will be examined in detail. Pr.: MANGT 631 or ECON 620.

**MANGT 641. Management of Quality.** (3) On sufficient demand. Development of quality as a management philosophy through the study of ideas from contemporary quality philosophies of Deming, Juran, and Taguchi. Statistical process control charting as a process and quality improvement tool and product and process design as important components of quality. Pr.: MANGT 421.

**MANGT 651. Operations Strategy.** (3) On sufficient demand. Emphasis on the elements of operations strategy as a subcomponent of general business strategy. Product/process design, operations scheduling, inventory control and quality control alternatives are investigated and analyzed in different combinations to understand their effect on productivity and competitiveness of organizations. Pr.: MANGT 522.

**MANGT 661. Management of Services.** (3) II, in alternate years. Identifying and comprehending the subtle differences between manufacturing and services. Managing in accordance to a coherent theory for services and greater productivity. Service characteristics of design, planning, location, layout, human resource management, technology and information, scheduling, quality and process control. Pr.: MANGT 421.

**MANGT 666. Applications of Data Models in Business.** (3) II. Examination of interrelationships between managers and database designers from the user's perspective. Database design strategies for the functional areas of business such as accounting, marketing, and manufacturing management with a focus on making data responsive to changing information needs and supportive or organizational plans and goals. Pr.: MANGT 466.

**MANGT 690. International Management.** (3) On sufficient demand. Examination of business decision parameters and strategy in a multinational context. The influence of cultural, economic, political, and social differences on decision making and the operation of American enterprises in the international environment. Pr.: FINAN 710.

**MANGT 696. Computer Applications in Management.** (3) II. A study of computer solutions to business problems and the development of computer models and programs in PERT, inventory control, mathematical programming, simulation, operations data analysis, and information systems. Pr.: CIS 110 or 200 and lab, and MANGT 421.

## Graduate credit

**MANGT 820. Behavioral Management Theory.** (3) I, S. An in-depth analysis of the development of the behavioral bases of individual and group behavior in business, governmental, educational, and other organizations with emphasis on current research literature and applications. Pr.: Open only to graduate students in business or with permission of the instructor.

**MANGT 821. Advanced Operations Management.** (3) II. Concepts and quantitative methods are integrated into a conceptual framework of production systems with applications and current issues. Major problems in managing the production, distribution, and information functions of manufacturing and service systems. Capacity determination, resource requirements planning, operating systems designs, scheduling, quality control models and systems, technological change and innovation, quantitative methods, comparisons of production and service processes and systems. Pr.: MATH 205, and STAT 350 or conc. enrollment.

**MANGT 840. Advanced Entrepreneurship.** (3) I, II. An in-depth examination of the nature of entrepreneurship including success factors, the requirements of successful new venture planning and implementation, and researching the current literature in the field. The study of new product identification, the assessment of commercial potential, and the elements of an effective business plan will be examined in detail, culminating in the preparation of a comprehensive plan for the development and marketing of a new product or service. Pr.: FINAN 710, MANGT 720, and MKTG 700.

**MANGT 866. Advanced Management Information Systems.** (3) I, S. An in-depth, analytical treatment of organizing, producing, and using information in complex organizations. Examination of information-management tools and concepts including technological developments, data processing, information systems' impact on organizations, and system output implementation. Problems and techniques concerning the development and installation of responsive systems' outputs. Pr.: CIS 200/203.

**MANGT 867. Management of Information Resources.** (3) II. Administration of the MIS function within the business enterprise. Topics of discussion will include control of MIS resources, evaluation of projects (cost/benefit analysis), and impact of the MIS function within a business organization. Pr.: MANGT 566 and MANGT 666.

**MANGT 888. Administrative Strategy.** (3) II, S. Through case analysis, a study of the functions, responsibilities, and point of view of general management and the problems which affect the total organization's character and success. The formulation and application of administrative strategy; specifically, analysis of interrelationships between the external and internal environments, choice of purpose, molding of organizational character, definition of what needs to be done, and mobilization of resources for goal attainment. Pr.: FINAN 850, MANGT 820 and 893, and MKTG 840.

**MANGT 890. Decision Theory.** (3) On sufficient demand. An integration of economic theory and operations research in solving business problems and making decisions with emphasis on model building, information selection and use, reducing uncertainty, and strategy development and optimization. Pr.: MANGT 720, MATH 205, STAT 707 or conc. enrollment.

**MANGT 891. Legal and Social Environment of Business.** (3) I. A study of the legal and social foundations of contemporary business; an analysis of public policies toward business; and case discussions of problems in the interaction of business firms with other elements of society. Pr.: Open to graduate students in business administration and accounting and to other graduate students with consent of instructor.

**MANGT 892. International Operations Analysis.** (3) I. Explores the global market context and the environment for multinational operations. Examines important tools, concepts, theories, models, and structures as defined and applied to manufacturing and service operations in other countries. Emphasis is placed on Japanese technology and practices. It draws upon those aspects of manufacturing and service operations that can help U.S. firms become increasingly competitive worldwide. Pr.: MANGT 690 and 821.

**MANGT 893. Business Operations Analysis.** (3) II, S. The application of management science methods to business problems to provide a basis for rational decision making. Includes mathematical programming, inventory theory, simulation, model building, and heuristics. Pr.: MATH 205, STAT 350 or conc. enrollment.

**MANGT 897. Topics in Management: Contemporary Issues in Management.** (3) II. Discussion and analysis of contemporary issues in management, including applications, development and study of relevant literature and research findings. Pr.: MANGT 820, 821 and 866.

**MANGT 898. Special Problems in Management.** (Var.) As scheduled. An in-depth study of specified topics. Pr.: Twelve hours of management and consent of the instructor and department head.

# Marketing

## Marketing courses

## Undergraduate and graduate credit in minor field

**MKTG 541. Retailing.** (3) I. 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.: MKTG 400.

**MKTG 542. Sales Management.** (3) II, S. Management of the sales force in other than retail settings. Involves hiring, screening, recruiting, training, organizing, motivating, supervising, controlling, and evaluating members of the sales force. Also focuses on the development and execution of sales strategies as well as on the mechanics and need for sales forecasting. Pr.: MKTG 400.

**MKTG 543. Promotional Strategy.** (3) I. Focuses on the management of promotional programs which include elements of advertising, personal selling, sales promotion, and public relations. Includes a review of concepts from economics, behavioral sciences, and mathematics which play a role in creating, executing, and evaluating promotional programs. Pr.: MKTG 400 and 450.

**MKTG 544. International Marketing.** (3) II. This course deals with the management of marketing problems arising from various degrees of foreign involvement (exports, licensing, foreign subsidiaries). Emphasis is on the management of marketing functions in a multinational context where the parameters differ from those in domestic marketing. Topics include international economic factors, foreign cultures, nationalism and government influences, and economic development. Pr.: MTKG 400.

**MKTG 545. Marketing Channels.** (3) II, S. Study of the quantitative and qualitative factors involved in selecting, developing, managing, and controlling marketing channels of distribution. Includes decision models from industrial marketers through purchasing units. Pr.: MKTG 400.

**MKTG 550. Industrial Marketing.** (3) I. A study of the nature of the industrial marketplace, concentrating on those aspects that differentiate it from the consumer markets. The major topics are analysis of market needs, market segments, organizational buying behavior, purchasing agent functions and activities, marketing strategy and mix for institutional customers, not-for-profit and services marketing, and buyer/seller relations. Pr.: MKTG 400.

## Undergraduate and graduate credit

**MKTG 640. Marketing Research.** (3) I, II, S. 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.: STAT 351, CMPSC 200 and lab, and MKTG 400.

**MKTG 690. Marketing Management.** (3) I, II, S. Analysis of marketing situations which lead to appropriate management of the marketing program's objectives. Capstone course integrates knowledge of marketing and other business management principles into marketing strategy, development, implementation, and control. Pr.: MKTG 640 or concurrent enrollment.

## Graduate credit

**MKTG 840. Advanced Marketing Management.** (3) II. An analytical approach to the study of marketing problems of business firms and other types of organizations. Attention to the influence of the marketplace and the marketing environment on marketing decision making; the organization's services, products, and communication strategies; and the organization's systems for planning and controlling its marketing effort. Pr.: Three hours of economics, three hours in statistics, and MATH 205 or 220.

**MKTG 841. Special Topics in Marketing.** (3) I, II. Investigation and discussion of a selected advanced topic in marketing. One of the following five topics will be chosen for intensive study: (1) industrial marketing management, (2) advanced consumer behavior, (3) product policy, (4) financial aspects of marketing management, (5) marketing in the service sector. Pr.: MKTG 840 or 6 hours of marketing.

**MKTG 844. Advanced International Marketing.** (3) I, II. The advanced international marketing course is designed to provide students with: (a) familiarity with the problems and perspectives of marketing across national boundaries and those within foreign countries; (b) insights into environmental perspectives of doing business outside the home country; (c) analytical ability to make marketing decisions facing all firms (exporters, licenser/licensee, joint venture firms, firms with overseas subsidiaries) engaged in business outside the U.S.; and (d) knowledge of tools and practices for structuring the controlling and evaluating functions of marketing programs related to overseas business. We will also study the world economy, U.S. competitiveness, and what the U.S. can do to improve its trade situation and maintain a relatively high material standard of living. Pr.: ECON-6 hrs., STAT-3 hrs., MKTG-3 hrs., MATH 205.

# Education

**Michael C. Holen,** Dean

**Janice R. Wissman,** Associate Dean

**Paul R. Burden,** Assistant Dean

**Robert C. Newhouse,** Assistant Dean

**Michael F. Perl,** Director, Center for Student and Professional Services and Coordinator Laboratory Experiences

**Willard J. Nelson,** Associate Director, Center for Student and Professional Services

**Candace Bond,** Certification Officer and Associate Director, Center for Student and Professional Services

**Floyd H. Price,** Director, Community College Relations

**Emmett L. Wright,** Director, NSF Preservice Elementary Education Project

**Charles I. Rankin,** Director, Midwest Desegregation Center

6 Bluemont Hall
532-5525

## Programs

College of Education programs prepare individuals for the broad spectrum of educational positions.

Primary consideration is given to preparing education students for the various positions in elementary, secondary, post-secondary, occupational, and vocational programs, and the personnel who support these programs. In addition, the college provides consultative services and in-service training for the improvement of various aspects of education programs at all levels.

The College of Education cooperates with all other colleges and departments in its interdisciplinary approach to the preparation of teachers and other educational personnel.

The College of Education offers work leading to the master of science, doctor of philosophy in education, and doctor of education degrees. Admission to the Graduate School is required of all students enrolling for graduate credit.

The college offers numerous off-campus courses throughout the state for people who cannot attend classes on campus. Credit toward a graduate degree may be earned off campus. Doctoral candidates must meet specific on-campus residency requirements.

The undergraduate teacher education programs are accredited by the Kansas Board of Education, North Central Association of Colleges and Secondary Schools, and the National Council for Accreditation of Teacher Education.

# Support Facilities and Programs

In addition to major instructional and research programs, the College of Education provides service to K-State faculty and students, local schools, and a variety of other entities in the state and region. Specific services of the College of Education are provided or coordinated through the following centers.

## Center for Extended Services and Studies

The center initiates and responds to requests for staff development programs, administrative searches, curriculum studies, staff development needs assessments, program evaluations, and other studies designed to enhance education at all levels and environments. Formalized partnerships have been established through the center to provide technical assistance and leadership to selected education foundations in Kansas.

The center is staffed and maintained through the assignment of faculty and staff in the College of Education and through contracts with faculty from K-State and other professionals as determined by the nature of the project. Coordination of K-State's educational development resources is a major responsibility of this service unit.

## Center for Rural Education and Small Schools

Activities designed to address the unique educational needs of small schools and rural communities in Kansas and the plains states are the major focus of this center. Its basic services as ongoing endeavors are in research—to identify unique needs, effective techniques, and decision-making processes—and assistance programs centered on the development, coordination, and delivery of information and services. Development and maintenance of linkages with local schools and state and federal agencies are important functions of the center. A highly successful annual conference on rural education and small schools has attracted national attention and was initiated by the center and the College of Education.

## Center for Economic Education

With joint support from K-State and many Kansas businesses, the Center for Economic Education has developed and conducted pre- and in-service programs on economic education, including consumer economic awareness. Center staff provide consultation seminars, noncredit workshops, and graduate credit course work for schools and educators interested in improving the competence of their students in economic education. A mini-grant program for teachers, the nationally acclaimed Stock Market Game, and an extensive materials library (free loan basis) are important functions of the center.

## Midwest Regional Processing Center for the Stock Market Game

The College of Education and Computing and Network Services work with the Securities Industry Foundation for Economic Education in processing portfolios for states participating in the Stock Market Game. In addition, curriculum materials and a consultation service are provided to state coordinators to enhance the teaching of economic concepts and to assist in interpreting weekly stock portfolios.

## Instructional Media Center

The Instructional Media Center provides a range of services, instructional materials, and audiovisual equipment for faculty and students. Professional-quality materials such as tapes, overhead transparencies, slides, films, and displays are produced for faculty members. Students use the media center to prepare similar materials for use in class projects and in student teaching. Audiovisual equipment of many types is maintained and provided by the center. The instructional materials collection includes films, filmstrips, slides, tapes, and computer software used in teacher education.

The Instructional Media Center includes a full range of computers and computer services for use in instructional media classes and for independent use. The up-to-date facilities include numerous computers with a variety of word processing, database, and spreadsheet programs. Programs and equipment are also available for multimedia presentations with the use of hypermedia and other presentation capabilities and also for desktop publishing. Portable workstations with most computer functions are available for use in other classrooms.

A video recording studio is used in the production of instructional television recordings. The Instructional Media Center also includes an outstanding audio recording studio. These studios accommodate production and reproduction of a variety of recorded teaching and individual study materials.

Facilities are available for group and individual uses of instructional media, including rooms for group viewing of films and video tapes, and an independent development laboratory for the individual use of instructional materials. The laboratory includes learning spaces with all materials and equipment needed for totally individualized instruction.

## Center for Science Education

Administratively housed in the College of Education, the Center for Science Education is a university-wide vehicle for marshalling and coordinating K-State's historically independent and compartmentalized endeavors in science, mathematics, technology, and environmental education. Groups of faculty affili-

ates specializing in science, mathematics, computer science, educational technology, and environmental education from across the K-State campus are brought together to address teaching and learning issues.

The center's mission is to improve the quality of science, mathematics, and technology teaching and learning throughout Kansas and the prairie states from kindergarten through the Ph.D. level. The center facilitates collaboration among individuals and units on and off campus for the purpose of conducting research; developing curriculum materials, pedagogical strategies, and organizational mechanisms; demonstrating their effectiveness in model school sites; and disseminating the latest knowledge to an audience of school administrators, teachers, researchers, and other professionals in related organizations and non-formal educational settings.

# Financial Support

### Assistantships

Graduate assistantships, with nine-month stipends that are similar to those of other Midwest universities, are available on a competitive basis to candidates who are admitted to one of the graduate programs in the College of Education. The graduate student holding an assistantship will be expected to assist with assignments 16–20 hours per week. Students with assistantships are expected to be full-time students. Students commonly apply for assistantships in the department in which they are seeking their degree, but are not prohibited from applying for an assistantship in other departments for which they have the necessary knowledge and skills. Many departments in the college have graduate assistantships, and some have several openings each year. Primary consideration is given to those pursuing a doctoral degree.

The deadline for applying for an assistantship is usually March 1 with notification to the student by May 1. Applications will continue to be received until all graduate assistantship positions are filled. For more information about assistantships and for an application, contact the Office of Graduate Studies in 17 Bluemont Hall at (913) 532-5595.

### Financial aid

Information about scholarships, loans, grants, and employment can be obtained in the Office of Student Financial Assistance, 104 Fairchild Hall, (913) 5322-6420.

# Certification Requiring Work Beyond the Bachelor's Degree

The College of Education will recommend for certification individuals satisfying program requirements for the following:

### Administrator

A graduate degree is required for any administrative certificate granted by the state of Kansas. The program required by the College of Education must be completed. Eight hours from courses required for the administrator certification must be earned at K-State before the College of Education may recommend administrative certification. The educational administration faculty should be contacted regarding advisement for specific administrative certification.

There are two administrator endorsements: the building administrator endorsement for the principalship and the district school administration endorsement for the superintendency.

#### Building administrator endorsement

This endorsement is for licensure for the principalship. It includes 36 hours of course work. Courses required for this endorsement are the same as those required in the M.S. in educational administration. Students who already have applicable course work from another degree do not need a second degree in order to qualify for the license. Endorsement requirements are listed here.

**Foundations (6 hours)**

| | |
|---|---|
| EDADM 818 | General School Administration |
| EDADM 886 | Seminar: Historical and Philosophical Analysis of Educational Administration |

**Instructional leadership and evaluation (9 hours)**

| | |
|---|---|
| EDADM 855 | Administrative Leadership in Curriculum |
| EDADM 875 | Administrative Leadership in Staff Supervision |
| EDADM 885 | Technology Leadership for Administrators |

**Communications (3 hours)**

| | |
|---|---|
| EDADM 836 | School–Community Relations |

**Educational administration (18 hours)**

| | |
|---|---|
| EDADM 819 | Educational Finance |
| EDADM 831 | Educational Law |
| EDADM 834 | Strategies for Educational Change |
| EDADM 835 | The Principalship |
| EDADM 889 | Practicum in School Administration |
| EDADM 910 | Educational Personnel Administration |

#### District school administrator endorsement

This endorsement is for licensure for the superintendency. It includes 60 hours of graduate course work. Much of this work is also required for building-level licensure. Accordingly, students who already hold a master's degree in educational administration may apply those degree hours toward this license. The course work for this endorsement is listed below:

**Required courses (42 hours)**

| | |
|---|---|
| EDADM 819 | Educational Finance |
| EDADM 830 | Educational Facility Planning |
| EDADM 831 | Educational Law |
| EDADM 834 | Strategies for Educational Change |
| EDADM 836 | School–Community Relations |
| EDADM 855 | Administrative Leadership in Curriculum |
| EDADM 865 | Administrative Leadership in Staff Development |
| EDADM 875 | Administrative Leadership in Staff Supervision |
| EDADM 885 | Technology Leadership for Administrators |
| EDADM 886 | Seminar: Historical and Philosophical Analysis |
| EDADM 886 | Seminar: Educational Administration |
| EDADM 886 | Seminar: Educational Administration |
| EDADM 910 | Educational Personnel Administration |
| EDADM 926 | Theory in Educational Administration |

**Elective courses**

Supportive course work is required, which may be taken in but is not limited to the following areas: educational administration, special education, curriculum, student services, adult education, management, political science, psychology, sociology, human ecology, or similar areas which relate to the practice of educational administration, particularly the superintendency.

### School counseling

The approved M.S. programs in elementary, secondary, vocational guidance and counseling satisfy the state of Kansas certification requirements. Applicants must hold a degree-teaching certificate and have two years of teaching experience, or one year of teaching experience and one year of field experience (may satisfy these requirements concurrently with the program). A minimum of 12 hours in guidance and counseling required courses must be earned at K-State. Three of the 12 hours must include the course EDCEP 887 Counseling Practicum.

There are two endorsement areas in guidance and counseling: the school counselor endorsement and the vocational education counselor endorsement. Specific requirements for each are listed here.

#### School counselor endorsement

Students must complete all core requirements and select one of the following options.

**Core requirements (30 hours)**

| | |
|---|---|
| EDCEP 715 | Principles of Measurement |
| EDCEP 815 | Using Tests in Counseling |
| EDCEP 816 | Research Methods and Treatment of Data |
| EDCEP 823 | Counseling Theory |
| EDCEP 852 | Career Development for School Counselors |
| EDCEP 857 | Guidance Program Management |
| EDCEP 877 | Prepracticum in Counseling |
| EDCEP 858 | Group Processes |
| EDCEP 951 | Multicultural Counseling |

A course in human growth and development

**Elementary school counseling option (6 hours)**

| | |
|---|---|
| EDCEP 856 | Guidance in the Elementary School |
| EDCEP 887 | Counseling Practicum-elementary level |

**Secondary school counseling option (6 hours)**

| | |
|---|---|
| EDCEP 822 | Principles of Guidance |
| EDCEP 887 | Counseling Practicum-secondary level |

**K–12 school counseling option (12 hours)**

Students must complete both EDCEP 822 and EDCEP 856 and a practicum at each level.

### Vocational education counselor endorsement

For this endorsement, students must complete the core requirements listed under the school counselor endorsement; document 4,000 hours of non-teaching work experience; and complete the following courses.

| | |
|---|---|
| EDSEC 620 | Principles and Philosophy of Vocational Education |
| EDSEC 701 | Administration and Supervision of Vocational Education |
| EDSEC 612 | Job Analysis |
| | **or** |
| EDSEC 713 | Occupational Analysis |

## Reading specialist

Special certification requirements exist for both elementary and secondary school teachers of special reading classes in Kansas. In addition to degree certification and teaching experience, a minimum of 15 semester hours in a planned sequence of graduate reading courses is required for certification. The College of Education offers a variety of courses which meet these requirements.

Students seeking this endorsement must hold a valid Kansas teaching certificate and have two years of verified teaching experience.

**Required courses** (12 hours)

| | |
|---|---|
| EDEL 816 | Approaches to Reading Instruction |
| EDEL 840 | Reading Assessment |
| EDEL 841 | Instruction of Less-Skilled Readers |
| EDEL 847 | Clinical Practicum in Reading |

**Elective** (3 hours)

| | |
|---|---|
| EDEL 786 | Topics: Literature-Based Reading Instruction |
| EDEL 786 | Topics: The Reading-Writing Connection |
| EDEL 786 | Topics: Tradebooks, Elementary and Middle School |
| EDEL 786 | Topics: Whole Language |
| EDEL 820 | Trends in Elementary School Language Arts |

## Special education

Endorsement in special education is available to those completing programs to serve the gifted, mentally retarded, learning disabled, or emotionally and behaviorally disordered. Each program is considered as being primarily one that leads to a master's degree. Specific requirements for these endorsement areas are included in the description for the M.S. in special education. At least half of the credits required for special education endorsement must be earned at K-State, including at least one major course and one practicum, before the College of Education may recommend for special education endorsement.

The special education endorsement can be granted to a person who holds a valid Kansas teaching certificate for the level (i.e., early childhood, elementary, or secondary) of special education preparation and subject area(s) (e.g., music, art).

Endorsement for all areas except special education administration can be met without completion of the master's degree. However, most students choose to complete the master's degree while working toward endorsement; completing the master's degree is recommended by the special education faculty. Students who intend to complete a master's degree should apply for admission to the master's program before completing 9 hours of graduate course work. Students seeking only endorsement can apply for admission as nondegree (special) students in the Graduate School.

There are two special education endorsement areas which are not included in the description for the M.S. in special education. These are endorsements for supervisor of special education programs and director of special education. Requirements are listed here.

### Supervisor of special education programs

This endorsement is available for those with a valid Kansas teaching certificate, full endorsement in the special education area to be supervised, and three years of accredited teaching experience in the area which he or she will be supervising or coordinating. The supervisor endorsement also requires a recommendation by the chief school administrator in which the person is employed as supervisor or coordinator.

The required 12 hours of course work focus on leadership, curriculum development, and consultation. The student must successfully complete the following courses for recommendation from Kansas State University:

| | |
|---|---|
| EDSP 833 | Administration of Special Education Programs |
| EDSP 850 | The Consulting Process in Special Education |
| EDADM 855 | Administrative Leadership for Curriculum |
| EDADM 875 | Administrative Leadership in Staff Supervision |

### Director of special education

This endorsement is available for those who hold or are eligible for full endorsement in a special education area, hold or are eligible for a district school administrator endorsement, and have one of the following: hold or are eligible for a Building Administrator endorsement, including two years of teaching experience; or hold or are eligible for a special education supervisor endorsement, including two years of teaching experience.

The 24 hours of required course work includes courses in special education and educational administration. An internship is also required. Specific requirements are listed here.

| | |
|---|---|
| EDADM 819 | Educational Finance |
| EDADM 831 | Educational Law |
| EDADM 836 | School–Community Relations |
| EDADM 910 | Educational Personnel Administration |
| EDSP 833 | Administration of Special Education |
| EDSP 886 | Seminar: Special Education |
| EDSP 991 | Internship: Special Education |

An elective course

Students will be required to have at least 12 semester hours in three areas of special education other than the one area of full special education certification, and students must meet the minimum of 48 graduate hours.

### Early childhood special education

This endorsement is offered through the cooperative efforts of the Department of Human Development and Family Studies in the College of Human Ecology and the Department of Special Education in the College of Education. Students choose their department affiliation and are assigned an advisor in the department chosen.

Specific course requirements for the full endorsement in early childhood special education are included in the description of the M.S. in special education.

To obtain provisional endorsement, students must complete the following requirements. The student must have a valid teaching certificate in either early childhood or elementary education. At least 12 hours of the course work required for endorsement must be completed at K-State. The following course sequence must be successfully completed for recommendation for provisional endorsement from Kansas State University:

| | |
|---|---|
| EDSP 700 | Introduction to Human Exceptionality |
| EDSP 846 | Interventions: Early Childhood Special Education |
| EDSP 885 | Practicum in Early Childhood Special Education |
| HDFS 728 | Assessment of Young Children |

### Emotional and behavior disorders, learning disabilities, and mental retardation (provisional endorsement)

Requirements for full endorsement for each of these categories are included in the description for the M.S. in special education. For provisional endorsement, the student must have a planned program of study leading to full endorsement and have successfully completed the following courses for recommendation from Kansas State University:

1. Eligible for certification in elementary or secondary education;

2. One (1) of the following courses:

| | |
|---|---|
| EDSP 324 | Exceptional Child in the Regular Classroom |
| EDSP 700 | Introduction to Human Exceptionality |

3. Each of the following:

| | |
|---|---|
| EDSP 710 | Education of Exceptional Individuals |
| EDSP 843 | Intervention: Academic Disabilities |
| EDSP 842 | Intervention:: Emotional and Behavior Disorders |
| EDSP 885 | Practicum (in area of specialization) |

At least one course in the sequence must be taken each year. The full sequence must be completed by the end of the fourth year.

### Gifted (provisional endorsement)

Requirements for full endorsement for gifted are included in the description for the M.S. in special education. For provisional endorsement, the student must have a planned program of study leading to full endorsement and have successfully completed the following courses for graduate credit for recommendation from Kansas State University:

| | |
|---|---|
| EDSP 750 | Introduction to Education of the Gifted |
| EDSP 847 | Curriculum for the Gifted |
| EDSP 850 | Consulting Process in Special Education |
| EDSP 885 | Practicum: Gifted (at the level for which the regular teaching certificate is held) |

### Speech-language pathologist and school audiologist

The speech pathology-audiology program at K-State meets the requirements for the Certificate of Clinical Competence of the American Speech-Language-Hearing Association and the Kansas Department of Education requirements for speech-language pathologist and school audiologist. The approved program requires both undergraduate- and graduate-level course work in the speech department of the College of Arts and Sciences resulting in the M.A. degree from the Graduate School. Students interested in the program are encouraged to obtain an advisor in the speech pathology/audiology program, Department of Speech, as early as possible. However, late entry into the program as a junior or senior is possible.

See Speech Pathology/Audiology in this catalog for details concerning undergraduate and graduate course requirements leading to this endorsement.

### Supervisor

The supervisor endorsement program offered in the College of Education provides course work and practical experience for individuals involved in leadership roles in curriculum and instruction. The supervisor endorsement is developed for department heads, directors of curriculum and instruction, supervisors of elementary or secondary instruction, program coordinators, library/media center supervisors or directors, and other educators in leadership positions. A solid background in program planning, curriculum development, staff supervision, and leadership practice for educators is provided through a combination of courses and internships. Certification recommendation is initiated through the Office of Certification, 13 Bluemont Hall.

There are 21 graduate credits in the program, and requirements are listed below. Substitutions for any course listed here must be approved by the supervisor endorsement coordinator in the College of Education at Kansas State University.

**Evaluative, supervisory, and staff development procedures (3 hours)**

| | |
|---|---|
| EDCIP 831 | Leadership for Improved Instruction |
| EDADM 841 | Administrative Leadership in Staff Supervision |

**Student testing and educational accountability systems (3 hours)**

| | |
|---|---|
| EDCEP 715 | Principles of Measurement |
| EDADM 841 | Educational Program Management and Evaluation |

**Curriculum development (3 hours)**

| | |
|---|---|
| EDCIP 803 | Curriculum Development |
| EDADM 855 | Administrative Leadership in Curriculum |

**Addressing a specific curricular or instructional strategy (3 hours)**

Several courses which satisfy this standard are listed here, but other courses may also be acceptable. Alternative courses must be approved by the supervisor coordinator.

| | |
|---|---|
| EDCIP 733 | Curriculum Materials for Ethnic Diversity |
| EDCIP 735 | Curriculum Materials for Non-Sexist Teaching |
| EDCIP 808 | Curriculum in the Inner City |
| EDEL 820 | Trends in Elementary School Language Arts |
| EDEL 821 | Contemporary Mathematics in the Elementary School |
| EDEL 822 | Trends in Elementary School Social Studies |
| EDEL 834 | Improving Elementary Science Teaching |
| EDSEC 840 | Curriculum Development in Agriculture I |
| EDSEC 844 | Curriculum Development in Vocational Home Economics |
| EDSEC 873 | The Science Curriculum |
| EDSEC 874 | The Mathematics Curriculum |
| EDSEC 876 | The Social Studies Curriculum in the Secondary School |
| EDSEC 877 | The Foreign Language Curriculum |
| EDSEC 878 | The Language Arts Curriculum |

**Supervisory implications of the school as a social system (3 hours)**

| | |
|---|---|
| EDCIP 907 | Curriculum Theory |
| EDCIP 910 | Multicultural Curriculum Programming |
| EDADM 834 | Strategies for Educational Change |
| EDADM 886 | Seminar: Historical and Philosophical Analysis of Education |

**Motivational research and its instructional implications (3 hours)**

| | |
|---|---|
| EDCEP 829 | Learning Principles for Effective Teaching |
| EDCEP 912 | Psychological Bases of Educational Thought and Practice |
| EDCEP 920 | Advanced Educational Psychology Learning |

**Directed field experience (3 hours)**

| | |
|---|---|
| EDCIP 991 | Internship in Curriculum and Instruction |

# Admission Requirements

### Application forms and information

Information about graduate programs in education and application forms can be obtained from the College of Education Office of Graduate Studies, Bluemont Hall.

### General admission requirements

Candidates for graduate work shall meet the following admission requirements:

Graduation from an accredited institution whose requirements for the bachelor's degree are substantially equivalent to those of Kansas State University.

Undergraduate grade average of 3.0 or better in the junior and senior years. Undergraduate preparation substantially equivalent to that given by K-State in the specific field in which the applicant expects to do graduate work.

Undergraduate preparation in closely related or supporting subjects adequate to support advanced work in the field of the applicant's choice.

Students lacking preparation in certain areas may be required to do additional work.

International students whose native language is not English must make available the results of the Test of English as a Foreign Language. A minimum score of 550 is required on this examination.

### Master's degree admission requirements

All students expecting to work for master's degrees shall make available to the Office of Graduate Studies, College of Education, two copies of the graduate school application, two official transcripts from each institution attended, and a statement of academic objectives for graduate study. International students must make available three letters of recommendation. Advisors and/or departments may require additional information. Some departments require a score on the Graduate Record Exam or the Miller Analogies Test; departments requiring a test score are noted on the application form.

### Ph.D. and Ed.D. admission requirements

In addition to the general admission requirements, applicants to the Ph.D. or the Ed.D. program in education shall provide to the Office of Graduate Studies, College of Education, two copies of the graduate school application, two official transcripts for undergraduate and graduate courses, and an official record of a score at least at the national mean for education students on the Miller Analogies Test or the verbal and quantitative sections of the Graduate Record Examination. Advisors and/or departments may require additional information.

Ph.D. applicants also need to submit a statement of objectives indicating educational experience and professional goals showing a commitment to a career with responsibilities congruent with those associated with college faculty membership, and three letters of recommendation from higher education faculty members.

Ed.D. applicants also need to submit a statement of objectives indicating educational experience and goals showing a commitment to a career in leadership positions in professional practice, and three letters of reference verifying at least two years of successful, relevant professional experience.

# Master of Science Degrees

Master's degrees offered include:

Adult and continuing education
Elementary education
Educational administration
Secondary education
Student counseling/personnel services
Special education

### Requirements

A minimum of 30 semester hours, approximately one-half of which shall be in the major field.

Academic advisors should be consulted regarding specific departmental program requirements.

Departments shall have the option of using one or more of three plans: (1) a thesis of 6 to 8 semester hours; (2) a written report of 2 semester hours either of research or of problem work on a topic in the major field; or (3) course work only, but including evidence of scholarly effort, such as term papers, production of art, music, designs, as determined by the student's supervisory committee.

A final oral examination and/or a comprehensive written examination 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 the fields of study. Choice of examination procedures shall be a departmental option.

Information on special requirements for an advanced degree may be obtained from the College of Education Office of Graduate Studies in Bluemont Hall or by writing to the department chair.

## Adult, occupational, and continuing education

For more information about requirements for this degree, contact:

Foundations and Adult Education
363 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5535

36 hours required

**Core courses (All courses are required, 12 hours)**

| | |
|---|---|
| EDACE 780 | Introduction to Adult Education |
| EDACE 790 | Characteristics of the Adult Learner |
| EDACE 830 | Program Planning in Adult Education |
| EDACE 886 | Seminar: Social Foundations of Adult Learning |

**Professional courses (12 hours from the following)**

| | |
|---|---|
| EDACE 704 | Extension Organization and Programs |
| EDACE 706 | Principles of Teaching Adults in Extension |
| EDACE 714 | International Education |
| EDACE 725 | Adult Basic Education Techniques |
| EDACE 750 | Women, Education, and Work |
| EDACE 754 | Adult Basic Education |
| EDACE 782 | Educational Gerontology |
| EDACE 786 | Topics: Adult and Continuing Education |
| EDACE 792 | Hospital and Industry Adult Education |
| EDACE 811 | Consumer Education |
| EDACE 815 | Introduction to Community Educational Development |
| EDACE 820 | Advanced Methods in Teaching Adults |
| EDACE 825 | Theory and Practice of Continuing Education |
| EDACE 860 | Nontraditional Study for Adults |
| EDACE 886 | Seminars. Adult and Continuing Education |

**Research courses (3–9 hours)**

*Required* (3 credits):

| | |
|---|---|
| EDCEP 816 | Research Methods and Treatment of Data |

*Additional options:*

| | |
|---|---|
| EDACE 898 | Master's Report (Report Plan) |
| EDACE 899 | Master's Research (Thesis Plan) |

**Experiential and individualized courses (0–6 hours)**

Within this degree, students may take no more than 6 hours of individualized work such as readings, problems, or practicum. No more than 3 hours can be practicum.

| | |
|---|---|
| EDACE 733 | Practicum in Adult and Continuing Education |
| EDACE 775 | Readings: Adult and Continuing Education |
| EDACE 795 | Problems: Adult and Continuing Education |
| EDSEC 736 | Practicum in Extension Education |

**Human resource development (0–6 hours)**

| | |
|---|---|
| EDACE 786 | Topics: Principles of Human Resource Development (HRD) |
| EDACE 886 | Seminar: Instructional Design in HRD |
| EDACE 886 | Seminar: Policy Development and Implementation in HRD |

## Elementary education or secondary education

For more information about requirements for this 30-hour degree, contact:

Elementary Education
261 Bluemont
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5550

Secondary Education
363 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5904

**Curriculum (At least 3 hours.)**

| | |
|---|---|
| EDCIP 803 | Curriculum Development |
| EDCIP 808 | Curriculum in the Inner City |
| EDCIP 979 | Community/Junior College Curriculum |

Or a curriculum course approved by the advisor.

**Instructional improvement (At least 3 hours.)**

| | |
|---|---|
| EDCIP 833 | Creativity in Education |
| EDCIP 882 | Teacher Self-Assessment |
| EDETC 718 | Microcomputers in Instruction (2 hours) |
| EDETC 719 | Microcomputer in Instruction Lab (1 hour) |
| EDETC 763 | Instructional Design |
| EDETC 786 | Topics/Microcomputer Management of Instruction |
| EDETC 861 | Educational Technology |

Or an instructional improvement course approved by the advisor.

**Research (At least 3 hours.)**

| | |
|---|---|
| EDCIP 831 | Leadership for Improved Instruction |
| EDCEP 816 | Research Methods and Treatment of Data |

Or a research course approved by the advisor.

**Multicultural education (At least 3 hours.)**

| | |
|---|---|
| EDCIP 730 | Education of the Disadvantaged |
| EDCIP 733 | Curriculum Materials for Ethnic Diversity |
| EDCIP 735 | Curriculum Materials for Non-Sexist Teaching |
| EDCIP 910 | Multicultural Curriculum Programming |
| EDACE 750 | Women, Education, and Work |

Or a multicultural education course approved by the advisor.

**Area of specialization (9 to 12 hours, depending on the specialization selected.)**

Students must select one of the following areas of specialization. The course listings that follow in each area of specialization are recommendations and may be replaced by other courses approved by the student's supervisory committee. Where a course in an area of specialization is also listed as fulfilling requirements in curriculum, instructional improvement, research, or multicultural education, that course may be used to fulfill both requirements.

*Agricultural education (At least 9 hours.)*

| | |
|---|---|
| EDSEC 621 | Program Planning in Vocational Education–Agricultural Education |
| EDSEC 705 | Organization Problems in Teaching Agricultural Mechanics |
| EDSEC 706 | Principles of Teaching Adults in Extension |
| EDSEC 740 | Advising Youth Organizations |
| EDSEC 822 | Young Farmer and Adult Farmer Education in Agriculture |
| EDSEC 823 | Agricultural Education for Beginning Teachers |
| EDSEC 840 | Curriculum Development in Agricultural Education I |
| EDSEC 842 | Curriculum Development in Agricultural Education II |

*Community/junior college (At least 9 hours.)*

This specialization is available for the M.S. in secondary education only.

| | |
|---|---|
| EDCIP 832 | Community/Junior College |
| EDCIP 943 | Principles of College Teaching |
| EDCIP 944 | Current Issues in College Teaching |
| EDCIP 979 | Community/Junior College Curriculum |

No more than three hours of topics (786) or seminars (886) in community/junior college.

*Computer-based education (At least 12 hours.)*

The M.S. student will be classified as elementary or secondary according to the level of teacher certification.

Required (6 hours):

| | |
|---|---|
| EDETC 718 | Microcomputers in Instruction (2 hours) |
| EDETC 719 | Microcomputers in Instruction Lab (1 hour) |
| EDETC 786 | Microcomputer Management of Instruction (3 hours) |

Electives (Select 6 hours from the following.):

| | |
|---|---|
| EDETC 723 | Computer Applications in Content Areas: (science, mathematics, social studies, humanities, reading, problem solving, desktop publishing, etc.) |
| EDETC 763 | Instructional Design |
| EDETC 861 | Educational Technology |
| EDETC 863 | Interactive Systems Design |
| EDETC 786 | Topics—(Many topics are offered; see sample topics in the seminar list that follows) |
| EDETC 886 | Seminars—(Recent seminar topics have included: Design of Intelligent CAI Programs, Classroom Computer Research, Design of Hypermedia for Instruction, Computer Equity, Cognitive Issues in Computer Education, Design of Instructional Simulations, Robotics in the Classroom, and Artificial Intelligence for Educators) |
| EDETC 920 | Design and Evaluation of Educational Software |

*Curriculum supervisor (At least 12 hours.)*

The M.S. student will be classified as elementary or secondary according to the level of teacher certification. To provide an adequate foundation for courses in this specialization, students are strongly encouraged to take the following courses to meet requirements in core areas of this master's degree:

| | | |
|---|---|---|
| Curriculum | EDCIP 803 | Curriculum Development |
| Research | EDCIP 831 | Leadership for Improved Instruction |

If students take the two courses listed above and the courses listed below, only EDCIP 991 Internship in Curriculum and Instruction is needed to meet the requirements for the supervisor's endorsement (granted by the State Board of Education). A list of requirements for the endorsement is available in the Office of Graduate Studies (017 Bluemont Hall). Make prior arrangements for the EDCIP 991 with the supervisor endorsement coordinator in the College of Education.

Substitutions for any course listed here must be approved by the advisor in consultation with the supervisor endorsement coordinator in the College of Education.

Student testing and educational accountability systems (3 hours):

| | |
|---|---|
| EDCEP 715 | Principles of Measurement |
| EDADM 841 | Educational Program Management and Evaluation |

Addressing a specific curricular or instructional strategy (3 hours):
Several courses which satisfy this standard are listed here, but other courses may also be acceptable.

| | |
|---|---|
| EDCIP 733 | Curriculum Materials for Ethnic Diversity |
| EDCIP 735 | Curriculum Materials for Non-Sexist Teaching |
| EDCIP 808 | Curriculum in the Inner City |
| EDEL 820 | Trends in Elementary School Language Arts |
| EDEL 821 | Contemporary Mathematics in the Elementary School |
| EDEL 822 | Trends in Elementary School Social Studies |
| EDEL 834 | Improving Elementary Science Teaching |
| EDSEC 840 | Curriculum Development in Agriculture I |
| EDSEC 844 | Curriculum Development in Vocational Home Economics |
| EDSEC 873 | The Science Curriculum |
| EDSEC 874 | The Mathematics Curriculum |
| EDSEC 876 | The Social Studies Curriculum in the Secondary School |
| EDSEC 877 | The Foreign Language Curriculum |
| EDSEC 878 | The Language Arts Curriculum |

Or another course approved by the advisor

Supervisory implications of the school as a social system (3 hours):

| | |
|---|---|
| EDCIP 907 | Curriculum Theory |
| EDCIP 910 | Multicultural Curriculum Programming |
| EDADM 834 | Strategies for Educational Change |
| EDADM 886 | Seminar: Historical and Philosophical Analysis of Education |

Motivational research and its instructional implications (3 hours):

| | |
|---|---|
| EDCEP 829 | Learning Principles for Effective Teaching |
| EDCEP 912 | Psychological Bases of Educational Thought and Practice |
| EDCEP 920 | Advanced Educational Psychology: Learning |

*Elementary education*
(At least 9 hours total including a minimum of two or more courses from the core, and then a choice of electives.)

Core (Select two or more courses):

| | |
|---|---|
| EDEL 820 | Trends in Elementary School Language Arts |
| EDEL 821 | Contemporary Mathematics in the Elementary School |
| EDEL 822 | Trends in Elementary School Social Studies |
| EDEL 834 | Improving Elementary Science Teaching |
| EDEL 714 | Understanding and Teaching Reading |
| | **or** |
| EDEL 816 | Approaches to Reading Instruction |

Electives:

| | |
|---|---|
| EDEL 779 | Primary School Education |
| EDEL 780 | Kindergarten Education |

Or other elementary education courses approved by the advisor.

*Home economics education (At least 9 hours.):*
It is recommended that those choosing this specialization take elective courses (see electives section) in one or two departments in the College of Human Ecology.

| | |
|---|---|
| EDACE 739 | Coordination of Cooperative Vocational Education |
| EDSEC 701 | Administration and Supervision of Vocational Education |
| EDSEC 713 | Occupational Analysis |
| EDSEC 740 | Advising Youth Organizations |
| EDSEC 786 | Topics (Recent Topics have included Methods of Teaching Food Science and Middle-Level Home Economics.) |
| EDSEC 810 | In-Service Education for Beginning Home Economics Teachers |
| EDSEC 811 | Consumer Education |
| EDSEC 834 | Trends in Home Economics Teaching |
| EDSEC 844 | Curriculum Development in Vocational Home Economics |
| EDSEC 864 | Assessment in Home Economics Education |
| EDSEC 886 | Seminars (Recent seminars have included issues related to Teaching Human Sexuality and AIDS Education, and Thinking Skills Strategies in the Home Economics Classrooms.) |

*Instructional systems design (At least 12 hours.)*
The M.S. student will be classified as elementary or secondary according to the level of teacher certification.

| | |
|---|---|
| EDETC 756 | Visual Communication |
| EDETC 762 | Instructional Television |
| EDETC 763 | Instructional Design |
| EDETC 764 | Telecommunications in Education |
| EDETC 861 | Educational Technology |
| EDETC 863 | Interactive Systems Design |
| EDETC 920 | Design and Evaluation of Educational Software |

*Multicultural education (At least 9 hours.)*
The M.S. student will be classified as elementary or secondary according to the level of teacher certification.

| | |
|---|---|
| EDCIP 730 | Education of the Disadvantaged |
| EDCIP 733 | Curriculum Materials for Ethnic Diversity |
| EDCIP 735 | Curriculum Materials for Non-Sexist Teaching |
| EDCIP 910 | Multicultural Curriculum Programming |

No more than three hours of topics (786) or seminars (886) in multicultural education.

*Reading (At least 9 hours.)*
The M.S. student will be classified as elementary or secondary according to the level of teacher certification. The student may meet the requirements for the elementary or secondary reading specialist endorsement (granted by the State Board of Education) as part of the M.S. program. A list of the requirements for endorsement is available from the Office Graduate Studies (17 Bluemont Hall) or the Student and Professional Services (13 Bluemont Hall).

| | |
|---|---|
| EDEL 600 | Reading with Practicum |
| EDEL 714 | Understanding and Teaching Reading |
| EDEL 717 | Corrective Reading Instruction |
| EDEL 816 | Approaches to Reading Instruction |
| EDEL 817 | Reading Comprehension |
| EDEL 840 | Diagnosis of the Reader |
| EDEL 841 | Remediation of Reading Disabilities |
| EDEL 846 | Diagnosis and Treatment of Reading Disabilities |
| EDEL 847 | Advanced Clinical Practicum in Reading |
| EDEL 848 | Organization and Administration of Reading Programs |
| EDEL 972 | Advanced Study of the Reading Process |
| EDSEC 715 | Reading in the Content Areas |

*School library media specialist (At least 12 hours.)*
The M.S. student will be classified as elementary or secondary according to the level of teacher certification. The student may meet the requirements for the elementary, secondary, or K–12 school library media specialist endorsement (granted by the State Board of Education) as part of the M.S. program. A list of the requirements for endorsement is available from the Center for Student and Professional Services (13 Bluemont Hall).

| | |
|---|---|
| EDETC 705 | Organization and Processing of Instructional Materials |
| EDETC 765 | Planning and Developing Instructional Materials |
| EDETC 786 | Topics (up to 3 hours of production topics) |
| EDETC 811 | Reference and Information Sources |
| EDETC 861 | Educational Technology |
| EDETC 911 | Optical Information Systems |
| EDETC 960 | Educational Media Programs |
| EDETC 966 | Selecting and Evaluating Instructional Materials |

*Secondary education*
(At least 9 hours total: at least 3 hours from the list below plus 6 additional hours from this list or from the teaching specialty.)

| | |
|---|---|
| EDCIP 805 | Curriculum Construction for Elementary and Secondary Schools |
| EDSEC 614 | Laboratory Techniques in the Teaching of Science |
| EDSEC 715 | Reading in the Content Areas |
| EDSEC 873 | The Science Curriculum |
| EDSEC 874 | The Mathematics Curriculum |
| EDSEC 876 | The Social Studies Curriculum |
| EDSEC 878 | The Language Arts Curriculum |
| ART690 | Techniques in Teaching Art |

No more than three hours of topics (786) or seminars (886) in the secondary education specialization.

*Secondary reading (At least 9 hours.)*

| | |
|---|---|
| EDSEC 715 | Reading in the Content Areas |
| EDSEC 786 | Topics/Middle School Reading Instruction |
| EDSEC 786 | Topics/Secondary and College Reading Instruction |
| EDSEC 786 | Topics/Assessment/Instruction Middle/Secondary Reading |
| EDSEC 878 | The Language Arts Curriculum |
| EDSEC 991 | Internship: Middle/Secondary Reading |

*Vocational education (At least 9 hours.)*

| | |
|---|---|
| EDSEC 611 | Coordination Techniques |
| EDSEC 612 | Job Analysis |
| EDSEC 620 | Principles and Philosophy of Vocational Education |
| EDSEC 701 | Administration and Supervision of Vocational Education |
| EDSEC 704 | Extension Organization and Programs |
| EDSEC 713 | Occupational Analysis |
| EDSEC 732 | Practicum in Career Education |
| EDSEC 735 | Practicum in Business and Office Occupations |
| EDSEC 740 | Advising Youth Organizations |
| EDSEC 811 | Consumer Education |
| EDSEC 910 | Occupational Experience Supervision |

**Electives**
Students should consider elective courses from the following areas:

Additional courses in the specialization.

Courses from other areas of specialization (e.g., A student may complete the specialization in reading with 9 credits and also take courses in other areas of specialization (such as computer-based education or multicultural education) that could apply to the elective section.)

General K–12 courses in teacher education.

Courses in other departments in the College of Education.

Courses in the university which contribute to the student's professional expertise.

Especially recommended are courses in colleges other than Education which strengthen the teaching fields. See the *K-State Undergraduate Catalog*.

**Report or thesis**
If a student selects a master's report or thesis, the minimum number of credits are shown here.

898 Master's Report (if selected, 2 hours)
899 Master's Thesis (if selected, 6–8 hours; 6 hours minimum)

## Educational administration

For more information about requirements for this degree, contact:

Educational Administration
369 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5543

The master's degree program consists of 36 hours of course work including three credit hours of a school-based practicum. Completion of the program includes the endorsement (license) for building-level administrator.

All of the following courses are required. Each is 3 credits. Students are strongly encouraged to take EDADM 818 as the first course in this program. If that is not possible, that course should be taken within the first 9 hours of the program.

**Foundations (6 hours)**
EDADM 818 General School Administration
EDADM 886 Seminar: Historical and Philosophical Analysis of Educational Administration

**Instructional leadership and evaluation (9 hours)**
EDADM 841 Educational Program Management and Evaluation
EDADM 855 Administrative Leadership in Curriculum
EDADM 875 Administrative Leadership in Staff Supervision

**Communications (3 hours)**
EDADM 836 School–Community Relations

**Educational administration (18 hours)**
EDADM 819 Educational Finance
EDADM 831 Educational Law
EDADM 834 Strategies for Educational Change
EDADM 835 The Principalship
EDADM 889 Practicum in Educational Administration
EDADM 910 Educational Personnel Administration

## Student counseling and personnel services

For more information about requirements for this degree, contact:

Counseling and Educational Psychology
369 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5541

The master's degree in student counseling and personnel services has two emphases: college student personnel work and school counseling. Students select one of these emphasis.

### College student personnel work

This emphasis is designed to prepare the student for work in a college setting at one or many different student affairs agencies and to assist the student to meet the professional entry-level and advancement requirements in the field. A minimum of 39 graduate credit hours are required in the program.

Students complete 24 hours of core courses and also select one of two options. The counseling option is most appropriate for those intending primarily to provide developmental counseling/advising services within a college or university. The administration option is more appropriate for those intending to work as student services/programs administrators. Each program of study is developed jointly by the student and advisor.

**Core requirements (24 hours)**
EDCEP 812 History and Philosophy of Higher Education
EDCEP 816 Research Methods and Treatment of Data
EDCEP 817 Statistical Methods in Education
EDCEP 818 Principles of College Student Personnel Services
EDCEP 838 The College Student and The College Environment
EDCEP 823 Counseling Theory
EDCEP 858 Group Processes
EDCEP 863 Trends in Career Development

**Counseling option (15 hours)**
EDCEP 715 Principles of Measurement
EDCEP 815 Using Tests in Counseling
EDCEP 877 Prepracticum in Counseling
EDCEP 887 Counseling Practicum
3 hours of elective

**Administration option (15 hours)**
EDCEP 804 Survey Techniques and Questionnaire Construction
EDCEP 875 Administration of College Student Personnel Services
EDCEP 885 Practicum in College Student Personnel Work
EDCEP 927 Higher Education Administration
3 hours of elective

### School counseling

This emphasis prepares students for an endorsement on their teaching certificate for at least one of three levels: elementary (K–9), secondary (7–12), or vocational education counseling. A K–12 endorsement is also available. Individuals who wish to receive endorsement for K–12 education must complete a practicum at both the elementary and secondary levels and all other course requirements. Endorsement for the chosen level is recommended upon completion of the appropriate curriculum and corresponding documentation of teaching experience.

To be fully endorsed, a student must have taught two years. If students have taught only one year, they must complete a one-year supervised field experience. Individuals seeking vocational education counseling endorsement must also document 4,000 clock hours of non-teaching work experience.

Students must complete all core requirements and also select at least one of the option areas.

**Core requirements (30 hours)**
EDCEP 715 Principles of Measurement
EDCEP 815 Using Tests in Counseling (Pr.: EDCEP 715)
EDCEP 816 Research Methods and Treatment of Data
EDCEP 823 Counseling Theory (Pr.: EDCEP 215 or PSYCH 520)
EDCEP 852 Career Development for School Counselors (Pr.: EDCEP 215 or PSYCH 520)
EDCEP 857 Guidance Program Management (Pr.: EDCEP 822)
EDCEP 858 Group Processes (Pr.: EDCEP 823)
EDCEP 877 Prepracticum in Counseling (Pr.: EDCEP 823 or concurrent enrollment)
EDCEP 951 Multicultural Counseling (Pr.: EDCEP 823 and 877)
A course in human growth and development

**Elementary school counseling option (6 hours)**
EDCEP 856 Guidance in the Elementary School
EDCEP 887 Counseling Practicum-elementary level (Pr.: EDCEP 823 and 877)

**Secondary school counseling option (6 hours)**
EDCEP 822 Principles of Guidance (Pr.: EDCEP 215 or PSYCH 520)
EDCEP 887 Counseling Practicum-secondary level (Pr.: EDCEP 823 and 877)

**K–12 school counseling option (12 hours)**
Students must complete both EDCEP 822 and EDCEP 856 and a practicum at each level.

**Vocational education counseling option (9 hours)**
Students must document 4,000 hours of non-teaching work experience and complete the following courses.

EDSEC 620 Principles and Philosophy of Vocational Education
EDSEC 701 Administration and Supervision of Vocational Education
EDSEC 713 Occupational Analysis

## Special education

For more information about requirements for this degree, contact:

Special Education
363 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5542

Students pursuing a master's degree in special education are required to complete requirements for *full certification in at least one categorical area* of special education. However, when feasible, it is advisable to plan programs leading to certification in more than one categorical area. A minimum of 30 hours of academic credit comprising an appropriate program of study must be approved early in the student's program by the student's graduate committee and the Graduate School. The master's degree in special education generally requires about 36 hours of study, including a research seminar, a capstone course, and a thesis or comprehensive examination.

The endorsement areas that can be incorporated in the master's degree include the following: early childhood special education, mental retardation, emotional and behavior disorders, education of the gifted, learning disabilities, supervisor of special education programs, and director of special education.

### Early childhood special education

(36 hours required for the master's degree, 30 hours required for the endorsement)

For full endorsement, the student must successfully complete the following courses for recommendation from Kansas State University.

**I. Foundations and identification (9 hours required)**
EDSP 700 Introduction to Human Exceptionality
HDFS 810 Child Development
HDFS 815 Infant Behavior

Electives:
SPPAT 555 Language Development
EDSP 728 Characteristics of the E/BD
EDSP 724 Characteristics of Mental Retardation

**II. Assessment and planning (3 hours required)**
HDFS 728 Assessment of Young Children

**III. Curriculum: instruction and program development (12 hours required)**
Required courses (9 hours required):
EDSP 710 Education of Exceptional Individuals
HDFS 540 Curriculum for Cognitive and Language Development for Young Children
EDSP 846 Interventions: ECSE

Electives:
PE 561 Adapted Physical Education
EDSP 777 Behavior Management for Exceptional Individuals
EDSP 842 Interventions: EBD

**IV. Consulting: parent interaction (2–3 hours required)**
EDSP 845 Special Ed. Programming: Parent Involvement
**or**
EDSP 850 Consulting Process in Special Education
**or**
HDFS 824 Parent Child Interaction, Theory and Research

**V. Practicum (9 hours required)**
HDFS 883 Practicum in Early Childhood Education
HDFS 885 Practicum: Early Childhood Special Childhood
HDFS 886 Seminar: Field Practice, ECSE

### Education of the gifted
(30 hours required for the master's degree, 30 hours required for the endorsement)

For full endorsement, the student must successfully complete the following courses for recommendation from Kansas State University.

**General competencies (8–9 hours required)**
Required courses (9 hours):

| | |
|---|---|
| EDCEP 715 | Principles of Measurement |
| EDSP 700 | Introduction to Human Exceptionality |
| | **or** |
| EDSP 324 | Exceptional Child in the Regular Classroom |
| EDSP 710 | Education of Exceptional Individuals |
| | **or** |
| EDCEP 856 | Guidance in the Elementary School |
| | **or** |
| EDCEP 822 | Principles and Practices of Guidance |
| | **or** |
| EDCEP 858 | Group Guidance |

**Major courses (12 hours required)**
Required courses (9 hours):

| | |
|---|---|
| EDSP 847 | Curriculum for the Gifted |
| EDSP 750 | Introduction to Education of the Gifted |
| EDSP 885 | Practicum: Gifted (elementary or secondary) |

Electives (3 hours):

| | |
|---|---|
| EDSP 787 | Field Experience: Gifted |
| EDSP 795 | Problems: Education of the Gifted |
| EDSP 886 | Seminar: Advanced Studies in Gifted Education |

**Supporting courses (9 hours required)**
Psychological principles:
Required course (3 hours):

| | |
|---|---|
| EDCEP 829 | Learning Principles for Effective Teaching |
| | **or** |
| EDCEP 912 | Psychological Bases of Educational Thought and Practice |
| | **or** |
| EDCEP 920 | Advanced Educational Psychology: Learning |

Electives (6 hours):

| | |
|---|---|
| EDCEP 921 | Advanced Educational Psychology: Development |
| EDSP 728 | Characteristics of Emotional and Behavioral Disorders |
| EDSP 721 | Characteristics of Learning Disabilities |

Skill development:
Required course (3 hours):

| | |
|---|---|
| EDSP 850 | The Consulting Process in Special Education |

Electives:

| | |
|---|---|
| EDETC 718: | Microcomputers in Instruction |
| EDETC 719 | Microcomputers in Instruction Lab |
| EDSP 845 | Special Education Programming: Parent Involvement |

Program development:
Electives:

| | |
|---|---|
| EDCIP 803 | Curriculum Development |
| EDCIP 833 | Creativity in Education |

**Research and theory (3 hours required)**
Required course (required for MS degree only):

| | |
|---|---|
| EDCEP 816 | Research Design and Treatment of Data |

Elective:

| | |
|---|---|
| EDSP 899 | Master's Research (optional) |

### Mild/Moderate disabilities (Behavior disorders, and/or learning disabilities, and/or mental retardation) Elementary and/or secondary

**Prerequisites:**
Eligible for certification in elementary or secondary education, and *one* of the following courses:
EDSP 323, Exceptional Student in the Secondary School;
EDSP 324, Exceptional Child in the Regular Classroom;
EDSP 700, Introduction to Human Exceptionality

**Required courses** (27 hours)

| | |
|---|---|
| EDSP 710 | Education of Exceptional Individuals |
| EDSP 842 | Interventions: Emotional and Behavioral Disorders |
| EDSP 843 | Interventions: Academic Disabilities |
| EDSP 850 | Consulting Process in Special Education |
| EDCEP 715 | Principles of Measurement |
| EDSP 730 | Assessment in Special Education |
| EDSP 848 | Transitions in Special Education |
| EDSP 845 | Special Education Programming: Parent Involvement |

*Two of the following. One must be in area of specialization*

| | |
|---|---|
| EDSP 721 | Characteristics of Learning Disabilities |
| EDSP 724 | Characteristics of Mental Retardation |
| EDSP 728 | Characteristics of Emotional and Behavioral Disorders |

**Electives: (At least 2 of the following as recommended by student's advisor)**

| | |
|---|---|
| EDSP 786 | Topics: Language and Learning Disabilities |
| EDSP 777 | Behavior Management of Exceptional Individuals |
| EDSP 841 | Interventions: Moderately Mentally Retarded (required for MR endorsement) |
| EDSP 844 | Special Education in Secondary Schools (required for adding secondary level endorsement to elementary level certification) |
| EDSP 778 | Technology for Special Education |
| EDEL 841 | Remediation of Reading Disabilities |

**Practicum (At least two different placements required)** (6 hours)
EDSP 885 Practicum in Education of Exceptional Individuals: BD, LD, or MR (2–6 depending on placement). First placement must be at the level for which endorsement is requested (i.e., elementary or secondary). Second placement can be in a different delivery model for the area of specialization, a different categorical area, on-the-job if employed in special education, or at a different level in the area of specialization.

**Internship (Required for full endorsement, not required for MS)** (1–3 hours)
EDSP 795 Problems: Internship in Special Education (1) Must be taken after *all* course work has been completed. Students will be provisionally endorsed and employed as special education teachers. Upon successful completion of this internship, students will be recommended for full endorsement.

**Provisional endorsement**
Prerequisites as cited above and:

| | | |
|---|---|---|
| EDSP 710 | Education of Exceptional Individuals | 3 |
| EDSP 842 | Intervention: Emotional and Behavior Disorders | 3 |
| EDSP 843 | Intervention: Academic Disabilities | 3 |
| EDSP 885 | Practicum (in area of specialization) | 3 |

At least one course in the sequence must be taken each year. The full sequence must be completed by the end of the fourth year.

**Limitations:**
Special education endorsement is limited to the level of the basic certification. Individuals certified K–12 in subject areas such as art, physical education, or music must complete additional courses in elementary education if they wish to receive elementary level special education endorsement. To be recommended for endorsement, the student must have a 3.0 GPA overall in graduate work and must not receive a grade lower than a B in the 9 hour core courses for the area of specialization (characteristics, interventions, and practicum). The above program is subject to change depending on actions taken by the Kansas State Board of Education.

**Additional requirements for a master's degree**
The above program leads to endorsement in special education. Students wishing to complete the master's degree must complete at least 30 hours of graduate level credit and pass a comprehensive written examination over the program content. Committee members will recommend additional course work based on individual student need. This course work will include but not be limited to: EDSP 886 Seminar: Special Education or EDCEP 816 Research Design and Treatment of Data.

# Doctor of Philosophy Degrees in Education

Doctor of philosophy degrees in education are offered in the following areas:
Adult and continuing education
Curriculum and instruction
Student counseling/personnel services

The student's Ph.D. program is directed by a minimum of five members of the university graduate faculty, including a major professor with substantial expertise in the area of emphasis, two other faculty with strengths in the area of emphasis, one faculty member outside the student's specialization, and one faculty member, appointed by the dean of the Graduate School, who serves as the chair of the examination committee for the oral defense of the dissertation.

Each student's program of study is individualized with the approval of the major professor and the supervisory committee to optimize the student's interests, expertise, and professional goals.

Information on the Ph.D. programs may be obtained from the College of Education Office of Graduate Studies in Bluemont Hall or from the relevant department chair.

## Credit hour requirements
A minimum of 90 semester hours beyond the baccalaureate degree, including the following:

**Area of emphasis (51 hours)**
This includes courses in the student's area of academic specialty.

**Research courses (9 hours)**
This includes research courses concerning methodology consistent with that required for the dissertation. This includes course work on research methods and interpretation of data, experimental design, quantitative analysis, with additional or alternative methodological course work appropriate to advancing the discipline's scholarship through a quality dissertation.

**Dissertation research (30 hours)**
Completion of a dissertation which examines a topic congruent with the program of study using a systematic methodology consistent with accepted research paradigms; the dissertation must be successfully defended in a public, oral defense.

## Residency
A minimum of one year of full-time, ongoing campus study is required. This includes a minimum of 24 on-campus credit hours (not including research or internship credits) during one calendar year.

## Preliminary examination
Satisfactory completion of all segments of a monitored, written examination of at least

12 hours over all areas of the program of study.

## Adult and continuing education

For more information about requirements for this degree, contact:

Foundations and Adult Education
363 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5535

The doctor of philosophy degree in adult and continuing education is a minimum 90-credit program designed to prepare scholars who are committed to a career with responsibilities and requirements associated with college/university faculty membership and/or interest in the development of knowledge, theory, and research.

### Prerequisite core courses (12 hours)

Students entering the Ph.D. program without prior knowledge and course work in adult and continuing education are required to take the core courses in addition to the regular program. The core courses should be completed before foundation and professional or specialized courses are taken.

| | |
|---|---|
| EDACE 780 | Introduction to Adult Education |
| EDACE 790 | Characteristics of the Adult Learner |
| EDACE 830 | Program Planning in Adult Education |
| EDACE 886 | Seminar: Social Foundations of Adult Education |

### Degree requirements (90 hours)

Required courses are marked with an asterisk.

**Adult learning and programming (6 hours minimum)**

| | |
|---|---|
| EDACE 706 | Principles of Teaching Adults in Extension |
| EDACE 782 | Educational Gerontology |
| EDACE 786 | Topics: Adult and Continuing Education |
| EDACE 815 | Introduction to Community Educational Development |
| EDACE 820 | Advanced Methods in Adult Teaching |
| EDACE 860 | Nontraditional Studies for Adults |
| EDACE 886 | Seminars: Adult and Continuing Education |

**Organization, administration, and supervision (3 hours minimum)**

| | |
|---|---|
| EDACE 704 | Extension Organization and Programs |
| EDACE 792 | Hospital and Industry Adult Education |
| EDACE 825 | Theory and Practice of Continuing Education |
| EDACE 937 | Organization and Administration of Adult Education* |

**Human resource development (0–6 hours)**

| | |
|---|---|
| EDACE 786 | Topics: Principles of Human Resource Development |
| EDACE 886 | Seminar: Instructional Design in H.R.D. |
| EDACE 886 | Seminar: Policy Development and Implementation in H.R.D. |

**Supporting courses (0–6 hours)**

| | |
|---|---|
| EDACE 714 | International Education |
| EDACE 725 | Adult Basic Education Techniques |
| EDACE 750 | Women, Education, and Work |
| EDACE 754 | Adult Basic Education |
| EDACE 791 | Career Education |
| EDACE 811 | Consumer Education |

**Foundations (6 hours)**

| | |
|---|---|
| EDACE 916 | Foundations of Adult Education* |
| EDACE 986 | Advanced Seminars in Adult Education* |

**Research courses (9 hours minimum)**

| | |
|---|---|
| EDCEP 816 | Research Methods and Treatment of Data.* |
| EDCEP 817 | Statistical Methods in Education* |
| EDCEP 917 | Experimental Design in Educational Research* |

**Doctoral research (30 hours minimum)**

| | |
|---|---|
| EDACE 999 | Research Seminar in Adult Education (3 hours)* |
| EDACE 999 | Doctoral Research in Adult and Continuing Education (27 hours)* |

**Experiential and individual courses (0–6 hours)**

Students may have no more than 6 hours of individualized work such as readings (775) and problems (795). No more than 3 hours of which must be practicum (including those courses from the master's program).

| | |
|---|---|
| EDACE 733 | Practicum in Adult and Continuing Education |
| EDACE 775 | Readings in Adult and Continuing Education |
| EDACE 795 | Problems in Adult and Continuing Education |
| EDACE 991 | Internship in Adult and Continuing Education |

Internship: Students may complete an internship of 3–6 hours in the Ph.D. program (not to be included as part of the residency requirement), and will replace part or all of the experiential and individualized course credit.

## Curriculum and instruction

For more information about requirements for this degree, contact:

Elementary Education
261 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5550

Secondary Education
363 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5904

Doctoral study in curriculum and instruction falls into several areas of emphasis. Faculty members from several departments may affiliate with one or more doctoral clusters. Faculty in these clusters review materials for applicants to the program, make admission recommendations, establish program guidelines in the emphasis area, and serve as advisors for admitted students.

The doctoral clusters include agriculture, business, home economics, and vocational/postsecondary; curriculum and instruction leadership; media/technology/computers; reading/language arts; science/math environmental education; social science: basic and cultural literacy; and teacher education/college teaching.

## Student counseling/personnel services

For more information about requirements for this degree, contact:

Counseling and Educational Psychology
369 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5541

This doctoral program has two emphases: counselor education and student affairs in higher education. Students select one emphasis.

### Counselor education

This emphasis is primarily designed to train individuals to assume academic positions in universities.

While students are provided skills in teaching, assessment, research, and intervention, the basic intent of the program is to enhance their knowledge of the counseling profession. As counselors or educators, students are prepared to provide preventive, developmental, and/or consultative training or treatment to less pathological populations experiencing life adjustment difficulties.

### Student affairs in higher education

Students choosing this emphasis have a choice of two specialty areas: student development specialist and student affairs administration.

*Student development specialist*

This emphasis relies on the foundation of knowledge and skill that is usually associated with the field of counseling. Students in this program typically have their master's degrees or a strong master's-level emphasis in counseling. They are expected to have or to obtain basic and advanced course work in human learning, human development, and psychological foundations of educational thought and practice. Graduates of this program emphasis will be well prepared for positions in college student affairs which require skills in individual and group counseling, student development programming, and campus consultation on matters related to students' personal, vocational, and developmental problems.

*Student affairs administration*

This emphasis features administration to a larger degree than counseling, although human resource development is an essential part of preparation in this area. Candidates may come to this program with backgrounds in administration or in another discipline (such as business), but their professional goals must clearly be within post-secondary education and must include the administration of student affairs functions. Students are expected to have or obtain foundational work in human learning, human development, and psychological foundations of educational thought and practice. Furthermore, students will be expected to have or obtain the essential knowledge and skills inherent in the master's degree program in college student personnel work. Graduates of the program will be prepared to assume leadership and management positions in student services including chief student affairs officer positions.

# Doctor of Education Degrees

Doctor of education degrees are offered in the following areas:
Adult and continuing education
Curriculum and instruction
Educational administration
Educational psychology
Special education
Student counseling and personnel services

The student's Ed.D. program is directed by a minimum of five members of the university graduate faculty, including a major professor with substantial expertise in the area of emphasis, two other faculty with strengths in the area of emphasis, one faculty member outside the student's specialization, and one faculty member, appointed by the dean of the Graduate School, from another department within the College of Education who serves as the chair of the examination committee for the oral defense of the dissertation.

Each student's program of study is individualized with the approval of the major professor and the supervisory committee to optimize the student's interests, expertise, and professional goals.

Information on the Ed.D. programs may be obtained from the College of Education Office of Graduate Studies in Bluemont Hall or from the relevant department chair.

## Credit hour requirements

A minimum of 94 semester hours beyond the baccalaureate degree, including the following:

**Foundations (12 hours)**
For each category, take the course listed or its equivalent:
*Historical and philosophical analysis of educational ideas and practice*
EDADM 886 Seminar: Historical and Philosophical Analysis of Education

*Techniques and interpretation of educational research*
EDCEP 816 Research Methods and the Treatment of Data

*Social science explanations of educating a diverse society*
EDCIP 910 Multicultural Curriculum Programming

*Psychological bases of educational thought and practice*
EDCEP 912 Psychological Bases of Educational Thought and Practice

**Research courses (6 hours)**
Research courses concerning methodology consistent with that required for the dissertation.

**Clinical experience (12 hours)**

**Area of emphasis (48 hours)**

**Dissertation research (16 hours)**
Completion of a dissertation which treats an important topic of professional education practice using a systematic methodology consistent with accepted research paradigms; the dissertation must be successfully defended in a public, oral defense.

## Residency

An academic residency is required and can be completed with one of the following options: four summers within a five-year period in which 27 hours of course work are completed; three summers within a four-year period in which 24 hours of course work are completed, with a minimum of six hours of coursework completed in one intervening semester; or 24 hours of coursework completed with 12 calendar months.

## Preliminary examination

Satisfactory completion of all segments of a monitored, written examination of at least 12 hours over all areas of the program of study, 3 of which must be over the foundation courses.

## Adult and continuing education

For more information about requirements for this degree, contact:

Foundations and Adult Education
363 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5535

The doctor of education degree in adult and continuing education is a minimum 94-credit program designed to prepare professionals to work in a variety of delivery systems. The Ed.D. degree provides advanced education and experience to prepare people for work in education, business, industry, government, health services, community agencies, community colleges, four-year colleges and universities, as well as many professional areas.

**Prerequisite core courses (12 hours)**
Students entering the Ed.D. program without prior knowledge and coursework in adult and continuing education are required to take the core courses in addition to the regular program. The core courses should be completed before foundation and professional or specialized courses are taken.

| | |
|---|---|
| EDACE 780 | Introduction to Adult Education |
| EDACE 790 | Characteristics of the Adult Learner |
| EDACE 830 | Program Planning in Adult Education |
| EDACE 886 | Seminar: Social Foundations of Adult Education |

**Degree requirements (94 hours)**
Required courses are marked with an asterisk.

**Adult learning and programming (6 hours minimum)**

| | |
|---|---|
| EDACE 706 | Principles of Teaching Adults in Extension |
| EDACE 782 | Educational Gerontology |
| EDACE 786 | Topics in Adult Education |
| EDACE 815 | Introduction to Community Educational Development |
| EDACE 820 | Advanced Methods in Adult Teaching |
| EDACE 860 | Nontraditional Studies for Adults |
| EDACE 886 | Seminar: Self-Directed Learning |
| EDACE 886 | Seminars in ACE, HRD, Extension, others |

**Organization, administration, and supervision (3 hours minimum)**

| | |
|---|---|
| EDACE 704 | Extension Organization and Programs |
| EDACE 792 | Hospital and Industry Adult Education |
| EDACE 825 | Theory and Practice of Continuing Education |
| EDACE 937 | Organization and Administration of Adult Education* |
| EDACE 986 | Advanced Seminars in Adult Education |

**Human resource development (0–6 hours)**

| | |
|---|---|
| EDACE 786 | Topics: Principles of Human Resource Development |
| EDACE 886 | Seminar: Instructional Design in H.R.D. |
| EDACE 886 | Seminar: Policy Development and Implementation in H.R.D. |

**Supporting courses (0–6 hours)**

| | |
|---|---|
| EDACE 714 | International Education |
| EDACE 725 | Adult Basic Education Techniques |
| EDACE 750 | Women, Education, and Work |
| EDACE 754 | Adult Basic Education |
| EDACE 791 | Career Education |
| EDACE 811 | Consumer Education |

**Foundations of education (12 hours)**
Ed.D. students are required to take 12 hrs. of the following foundations courses or their equivalent. Courses must be approved by the Ed.D. supervisory committee.

| | |
|---|---|
| EDCEP 816 | Research Methods and Treatment of Data |
| EDADM 811 | Philosophy of Education<br>or |
| EDADM 886 | Seminar: Historical and Philosophical Analysis of Education |
| EDCIP 910 | Multicultural Curriculum Programming |
| EDCEP 912 | Psychological Bases of Educational Thought and Practice<br>or |
| EDACE 916 | Foundations of Adult Education |

**Research courses (6 hours)**

| | |
|---|---|
| EDCEP 804 | Survey Techniques and Questionnaire Construction |
| EDCEP 817 | Statistical Methods in Education |
| EDCEP 917 | Experimental Design in Educational Research |
| SOCIO 724 | Qualitative Methodology |

Other research or methodology courses may be chosen if they are related to or beneficial for your chosen dissertation topic (with approval of Ed.D. supervisory committee).

**Doctoral research (16 hours)**

| | |
|---|---|
| EDACE 999 | Research Seminar in Adult Education (3 hours)* |
| EDACE 999 | Doctoral Research (13 hours)* |

**Clinical experience (12 hours)**
Students are supervised in an educational, professional, and/or career internship designed to increase their expertise and employment options.

| | |
|---|---|
| EDACE 991 | Internship/Clinical Experience in adult education, human resource development, extension education or other areas related to your major area of emphasis or professional goals |

## Curriculum and instruction

For more information about requirements for this degree, contact:

Elementary Education
261 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5550

Secondary Education
363 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5904

Doctoral study in curriculum and instruction falls into several areas of emphasis. Faculty members from several departments may affiliate with one or more doctoral clusters. Faculty in these clusters review materials for applicants to the program, make admission recommendations, establish program guidelines in the emphasis area, and serve as advisors for admitted students.

The doctoral clusters include agriculture, business, home economics, and vocational/postsecondary; curriculum and instruction leadership; media/technology/computers; reading/language arts; science/math environmental education; social science: basic and cultural literacy; and teacher education/college teaching.

### Educational administration

For more information about requirements for this degree, contact:

Educational Administration
369 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5543

The doctor of education degree is a professional degree program principally for preparing skilled practitioners. Students who do not already hold a district-level (superintendent) endorsement may tailor coursework in their emphasis area to meet that license requirement.

### Educational psychology

For more information about requirements for this degree, contact:

Counseling and Educational Psychology
369 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5541

The discipline of educational psychology has a rich history founded in learning psychology and educational measurement. These historical foundations have led to a more contemporary educational psychology of applied research and evaluation. In keeping with this applied emphasis, the Ed.D. program in educational psychology provides an in-depth understanding of applied learning psychology, quantitative research methods, tests and measurements, and program evaluation.

Prospective students in educational psychology will be those whose career goals are to be institutional researchers or program evaluators in public schools, higher education, the military, or perhaps business and industry. Students who are interested in pursuing the Ed.D. should have in mind the setting within which they wish to work. The doctoral program will provide extensive training in the use of statistical and research methods necessary to evaluate educational and training programs. The student who successfully completes the Ed.D. program in educational psychology will have the capacity to be instrumental in the resolution of concrete problems in a variety of educational settings, as well as the ability to contribute to the improvement of educational practice.

### Special education

For more information about requirements for this degree, contact:

Special Education
369 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5542

The Department of Special Education offers an Ed.D. in special education. Programs are designed according to Graduate School and College of Education requirements and in consultation with student's advisor. The focus of this degree is on cross-categorical special education, legal and administrative issues, and other special areas such as technology or curriculum development.

### Student counseling and personnel services

For more information about requirements for this degree, contact:

Counseling and Educational Psychology
369 Bluemont Hall
Kansas State University
1100 Mid-Campus Drive
Manhattan, KS 66506
(913) 532-5541

This degree has an emphasis in counseling and is intended to prepare practitioners to work in school settings. The program is designed to enhance students' skills as a counselor and to enable them to assume supervisory responsibilities in the guidance and counseling setting. As with all Ed.D. curricula, this program emphasizes a foundation in education, a specialty in the field of study (counseling in the school environment), and clinical experience to apply the knowledge base to the field setting.

## General Courses

**DED 500. Topics in Women's Studies.** (Var.) I, II, S. Exploration of an interdisciplinary topic in women's studies. Cross-listed with the Dean of Human Ecology and the Dean of Arts and Sciences.

**DED 505. Independent Study in Women's Studies.** (1–3) I, I. Independent, interdisciplinary, supervised studies in an area of women's studies which does not fall within the boundaries of a traditional department. May be repeated once for credit with change of topic. Pr.: Junior standing, consent of instructor(s), and approval of women's studies faculty.

**DED 506. Contemporary Feminist Frameworks.** (3) I. Surveys major contemporary U.S. theories of gender and their development, including impact of feminist movement on the development of theory, interactions of race and gender, women's culture, and men's roles. Compares approaches of social sciences and humanities. Pr.: Six semester hours women's studies.

**DED 560. Topics in American Ethnic Studies.** (1–4) I or II. Selected topics of special interest in American ethnic studies. Repeatable with change of topic. Pr.: DED 160 Introduction to American Ethnic Studies. Cross-listed with the Dean of Human Ecology and the Dean of Arts and Sciences.

## Counseling and Educational Psychology

**Peggy Dettmer,** Chair
369 Bluemont Hall, (913) 532-5541

**Professors**

**Fred Bradley,** Ph.D., 1972, University of Wyoming. Group processes, counseling practicum, elementary and secondary guidance, practicum in supervision.

**Peggy Dettmer,** Ph.D., 1979, Kansas State University. Constructive use of individual differences, staff development, school consultation skills, education of gifted, creativity.

**Gerald S. Hanna,** Ed.D., 1965, University of Southern California. Uses of measures to enhance teaching and counseling.

**Michael C. Holen,** Ph.D. 1971, University of Oregon. Memory and aging, educational measurement.

**Kenneth Hoyt,** Ph.D., 1954, University of Minnesota. Career development.

**Margery Neely,** Ph.D., 1971, University of Missouri. Brief interview.

**Robert Newhouse,** Ph.D., 1972, University of Oregon. Methodology/learning.

**Fred Newton,** Ph.D., 1972, University of Missouri. Co-dependency patterns, academic assistance strategies.

**Associate professors**

**Steve Benton,** Ph.D., 1983, University of Nebraska. Writing processes, academic studying, alcohol/drug abuse and its prevention.

**Michael Dannells,** Ph.D., 1978, University of Iowa. Student affairs policy, college student development.

**Mike Lynch,** Ed.D., 1972, Indiana University. Student performance, attrition/retention, student outcomes.

**John Steffen,** Ph.D., 1968, University of Minnesota. Academic advising.

**Assistant professors**

**Kenneth Hughey,** Ph.D., 1989, University of Missouri. Career development, school counseling.

### Program

This department offers a master's degree, Ed.D., and Ph.D. degree in student counseling and personnel services and an Ed.D. in educational psychology. The M.S. in student counseling and personnel services offers emphases in college student personnel work and school counseling. The Ph.D. in student counseling and personnel services offers emphases in counselor education and student affairs in higher education.

Doctoral programs of study are individually developed with the major professor (advisor) and the supervising committee. Descriptions of core requirements, major area of emphasis coursework, and supporting area coursework are available from the department.

## Counseling and educational psychology courses

### Undergraduate and graduate credit in minor field

**EDCEP 502. Independent Study in Counseling and Educational Psychology.** (1–3) I, II, S. Selected topics in professional education. Maximum of three hours applicable toward degree requirements. Pr.: Consent of department chair.

**EDCEP 525. Interpersonal Relations in the Schools.** (1) I, II. A didactic and experiential course designed to develop an understanding of human relations skills in the schools. Provides knowledge and skills necessary to work effectively with students, parents, and school personnel. Particular emphasis is on the basis for interpersonal relations in education, communication skills, the facilitative relationship, working with students in groups, and conducting meetings with parents and school personnel. Pr.: EDSEC 420, 477, and 476. Simultaneous enrollment required for EDCIP 455, EDCEP 525, and EDSEC 586.

### Undergraduate and graduate credit

**EDCEP 711. Middle School Classroom Guidance.** (3) On sufficient demand. Techniques of integrating guidance principles for pre- and early teens into a middle school concept; investigation of classroom dynamics for middle school teachers as members of the guidance team; involvement of teachers in model guidance programs. Pr.: EDCEP 315.

**EDCEP 715. Principles of Measurement.** (3) I, II, S. Principles of constructing, administering, and evaluating tests and other measures used in schools. Focus on norm- and criterion-reference uses of teacher-made and standardized measures as an integral part of teaching. Pr.: EDCEP 315.

**EDCEP 721. Mental Hygiene in the School and Community.** (3) On sufficient demand. Dynamics creating different personalities and deviant behavior. The educative process as it affects personality integrity. Pr.: PSYCH 280 or EDCEP 215.

**EDCEP 775. Readings in Counseling and Educational Psychology.** (1–3) I, II, S. Readings in research and application in specialized areas in education. May be taken more than once. Pr.: EDCEP 215.

**EDCEP 786. Topics in Counseling and Educational Psychology.** (1–3) I, II, S. Examination of current topic in specialization of faculty. Varied topics offered each semester so course may be repeated. Pr.: EDCEP 215.

**EDCEP 795. Problems in Counseling and Educational Psychology.** 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

**EDCEP 802. Stress Management for Teachers, Counselors, and Administrators.** (3) On sufficient demand. Systematic training in stress-management strategies and techniques for the professional educator and for use in classroom and counseling settings. Includes knowledge of self-directed and instrumental techniques, psychophysiology of stress, issues in stress management, and role of teacher and counselor in delivering stress-management training. Pr.: EDCEP 315.

**EDCEP 804. Survey Techniques and Questionnaire Construction.** (3) I. Principles of survey research including instrument design, sample selection, assessment of instruments and samples, and interpreting results. Pr.: Senior standing and EDCEP 315.

**EDCEP 812. 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.

**EDCEP 815. Using Tests in Counseling.** (3) II. Focus on the use of tests as an integral part of counseling. Emphasizes interpretation of scores, issues of psychological and educational measurement, and selection and evaluation of instruments. Pr.: EDCEP 715.

**EDCEP 816. 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.

**EDCEP 817. Statistical Methods in Education.** (3) I, II, S. An introductory yet comprehensive survey of common statistical analyses encountered in educational research. Computer oriented. Pr.: A first course in college mathematics plus either STAT 703 or EDCEP 816.

**EDCEP 818. Principles of College Student Personnel Services.** (3) I. Principles, history, philosophy, current professional issues and future trends in college student personnel work; an introduction to the primary student services. Pr.: Twelve hours of undergraduate social sciences and consent of instructor.

**EDCEP 820. Individual Intelligence Testing.** (3–5) On sufficient demand. Appraisal of individual intelligence with emphasis on techniques of administration, scoring, interpreting, and applying in school settings. Supervised practice in the use of WISC-R and other tests such as the Stanford–Binet, K-ABC, and WAIS-R. Pr.: EDCEP 715 and consent of instructor.

**EDCEP 822. Principles of Guidance.** (3) S. This is a foundation course for secondary school counselors and addresses issues relevant to secondary school guidance programs. Pr.: EDCEP 215 or PSYCH 520.

**EDCEP 823. Counseling Theory.** (3) I, S. Theories, methods, and problems in counseling, relating the counseling process to dynamics of human behavior. Pr.: EDCEP 215 or PSYCH 520.

**EDCEP 825. Social Psychology of Education.** (3) II. Consideration of the literature and applications of social/psychological studies of the student, student cultures, characteristics of educational institutions, and organizational change. Pr.: EDCIP 611 or EDCEP 812 or consent of instructor.

**EDCEP 829. Learning Principles for Effective Teaching.** (3) S and on sufficient demand. Exploration of learning theories with emphasis on the application of psychological principles to the teaching-learning process, as a basis for examining and understanding contemporary research in teaching effectiveness. Pr.: EDCEP 315.

**EDCEP 838. The College Student and the College Environment.** (3) II. Study of the American college student and how he/she is influenced by institutional policies, practices, and other environmental variables. Special attention will be given to contemporary student development theory and research. Pr.: EDCEP 215 and consent of instructor.

**EDCEP 852. Career Development for School Counselors.** (3) I, S. This courses addresses the knowledge and competencies necessary for school counselors to use educational, career, and labor market information resources, and career guidance and counseling techniques, methods, and technology in developing programs, services, and activities to meet the career development needs of students. Pr.: EDCEP 215 or PSYCH 520.

**EDCEP 856. Guidance in the Elementary School.** (3) II. 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.: EDEL 585, EDCEP 820, and consent of instructor.

**EDCEP 857. Guidance Program Management.** (3) I. This course addresses the issues, knowledge, and competencies relevant to planning, implementing, and evaluating effective guidance and counseling programs to meet the needs of all students. Pr.: EDCEP 822.

**EDCEP 858. Group Processes.** (3) I, S. Designed to acquaint students with group procedures as basic tools in counseling, guidance, and other education services. Pr.: EDCEP 823.

**EDCEP 860. Adult Counseling.** (3) I, on sufficient demand. Study of adults and the problems they face in their educational, psychological, social, and career development. Particular emphasis will be given to counseling theories and strategies important for counselors working with adults experiencing these developmental problems. Pr.: EDCEP 823 or conc. enrollment.

**EDCEP 861. Management of Counseling Services for Adults.** (3) I. Strategies for the development and implementation of counseling services for adults in school, community, business, and industrial settings. The course will focus on the integration of formal and informal educational, career development, and mental health programs developed for adults having life adjustment problems. Local, state, and federal programs and agencies and their role in adult counseling services will be examined. Pr.: EDCEP 823 and 860.

**EDCEP 862. Leisure Counseling.** (3) On sufficient demand. Course develops leisure counseling models for use in community and institutional recreational programs and to provide skills and competencies in assessing, interviewing, and counseling individuals and groups in the use of leisure experiences. Pr.: REC 725 and/or EDCEP 858. Same as REC 862.

**EDCEP 863. Trends in Career Development.** (3) II. Integration of major research/issue/policy contributions to major aspects of career development including occupational adjustment and vocational fitness. Pr.: EDCEP 215 or PSYCH 520.

**EDCEP 871. Consultation for Counselors.** (3) II. This course acquaints students with the major models of consultation that may be used by counselors for intervention with individuals and organizations. Techniques, issues and ethical considerations are also addressed. Pr.: EDCEP 823 and 858.

**EDCEP 875. Administration of College Student Personnel Services.** (3) I. Planning, budgeting, personnel supervision and evaluation, office management, administrative use of computers, program evaluation and related applications in the primary college student personnel services. Pr.: EDCEP 818 and 838.

**EDCEP 877. Prepracticum in Counseling.** (3) I, II, S. A prepracticum in counseling and interviewing emphasizing facilitative relationships, ethics, case conceptualization, listening and responding skills, and understanding of personal dynamics. Pr.: EDCEP 859 or concurrent enrollment.

**EDCEP 885. Practicum in College Student Personnel Work.** (3) I, II. Supervised professional experience in college student personnel services. Pr.: EDCEP 818, 838, 875, and consent of instructor.

**EDCEP 886. Seminar in Counseling and Educational Psychology.** (Var.) On sufficient demand. 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.

**EDCEP 887. Counseling Practicum.** (3) I, II. Supervised practice in counseling. Pr.: EDCEP 823 and 877.

**EDCEP 898. Master's Report.** (Var.) I, II, S. Pr.: Consent of instructor.

**EDCEP 899. Master's Research.** (Var.) I, II, S. Pr.: Consent of instructor.

**EDCEP 912. Psychological Bases of Educational Thought and Practice.** (3) I, S. In studying educational applications of behavioristic and cognitive learning theories, attention is given to historical milieus of origin, relationships to major educational philosophies, relationships to features of instruction, and evaluation of impact on contemporary educational thought and practice. Pr.: EDCEP 315 or EDACE 790 and either EDCIP 410, EDADM 811, EDCEP 812, or EDADM 813.

**EDCEP 915. Theory of Measurement.** (3) On sufficient demand. A course designed to provide the theoretical background needed for students who wish to (1) develop greater competence in practical uses of tests in educational settings, (2) pursue academic study of measurement theory, and (3) develop instruments for research use. Pr.: EDCEP 715.

**EDCEP 917. Experimental Design in Educational Research.** (3) II, S. Philosophy, planning, and evaluation of research in education. Experimental designs appropriate for educational research with special emphasis on multivariate procedures. Computer oriented. Pr.: EDCEP 817.

**EDCEP 920. Advanced Educational Psychology: Learning.** (3) I, 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.: EDCEP 315 or its equiv.

**EDCEP 921. Advanced Educational Psychology: Development.** (3) On sufficient demand. Advanced studies in physical, intellectual, emotional, social, and personality development with the focus on the importance of these factors to the educational process. Pr.: EDCEP 315.

**EDCEP 924. Theories of Vocational Counseling.** (3) On sufficient demand. A historical and contemporary analysis of systems and theories of vocational psychology and their implications for use in the counseling setting. Pr.: EDCEP 823, 852, and 863.

**EDCEP 927. Higher Education Administration.** (3) II. Administration theory applied to the organization and administration of colleges and universities; special reference to structure, governing boards, administrative roles, decision making, and analysis of selected problems. Pr.: EDAF 812.

**EDCEP 948. Advanced Student Development Theory in College Student Affairs.** (3) S. In-depth examination of the major young adult and adult development models and their implications within the context of student affairs in higher education. Pr.: EDCEP 816, 818, 838, and consent of instructor.

**EDCEP 951. Multicultural Counseling.** (3) S. Adaptations of generic counseling skills to meet the needs of diverse populations. Pr.: EDCEP 823 and 877.

**EDCEP 955. Professional Counseling Ethics.** (3) I. Examination of ethical standards developed by professional organizations of counselors. Current interpretations of standards and applications are developed through case studies, essays, reading, and literature review. Pr.: EDCEP 823, 877, and EDCEP 822 or 856.

**EDCEP 958. Advanced Group Counseling.** (3) II. The examination of selected group counseling theories and their relevance for the practice of group counseling in a variety of settings. Pr.: EDCEP 858.

**EDCEP 959. Practicum in Group Counseling.** (3) On sufficient demand. Supervised group counseling experience in a variety of settings. Pr.: EDCEP 858 and 958.

**EDCEP 977. Advanced Counseling Practicum.** (3) I, II. Intense supervised practice in counseling. Particular emphasis will be given to the development of skills for intervention into human problems and time-limited case management. Pr.: EDCEP 823, 877, and 887.

**EDCEP 985. Advanced Counseling Theory.** (3) I. Reading and analysis of primary sources in major counseling theories. Written reaction papers, presentations, discussion, and development of a major paper on a personal theory. Pr.: EDCEP 823 and 887.

**EDCEP 986. Advanced Seminar in Counseling and Educational Psychology.** (Var.) On sufficient demand. These seminars will critically consider recent research in the designated fields. The emphasis will be upon individual studies and small group interaction.. Enrollment is restricted to those students who have been admitted to the doctoral program in education and who have completed substantial amounts of graduate study in the designated fields. Pr.: Consent of instructor.

**EDCEP 987. 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.

**EDCEP 991. Internship in Counseling and Educational Psychology.** (Var.) 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 Counseling and Educational Psychology graduate faculty members. A maximum of 6 credit hours may be chosen from the areas listed. Pr.: Consent of instructor.

**EDCEP 999. Research in Counseling and Educational Psychology.** (Var.) I, II, S. Individual investigation in the field of a student's specialization. Pr.: Sufficient training to carry on the line of research undertaken.

# Curriculum, Instruction, and Policy Studies

## Program

Courses in this area address curriculum design, foundations of education, supervision and improvement of instruction, multicultural education, and post-secondary education curriculum and instruction. A number of courses are required as core courses for the master's degrees in elementary education and the master's degree in secondary education. Many of the courses offered in the department are required for the Ph.D. degree or the Ed.D. degree in curriculum and instruction.

Courses in this area address curriculum components and educational policy related to academic decision-making including program conceptualization, instruction, theoretical factors of curriculum and instruction, and programmatic issues related to human resource development. In the main, the focus of courses in this area is on the improvement of educational practice.

## Curriculum, instruction, and policy studies courses

### Undergraduate and graduate credit in minor field

**EDCIP 502. Independent Study in Curriculum, Instruction, and Policy Studies.** (1–3) I, II, S. Selected topics in professional education. Maximum of 3 hours applicable toward degree requirements. Pr.: Consent of department chair.

### Undergraduate and graduate credit

**EDCIP 611. Educational Sociology.** (3) I, II, S. A study to gain an understanding of the ways in which the school can effectively use 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.

**EDCIP 704. Extra-Class Activities.** (3) On sufficient demand. Organization, sponsorship, and objectives of clubs, publications, athletics, dramatics, musical organizations, assemblies,home room, and student council in junior and senior high schools. Pr.: Senior standing or consent of instructor.

**EDCIP 706. Aerospace Education Workshop.** (3) S. To provide elementary and secondary teachers with knowledge, skills, and attitudes about aerospace activities and the total impact of air and space vehicles upon society. Pr.: EDSEC 586 or teaching experience.

**EDCIP 721. Economic Education Workshop.** (3) S. Basic economic concepts and how to integrate them into elementary and secondary curriculums and an examination of recent economic education materials. Pr.: Senior standing or higher.

**EDCIP 725. The Teacher and Child Abuse.** (3) On sufficient demand. An exploration of child abuse and neglect with specific references to legal and moral responsibilities of teaching. Suggestions for detection, reporting, and responsive instruction for suspected cases of child abuse and neglect. Pr.: PSYCH 110 or junior standing.

**EDCIP 730. Education of the Disadvantaged.** (3) On sufficient demand. Consideration of the life-space of the disadvantaged learner and its relationship to curriculum, organization, and interpersonal relationships in schools. The development of realistic, relevant goals for the teacher of the disadvantaged. Pr.: EDCIP 410 or 611.

**EDCIP 733. Curriculum Materials for Ethnic Diversity.** (3) On sufficient demand. An examination and analysis of recent materials and practices of schools serving multiethnic student bodies, particularly minorities from disadvantaged backgrounds. Materials include any items used by the school in implementing the curriculum. Pr.: Senior standing or higher.

**EDCIP 735. Curriculum Materials for Nonsexist Teaching.** (3) II, S. Analysis of recent materials from perspective of concern with their potential for sex-role stereotyping. Examination of teaching resource materials for curriculum intended to facilitate nonsexist teaching. Pr.: Junior standing or higher.

**EDCIP 737. Drug Abuse Education.** (3) On sufficient demand. Emphasis on the development of effective drug abuse education programs with attention given to the role delineation for schools and teachers. Materials and procedures for developing values and attitudes in an education setting. Pr.: Senior standing.

**EDCIP 775. Readings in Curriculum, Instruction, and Policy Studies.** (1–3) I, II, S. Readings in research and application in specialized areas in education. May be taken more than once. Pr.:EDCEP 215.

**EDCIP 786. Topics in Curriculum, Instruction, and Policy Studies.** (1–3) I, II, S. Examination of current topic in area of specialization of faculty. Varied topics offered each semester so course may be repeated. Pr.: EDCEP 215.

**EDCIP 795. Problems in Curriculum, Instruction, and Policy Studies.** (Var.) I, II, S. Independent study of a specific problem in curriculum or instruction. Pr.: Junior standing or higher.

### Graduate credit

**EDCIP 803. Curriculum Development.** (3) I, II, S. An overall view of the entire school curriculum, patterns of organization, outlining of instructional fields, and specific helps in curriculum development for administrators and classroom teachers. Pr.: Twelve hours of education or consent of instructor.

**EDCIP 805. Curriculum Construction for Elementary and Secondary Schools.** (2–3) On sufficient demand. Procedures for organizing and conducting programs for curriculum improvement in the elementary and secondary schools; techniques for the development and evaluation of curriculum materials. Opportunity is provided for work on individual curriculum problems. Pr.: EDCIP 803.

**EDCIP 808. Curriculum in the Inner City.** (3) On sufficient demand. Exploration of research and innovations in curriculum and instruction for inner city schools. Emphasis on curricular and instructional difficulties in low-income communities and on productive compensatory educational practices. Pr.: EDCIP 803.

**EDCIP 831. Leadership for Improved Instruction.** (3) II, S. A consideration of the relationship and techniques involved when teachers, supervisors, and administrators plan and implement improvement of instruction. Pr.: EDEL 585 or EDSEC 586.

**EDCIP 832. The Community/Junior College.** (3) I. This course is designed to give the student an overview of community/junior colleges. Emphasis on philosophy, purposes, curriculum, organization, professional staff, student–personnel programs, and the role of the comprehensive community junior college in higher education. Pr.: EDCEP 315.

**EDCIP 833. 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.

**EDCIP 836. 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 nongraded, multigraded, and multiracked programs. Pr.: Teaching experience.

**EDCIP 882. Teacher Self-Assessment.** (3) I. A systematic study of how teachers can improve their instruction in an autonomous fashion (K–12 and higher education). Major topics include: videotape recording, verbal and nonverbal cues, means-referenced objectives, observation tools, student feedback instruments, and peer feedback. For teachers, administrators, and supervisors interested in improving or assisting people in improving their instruction. Pr.: EDCIP 803 or 943.

**EDCIP 886. Seminar in Curriculum, Instruction, and Policy Studies.** (Var.) On sufficient demand. Intensive discussion of research or problems of current professional interest based on study of pertinent original literature. Pr.: Teaching experience.

**EDCIP 898. Master's Report.** (Var.) I, II, S. Pr.: Permission by department head.

**EDCIP 899. Master's Research.** (Var.) I, II, S. Pr.: Permission by department head.

**EDCIP 907. Curriculum Theory.** (3) I. Theoretical concepts underlying significant curriculum developments. A systematic critique of current curricular theory. Consideration of model generation. Pr.: EDCIP 803.

**EDCIP 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.: EDCIP 831 or EDCEP 920.

**EDCIP 910. Multicultural Curriculum Programming.** (3) I, S. Application of multicultural curriculum principles to total school programming with particular emphasis on the cultural pluralism phenomenon. Includes analytic review of instruments on multicultural/multiracial curriculum evaluation as well as planning skills for equitable thrusts. Primarily involves elementary and secondary focus with some attention to postsecondary programming. Pr.: EDCIP 803 or 808 or equiv.

**EDCIP 943. Principles of College Teaching.** (3) I, II. Principles of learning, learning theory, educational objectives, methods and techniques, college students, and evaluation in the classroom, Emphasis upon preservice and in-service help in improving instruction at the college level. Pr.: Teaching experience.

**EDCIP 944. Current Issues in College Testing.** (2) On sufficient demand. 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.: EDCIP 943.

**EDCIP 979. Community/Junior College Curriculum.** (3) I, II, S. Evaluation of community/junior college curricula, reasons for revision, aims and objectives. Designed to familiarize students with the entire curricular offerings of the comprehensive community/ junior college. Pr.: EDCIP 832.

**EDCIP 980. The Curriculum Information Consultant.** (3) On sufficient demand. The process skills and knowledge needed for the retrieval and dissemination of curriculum information. For teachers and administrators involved with helping others in curriculum development. Pr.: EDCIP 803, 808, or 979.

**EDCIP 986. Advanced Seminar in Curriculum, Instruction, and Policy Studies.** (Var.) On sufficient demand. These seminars will critically consider recent research in the designated fields. The emphasis will be upon individual studies and small group interaction. Enrollment is restricted to those students who have been admitted to the doctoral program in education and who have completed substantial amounts of graduate study in the designated fields. Pr.: Consent of instructor.

**EDCIP 990. Internship in College Teaching.** (2–6) I, II, S. An experiential course for graduate students devoted to improving instruction. Supervised teaching of college classes and seminars in conjunction with cooperating departments. Pr.: Master's degree, EDCIP 943 or 944, and consent of department head.

**EDCIP 991. Internship in Curriculum, Instruction, and Policy Studies.** (Var.) I, II, S. 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 6 credit hours may be chosen from the areas listed. Pr.: Consent of department head.

**EDCIP 999. Research in Curriculum, Instruction, and Policy Studies.** (Var.) I, II, S. Pr.: EDCEP 817 and/or consent of instructor.

# Educational Administration

**G. Kent Stewart,** Chair
369 Bluemont Hall, (913) 532-5543

**Professors**
**Gerald D. Bailey,** Ed.D., 1972, University of Nebraska. Curriculum, staff development, and technology.

**Robert J. Shoop, Ph.D.,** 1974, University of Michigan. Law and community education.

**G. Kent Stewart,** Ed.D., 1964, Indiana University. Facilities, community relations, principalship.

**Alfred P. Wilson,** Ed.D., 1969, Utah State University. Personnel and research.

**Associate professors**
**David C. Thompson,** Ed.D., 1985, Oklahoma State University. Finance and policy analysis.

**Instructors**
**Gary A. Livingston,** Ph.D., 1976, Kansas State University. General administration and instruction.

## Program description

The Department of Educational Administration offers the master's degree and an Ed.D. in educational administration. In addition, courses are offered which lead to licensure as a building administrator (principal) or a district school administrator (superintendent).

## Educational administration courses

### Undergraduate and graduate credit in minor field

**EDADM 502. Independent Study in Educational Administration.** (1–3) I, II, S. Selected topics in professional education. Maximum of 3 hours applicable toward degree requirements. Pr.: Consent of department chair.

### Undergraduate and graduate credit

**EDADM 775. Readings in Educational Administration.** (1–3) I, II, S. Readings in research and application in specialized areas in education. May be taken more than once. Pr.:EDCEP 215.

**EDADM 786. Topics in Educational Administration.** (1–3) I, II, S. Examination of current topic in area of specialization of faculty. Varied topics offered each semester so course may be repeated. Pr.: EDCEP 215.

**EDADM 795. Problems in Educational Administration.** 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

**EDADM 811. 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.

**EDADM 813. History of American Education.** (3) II. Historical study of the educational endeavor in the United States with special attention to problems that have relevance to contemporary education. Readings, discussion, presentations by instruction leader and students. Pr.: EDCIP 410 or consent of instructor.

**EDADM 818. General School Administration.** (3) II, S. A panoramic view of the problems and tasks of school–system administration centered on the administrative process and substantive problems of leadership, personnel, business and finance, curriculum, facilities, and school–community relations. Pr.: One year of teaching experience or instructor consent.

**EDADM 819. Educational Finance.** (3) II, S. An examination of issues relating to the financing of education, including local, state, and federal fiscal support, tax structures, distributional formulas, school finance reform strategies, and budget preparation and administration. Pr.: EDADM 818.

**EDADM 827. Foundations of Community Education.** (3) II, alternate S. A study of the relationship between the school and the community, with special emphasis on the development of a comprehensive community education program. Organizational patterns, financing, program development, and interaction with other community agencies are analyzed. Pr.: EDADM 818 or EDCIP 611.

**EDADM 830. Educational Facility Planning.** (3) S. Examination of issues relating to the provision of educational building and other facility needs, including planning, financing, construction, maintenance, and utilization. Pr.: EDADM 818.

**EDADM 831. Educational Law.** (3) I, S. An examination of the legal status of educational institutions in the United States; the legal rights and responsibilities of educators including due process, tort liability, and contracts; student rights; landmark court decisions; federal and state legislation impacting on education, and resources available to assist in developing solutions to legal problems. Pr.: EDADM 818.

**EDADM 834. Strategies for Educational Change.** (3) I, S. This course provides 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.: EDADM 818.

**EDADM 835. The Principalship.** (3) I, alternate S. Analysis of the principal's role as he or she interacts with various referent groups. Applicable to both elementary and secondary administration. Pr.: One year of teaching experience.

**EDADM 836. School–Community Relations.** (2–3) I, S. Interrelationships that exist between the school and the community and the role of the teacher and administrator in such relationships. Pr.: EDADM 818 for graduate students in educational administration. One year of teaching experience for all others.

**EDADM 841. Educational Program Management and Evaluation.** (3) II, S. An examination of program management techniques as well as formative evaluation strategies used in educational project and program administration. Pr.: EDADM 818.

**EDADM 855. Administrative Leadership in Curriculum.** (3) This course identifies the major roles and responsibilities of school administrators in curriculum-related activities. Administrative skills necessary for developing and evaluating the curriculum will be examined. Pr.: EDADM 818.

**EDADM 865. Administrative Leadership in Staff Development.** (3) I, II, S. This course focuses on the role of the administrator in developing, implementing, and evaluating staff development programs. Superintendent, building-level administrator, and staff development director leadership skills will be analyzed. Pr.: EDADM 818.

**EDADM 875. Administrative Leadership in Staff Supervision.** (3) This course identifies the major roles and responsibilities of superintendents and building-level administrators as supervisors of staff in a K–12 school district.

**EDADM 885. Technology Leadership for Administrators.** (3) I, S. A course designed to provide an in-depth analysis of administrator technology leadership skills necessary for integrating technology in education. The roles and technologies of technology leadership will be studied in the context of staff development, supervision, and curriculum articulation. Considerable attention will be given to strategies necessary for creating and revising technology plans. Pr.: EDADM 818.

**EDADM 886. Seminar in Educational Administration.** (Var.) On sufficient demand. 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.

**EDADM 889. Practicum in School Administration.** (3–6) I, II, S. Supervised on-the-job experience in school administration. Pr.: Consent of instructor.

**EDADM 898. Master's Report.** (Var.) I, II, S. Pr.: Consent of instructor.

**EDADM 899. Master's Research.** (Var.) I, II, S. Pr.: Consent of instructor.

**EDADM 910. Educational Personnel Administration.** (3) II, S. Personnel practices in education are considered along with the implications of collective negotiations and professional accountability for personnel policies. Pr.: EDADM 818.

**EDADM 926. Theory in Educational Administration.** (3) II. Organizational and administrative theory as applied to the school and the functions of the school administrator. The process of theory development in educational administration is also considered. Pr.: EDADM 818.

**EDAF 928. Educational Governance.** (3) S. An analysis of educational decision making at the local, state, and national levels. The internal decision making practices of professional educational organizations are also considered. Pr.: EDADM 818 and 6 additional hours in educational administration.

**EDADM 986. Advanced Seminars in Educational Administration.** (Var.) On sufficient demand. These seminars will critically consider recent research in the designated fields. The emphasis will be upon individual studies and small group interaction. Enrollment is restricted to those students who have been admitted to the doctoral program in education and who have completed substantial amounts of graduate study in the designated fields. Pr.: Consent of instructor.

**EDADM 991. Internship in Educational Administration.** (Var.) 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 6 credit hours may be chosen from the areas listed. Pr.: Consent of instructor.

**EDADM 999. Research in Educational Administration.** (Var.) I, II, S. Individual investigation in the field of a student's specialization. Pr.: Sufficient training to carry on the line of research undertaken.

# Educational Technology and Computer Education

## Program

Courses in educational technology and computer education include emphasis upon trends, recent developments, theory, and practice in educational media and technology. These courses are offered on campus, at selected off-campus sites, and via delivery systems such as Telenet.

These courses support the master of science in elementary education and masters of science in secondary education, each with specializations in school library media, instructional design, and computer-based education. The master's degree specialization in school library media is designed to meet the standards of the Kansas State Department of Education for certification as a school library/media specialist.

These courses support the doctor of education and doctor of philosophy in curriculum and instruction with the same specializations as described in the master's degree programs.

In all of the graduate programs, breadth of study is stressed with students taking courses in other departments in the College of Education and the university.

## Educational technology and computer education courses

### Undergraduate and graduate credit in minor field

**EDETC 502. Independent Study in Educational Technology and Computer Education.** (1–3) I, II, S. Selected topics in professional education. Maximum of 3 hours applicable toward degree requirements. Pr.: Consent of department chair.

### Undergraduate and graduate credit

**EDETC 705. Organization and Processing of Instructional Materials.** (2) I. Supervisory experiences in cataloging, organization, arrangement, and processing of print and nonprint materials for media centers and libraries. Issues in and approaches to coding and bibliographic concepts are explored. Pr.: EDETC 318 and ENGL 355 and 545.

**EDETC 718. Microcomputers in Instruction.** (2) I, II, S. Trends in computer applications in instruction, major components and functions of microcomputer instructional systems, and use of authoring systems for computer-assisted instruction. Does not prepare the student to teach computer programming. Pr.: EDEL 585 or EDSEC 586.

**EDETC 719. Microcomputers in Instruction Lab.** (1) I, II, S. Applications of BASIC and PASCAL to design of computer-assisted instruction and other classroom application of microcomputers. One two-hour lab a week. Conc. with EDETC 718. Pr.: CIS 200 and 203.

**EDETC 723. Computer Applications in Subject Areas.** (1–3) On sufficient demand. Theory and practice of using computer software to enhance teaching and learning in specific subject areas. Subjects covered will vary. May be repeated for credit in different subject areas. Pr.: EDETC 318 and EDCEP 315.

**EDETC 756. Visual Communication.** (3) I, alternate S. Implications of visual communication and learning for the design of instructional programs. Pr.: Graduate standing or EDETC 318 and EDCEP 315.

**EDETC 762. Instructional Television.** (3) II, alternate S. The principles of instructional television: its development, programming, techniques, and application. Pr.: Junior standing.

**EDETC 763. Instructional Design.** (3) I, alternate S. Implications of the major theories and models of instructional design to the development of instructional programs. Pr.: EDETC 318 and EDCEP 315.

**EDETC 764. Telecommunications in Education.** (Var. 2–3) Alternate S. Examination of the relationship of current telecommunications media and hardware to the design of instruction. Pr.: EDETC 318 and permission of instructor or graduate standing.

**EDETC 765. Planning and Developing Instructional Materials.** (3) II, S. 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.: EDETC 861 or consent of instructor.

**EDETC 775. Readings in Educational Technology and Computer Education** (1–3) I, II, S. Readings in research and application in specialized areas in education. May be taken more than once. Pr.:EDCEP 215.

**EDETC 786. Topics in Educational Technology and Computer Education.** (1–3) I, II, S. Examination of current topic in area of specialization of faculty. Varied topics offered each semester so course may be repeated. Pr.: EDCEP 215.

**EDETC 795. Problems in Educational Technology and Computer Education.** (Var.) I, II, S. Independent study of a specific problem in curriculum or instruction. Pr.: Junior standing or higher.

### Graduate credit

**EDETC 811. Reference and Information Sources.** (3) I, alternate S. Evaluation of print and non-print reference and information sources, reference processes and services, and emerging technologies in reference for school library media centers. Pr.: Graduate standing in library/media specialist program.

**EDETC 861. Educational Technology.** (2–3) Principles and techniques in the use of visual and audiovisual materials; operation and maintenance of equipment and sources of supply. Pr.: Completion of student teaching or graduate standing.

**EDETC 863. Interactive System Design.** (3) II, alternate S. Examination of the use of cognitive science as a theoretical base for the design of interactive learning systems. Emphasis on human factors, interactivity, and systems theories. Pr.: EDETC 763.

**EDETC 886. Seminars in Educational Technology and Computer Education.** (Var.) On sufficient demand. Intensive discussion of research or problems of current professional interest based on study of pertinent original literature. Pr.: Teaching experience.

**EDETC 898. Master's Report.** (Var.) I, II, S. Pr.: Permission by department head.

**EDETC 899. Master's Research.** (Var.) I, II, S. Pr.: Permission by department head.

**EDETC 911. Optical Information Systems.** (3) I, alternate S. Theoretical, practical, and research implications of optical information systems. Includes data conversion, authoring systems, and interface issues in design and implementation for education and training. Pr.: EDETC 718 or consent of instructor.

**EDETC 920. Design and Evaluation of Educational Software.** (3) I, alternate S. Application and analysis of the principles of instructional design as related to educational software. Pr.: EDETC 719 and proficiency in a programming language or authoring system.

**EDETC 960. 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.: EDETC 861.

**EDETC 966. Selecting and Evaluating Instructional Materials.** (3) On sufficient demand. Principles and procedures for evaluating graphic, photographic, and audio instructional materials. Development of evaluative criteria, instruments, and utilization guides. Sources for selecting instructional materials. Pr.: EDETC 861.

**EDETC 986. Advanced Seminars in Educational Technology and Computer Education.** (Var.) On sufficient demand. These seminars will critically consider recent research in the designated fields. The emphasis will be upon individual studies and small group interaction. Enrollment is restricted to those students who have been admitted to the doctoral program in education and who have completed substantial amounts of graduate study in the designated fields. Pr.: Consent of instructor.

**EDETC 991. Internship in Educational Technology and Computer Education.** (Var.) I, II, S. 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 6 credit hours may be chosen from the areas listed. Pr.: Consent of department head.

**EDETC 999. Research in Educational Technology and Computer Education.** (Var.) I, II, S. Pr.: EDCEP 817 and/or consent of instructor.

# Elementary Education

**V. Ray Kurtz,** Chair
261 Bluemont Hall, (913) 532-5550

**Professors**

**V. Ray Kurtz,** Ed.D., 1967, University of Nebraska. Mathematics education.

**Leo M. Schell,** Ph.D., 1964, University of Iowa. Reading education.

**John R. Staver,** Ed.D., 1978, Indiana University. Science education, problem solving in chemistry, science process skills, activity-based elementary science.

**Associate professors**

**Paul R. Burden,** Ph.D., 1979, Ohio State University, Instructional leadership, staff development, teaching methods, classroom management.

**Jana R. Fallin,** Ph.D., 1979, University of Texas. Music education.

**Mary F. Heller,** Ed.D., 1979, Oklahoma State University. Language arts education.

**Michael F. Perl,** Ph.D., 1976, University of South Carolina. Supervision and field experience.

**Ben A. Smith,** Ed.D., 1986, University of Georgia. Social studies education.

## Program

The Department of Elementary Education offers a variety of graduate-level courses in all curricular areas with specific emphasis upon trends and recent developments in practice, theory, and research. These courses are offered on-campus, at selected off-campus sites, and via delivery systems such as Telenet.

This department supports the following degrees: the master of science in elementary education, the doctor of education in curriculum and instruction, and the doctor of philosophy in curriculum and instruction. In all of these programs, breadth of study is stressed with students taking courses in other departments in the College of Education and the university.

The department offers numerous short courses, workshops, and seminars in addition to courses in the catalog. These can be applied to degree programs or taken for personal or professional development unrelated to a degree program.

## Elementary education courses

### Undergraduate and graduate credit in minor field

**EDEL 502. Independent Study in Elementary Education.** (1–3) I, II, S. Selected topics in professional education. Maximum of
3 hours applicable toward degree requirements. Pr.: Consent of department chair.

**EDEL 585. Teaching Participation in the Elementary School.** (Var) I, II. Observation and teaching participation under the direction of selected elementary teachers. Pr.: EDEL 300, 470, 471, 472, 473, 474, and admission to student teaching. Conc. successful completion of EDEL 600 required.

### Undergraduate and graduate credit

**EDEL 600. Reading with Practicum.** (3) I, II. Supervised observation and teaching of reading in approved school classrooms. Pr.: EDEL 474 or teaching experience. May not apply to reading specialist endorsement.

**EDEL 717. Corrective Reading Instruction.** (1–3) On sufficient demand. Supervised tutoring of children with reading difficulties. Not open to students with credit in EDEL 847. Pr.: Student teaching experience.

**EDEL 720. Foreign Language Methods of Elementary Schools.** (3) On sufficient demand. Methods of teaching and organization of materials for the foreign language program in the elementary school. Pr.: EDCEP 315, 24 hours in the foreign language, and conc. enrollment in either Preprofessional Lab (DED 100, 1 cr.) or Teaching Participation in the Elementary School (EDEL 585, 4 cr.)

**EDEL 739. Environmental Education.** (1–3) On sufficient demand. The selection, adaptation, and development of environmental education K–12 curriculum materials: procedures for an integrated curricular implementation; the selection of appropriate instructional strategies. Pr.: A course in environmental studies.

**EDEL 775. Readings in Elementary Education.** (1–3) I, II, S. Readings in research and application in specialized areas in education. May be taken more than once. Pr.: EDCEP 215.

**EDEL 779. Primary School Education.** (3) On sufficient demand. A course for those interested in the kindergarten and primary school child. Emphasis will be placed on curriculum development, pertinent research, and innovative practices in early education. Pr.: EDCEP 315.

**EDEL 780. Kindergarten Education.** (3) On sufficient demand. 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.: EDCEP 215, EDEL 300, and junior standing.

**EDEL 786. Topics in Elementary Education.** (1–3) I, II, S. Examination of current topic in area of specialization of faculty. Varied topics offered each semester so course may be repeated. Pr.: EDCEP 215.

**EDEL 795. Problems in Elementary Education.** (Var.) I, II, S. Independent study of a specific problem in curriculum or instruction. Pr.: Junior standing.

**EDEL 814. Understanding and Teaching Reading.** (3) On sufficient demand. Foundational issues in K–12 reading instruction. Focus on the reading process, the nature of the learner, the text, and the instructional setting. Pr.: EDEL 585 or EDSEC 586.

### Graduate credit

**EDEL 816. Approaches to Reading Instruction.** (3) On sufficient demand. A critical study of approaches, materials, and methods for effective reading instruction. Pr.: EDEL 585, EDSEC 582, or EDSEC 586.

**EDEL 817. Reading Comprehension.** (3) On sufficient demand. Reviews comprehension theory and research; explores strategies for developing reading comprehension in readers. K–12; examines evaluative devices for assessing comprehension abilities. Pr.: EDEL 600 or EDSEC 715.

**EDEL 820. 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.

**EDEL 821. 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.

**EDEL 822. 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.

**EDEL 825. Creative Language Expression in the Elementary School.** (3) On sufficient demand. Developing experiences in creative expression as part of the elementary school English language arts program; role of the arts in fostering creative language expression, strategies for teaching and evaluating creative writing and dramatic arts. Pr.: EDEL 471.

**EDEL 834. Improving Elementary Science Teaching.** (3) On sufficient demand. 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.

**EDEL 835. Supervision of Student Teaching.** (3) II. Organization and functions of student teaching programs; orienting, supervising, and evaluating student teachers in elementary and secondary schools. Pr.: Teaching experience.

**EDEL 840. Reading Assessment.** (3) On sufficient demand. A survey of the principles, procedures, instruments, and programs for assessing reading achievement in the classroom and resource room. Special attention to less-skilled readers. Pr.: EDEL 816 or EDCEP 715 or EDSEC 763 and student teaching.

**EDEL 841. Instruction of Less Skilled Readers.** (3) On sufficient demand. A study of selected theories, approaches, materials, and organizational plans for instructing students having problems learning to read. Pr.: EDEL 816 or 840 or EDSP 763 and student teaching.

**EDEL 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.: EDEL 474.

**EDEL 846. Diagnosis and Treatment of Reading Disabilities.** (3–4) On sufficient demand. 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.: EDEL 715 or EDEL 845 and teaching experience.

**EDEL 847. Clinical Practicum in Reading.** (3) S. Supervised experience in diagnosing and teaching students with reading problems. Pr.: EDEL 840 and 841.

**EDEL 848. Organization and Administration of Reading Programs.** (2) On sufficient demand. 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.: EDSEC 715 or EDEL 845.

**EDEL 849. Directed Professional Development/ Elementary.** (5) On sufficient demand. Research and teaching under supervision in the elementary 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 elementary schools. Pr.: Registration in Graduate School.

**EDEL 886. Seminars in Elementary Education.** (Var.) On sufficient demand. Intensive discussion of research or problems of current professional interest based on study of pertinent original literature. Pr.: Teaching experience.

**EDEL 898. Master's Report.** (Var.) I, II, S. Pr.: Permission by department head.

**EDEL 899. Master's Research.** (Var.) I, II, S. Pr.: Permission by department head.

**EDEL 972. Advanced Study of the Reading Process.** (3) On sufficient demand. 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.: EDEL 845 or EDSEC 715.

**EDEL 986. Advanced Seminars in Elementary Education.** (Var.) On sufficient demand. These seminars will critically consider recent research in the designated fields. The emphasis will be upon individual studies and small group interaction. Enrollment is restricted to those students who have been admitted to the doctoral program in education and who have completed substantial amounts of graduate study in the designated fields. Pr.: Consent of instructor.

**EDEL 991. Internship in Elementary Education.** (Var.) I, II, S. 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 6 credit hours may be chosen from the areas listed. Pr.: Consent of department head.

**EDCI 999. Research in Elementary Education.** (Var.) I, II, S. Pr.: EDCEP 817 and/or consent of instructor.

# Foundations and Adult Education

**Robert Newhouse,** Interim Chair
363 Bluemont Hall, (913) 532-5535

Professors

**James B. Boyer,** Ph.D., 1969, Ohio State University. Multicultural studies, curriculum.

**David R. Byrne,** Ph.D., 1971, University of Utah. Foundations of education.

**Charles E. Litz,** Ph.D., 1970, University of Michigan. Historical and philosophical foundations and theory.

**Robert G. Meisner,** Ed.D., 1967, University of California, Berkeley. International education, non-traditional studies.

**Robert Newhouse,** Ph.D., 1972, University of Oregon. Methodology/learning.

**Charles R. Oaklief,** Ph.D., 1970, Wisconsin State University and Ohio State University. Program planning and development

**Thomas Parish,** Ph.D., 1972, University of Illinois. Social-emotional development, motivation, reality therapy & control theory.

**Floyd H. Price,** Ed.D., 1965, University of Oklahoma. Community college education, curriculum.

**Charles I. Rankin,** Ph.D., 1973, Kansas State University. Multicultural non-sexist education, self concept, school desegregation.

**W. Franklin Spikes,** Ed.D., 1975, Northern Illinois University. Human resource development, workplace learning.

**Emmett L. Wright,** Ph.D., 1974, Pennsylvania State University. Science education, secondary education.

Associate professors

**Phillip D. Carter,** Ph.D., 1976, University of Missouri. Education of older adults, staff development.

**Mary Evan Griffith,** Ph.D., 1966, Ohio State University. Curriculum, teacher assessment.

**Cheryl J. Polson,** Ph.D., 1983, Kansas State University. Non-traditional students in higher education.

Assistant professor

**Jacqueline Spears,** Ph.D., 1988, Kansas State University. Policy studies, multicultural education.

## Program

The faculty of adult and continuing education offer three graduate programs: (1) a master's degree in adult and continuing education designed to prepare scholars for careers in college and university settings; (2) a Ph.D. in adult and continuing education designed to prepare scholars for careers in college and university settings; and (3) and Ed.D. in adult and continuing education that provides advanced education and experience to prepare people for business, industry, government, health services, community agencies, and careers in two- and four-year colleges and universities. Course focus on issues related to planning, developing, delivering, or facilitating instruction for adult learners.

The graduate programs are compatible with a variety of delivery settings where the following specializations and support areas are required or desired: adult and continuing education, extension education, human resource development, community education and development, and institutions, agencies, and organizations that deal primarily with adult needs and education.

## Foundations and adult education courses

### Undergraduate and graduate credit in minor field

**EDACE 502. Independent Study in Foundations and Adult Education.** (1–3) I, II. Selected topics in professional education. Maximum of
3 hours applicable toward degree requirements. Pr.: Consent of department chair.

### Undergraduate and graduate credit

**EDACE 704. Extension Organization and Programs.** (3) I, S. Development and objectives of Cooperative Extension and other university adult education programs; with emphasis on programs and procedures. Cross-listed as EDSEC/EDACE 704. Pr.: Consent of instructor.

**EDACE 706. Principles of Teaching Adults in Extension.** (3) II, S. Methods and principles of adult teaching, with emphasis on Cooperative Extension Service; application to various adult education programs. Cross-listed as EDSEC/EDACE 706. Pr.: Senior standing, juniors by consent of instructor.

**EDACE 713. Occupational Analysis.** (2–3) I, II, S. An introduction to various techniques used in analyzing occupations and jobs. Emphasis on developing and organizing related instructional materials content. Cross-listed with EDACE/EDSEC 713. Pr.: or conc.: EDSEC 620.

**EDACE 714. International Education.** (3) On sufficient demand. Contemporary overview of the field of international education and an introduction to three of its parts. comparative education, intercultural education, and development education. Pr.: PSYCH 110.

**EDACE 725. Adult Basic Education Techniques.** (3) On sufficient demand. Emphasis on providing students with an understanding of the selection, utilization, and development of adult basic education reference, resources, and other materials. Pr.: EDACE 215.

**EDACE 733 and 738. Practica in Adult Education.** (1–6) On sufficient demand. Related occupational or professional experiences in approved industry, school, Cooperative Extension Service, or similar agency setting under faculty supervision. Pr.: Consent of instructor.

**EDACE 733. Adult Education.**

**EDACE 738. Occupations in Business Industry.**

**EDACE 739. Coordination of Cooperative Vocational Education.** (2–3) I, II S. Emphasis on the legal aspects and other minimum requirements essential to conducting cooperative vocational education programs at the secondary and postsecondary levels. Pr. or conc.: EDSEC 620.

**EDACE 750. Women, Education, and Work.** (2–3) II, S. Emphasizes the collective and individual educational needs of women in and out of the work force and the part that occupational/educational preparation contributes to their participation in the work force. Pr.: SOCIO 211 or equiv.

**EDACE 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.

**EDACE 754. Adult Basic Education.** (3) On sufficient demand. Evolving adult basic and high school equivalency education concepts will be examined. Program implementation, supervision, methods, and materials are emphasized. PR.: Adult teaching experience or consent of instructor.

**EDACE 775. Readings in Foundations and Adult Education.** (1–3) I, II, S. Readings in research and application in specialized
areas in education. May be taken more than once. Pr.: EDCEP 215. No more than 3 hours may apply to a graduate degree.

**EDACE 780. Introduction to Adult Education.** (3) I, II, S. A survey of adult education. Consideration given to articulation with other levels of education. Identification of changing needs within the field are reviewed. Pr.: Consent of instructor.

**EDACE 782. Educational Gerontology.** (3) On sufficient demand. For both the practitioner and those interested in educational gerontology as a field of inquiry. It will examine education for and about aging, with particular reference to the role, needs, and ability of persons in the later years as learners. Pr.: EDACE 780.

**EDACE 786. Topics in Foundations and Adult Education.** (1–3) I, II, S. Examination of current topic in area of specialization of faculty Varied topics offered each semester so course may be repeated. Pr.: EDCEP 215.

**EDACE 790. Characteristics of the Adult Learner.** (3) II, S. For teachers and administrators in adult and occupational programs who need a familiarity with the major characteristics of adulthood which affect the adult as a learner. Pr.: EDACE 780 or EDCEP 215 or PSYCH 110.

**EDACE 791. Career Education.** (2–4) On sufficient demand. Emphasis on providing for prevocational and adult experiences including orientation and exploratory and applied experiences in school and nonschool situations. Cross-listed with EDACE/EDSEC 791. Pr.: Teaching experience or consent of instructor.

**EDACE 792. Hospital and Industry Adult Education.** (3) On sufficient demand. An introduction to principles, roles, organization, procedures, and problems of adult education in hospitals, industry, and related agencies.

**EDACE 795. Problems in Foundations and Adult Education.** (Var.) I, II, S. Independent study of specific problems in the areas of adult or occupational education.

## Graduate credit

**EDACE 811. Consumer Education.** (3) S. Evaluate syllabi and approaches to teaching consumer education. Relate consumer education to consumer economics and consumer affairs. Cross-listed with EDSEC 811. Pr.: EDSEC 476 or consent of instructor.

**EDACE 815. Introduction to Community Educational Development.** (3) A comprehensive review of factors related to community change and the role of educational programs in dealing with them. Emphasis is on educational and economic problem-solving approaches and change-implementing programs.

**EDACE 820. Advanced Methods in Adult Teaching.** (3) On sufficient demand. Emphasis on teaching strategies, techniques, and media appropriate to various adult education programs. Pr.: Teaching experience or consent of instructor. EDACE 780 and 790.

**EDACE 825. Theory and Practice of Continuing Education.** (3) I, S. Specific instruction on facilitating continuing education programs; emphasis on serving the institution, part-time students, community, and other interests. Pr.: EDACE 780 and 790.

**EDACE 830. Program Planning in Adult Education.** (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.: EDACE 790.

**EDACE 860. Nontraditional Study for Adults.** (3) II, S. Designed to provide a conceptual understanding of current forms of nontraditional study and accreditation with emphasis on organizing studies to serve adult needs. Pr.: EDACE 780.

**EDACE 886. Seminars in Foundations and Adult Education.** (Var.) On sufficient demand. These seminars will consider research and professional development on the special interests of the students in the several fields of education represented. Pr.: Consent of instructor.

**EDACE 898. Master's Report.** (Var.) I, II, S. Pr.: Consent of Instructor.

**EDACE 899. Master's Research.** (Var.) I, II, S. Pr.: Consent of instructor.

**EDACE 914. Technical Education.** (3) I, S. An analysis of the evolving role of technical education and other postsecondary occupational education with emphasis upon principles underlying organization and practice unique to technical education. Cross-listed with EDACE/EDSEC 914. Pr.: Graduate standing.

**EDACE 916. Foundations of Adult Education.** (3) On sufficient demand. A study of adult education historical perspectives, contemporary institutions and programs, teaching-learning process, administrative practices, and conceptual roles. Pr.: Consent of instructor.

**EDACE 937. Organization and Administration of Adult Education.** (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.

**EDACE 986. Advanced Seminars in Foundations and Adult Education.** (Var.) On sufficient demand. These seminars will critically consider recent research in the designated fields. The emphasis will be upon individual studies and small group interaction. Enrollment is restricted to those students who have been admitted to the doctoral program in education and who have completed substantial amounts of graduate study in the designated fields. Pr.: Consent of instructor.

**EDACE 991. Internship in Foundations and Adult Education.** (Var.) On sufficient demand. Field experiences in the development of programs in cooperating schools and educational or related agencies under the supervision of College of Education graduate faculty member. A maximum of 6 credit hours. Pr.: Consent of instructor.

**EDACE 999. Research in Foundations and Adult Education.** (Var.) I, II, S. Pr.: Sufficient training to carry on the line of research undertaken and consent of instructor.

# Secondary Education

**John D. Parmley,** Chair
363 Bluemont Hall, (913) 532-5904

**Professors**

**Richard G. Hause,** Ed.D., 1966, University of Colorado. Language arts and creativity, curriculum and instruction, and multicultural education in the language arts.

**Charles Heerman,** Ed.D., 1974, Oklahoma State University. Secondary reading instruction, literacy, and social studies research.

**Richard F. Welton,** Ph.D., 1971, Ohio State University. Agricultural education and international agriculture.

**Associate professors**

**Loren Alexander,** Ph.D., 1971, Michigan State University. Modern languages.

**Larry Enochs,** Ed.D., 1982, Indiana University. School improvement, teacher efficacy, and geology.

**Steven R. Harbstreit,** Ph.D., 1987, University of Missouri. Agricultural education, adult education, and teacher inservice education.

**John Hortin,** Ed.D., 1980, Northern Illinois University. Library media, visual literacy.

**David Laurie,** Ed.D., 1974, Oklahoma State University. Physical education and fitness research.

**Diane McGrath,** Ph.D., 1973, University of Illinois. Hypermedia, multimedia, cognitive science, computer education, computer equity.

**John D. Parmley,** Ph.D., 1980, Ohio State University. Agricultural education, beginning teachers, curriculum integration, enhancing instruction through technology.

**Lawrence Scharmann,** Ph.D., 1985, Indiana University. Science-technology-society, nature of science, controversial issues in science, and biology.

**Edward Sturr, Ed.D.,** 1973, Illinois State University. Art education and artistic photography.

**Rosemary Talab,** Ph.D., 1979, University of Southern California. Library media, information systems, copyright, distance education.

**Janice R. Wissman,** Ed.D., 1981, University of Kansas. Home economics education and NCATE.

**Assistant professors**

**Jackson A. Byars,** Ph.D., 1970, University of Nebraska. Computer education, software design and evaluation, mathematics education.

**Hilary McLellan,** Ph.D., 1987, University of Wisconsin. Interactive systems, visual literacy, virtual reality, hypermedia.

**Rita Weimer,** Ed.D., 1974, University of Kansas. Secondary reading improvement and computer instruction in secondary schools.

## Program

The graduate faculty of the Department of Secondary Education deliver instructional programming leading to the master of science, doctor of philosophy, and doctor of education degrees. The areas of specialization within the master of science degree in secondary education include agricultural education, home economics education, secondary reading, secondary education, and vocational education. The graduate faculty also cooperate with faculty in the Departments of Curriculum, Instruction and Policy Studies; Elementary Education; and Educational Technology and Computer Education to offer doctoral studies in curriculum and instruction. The curriculum and instruction doctoral programs provide opportunities for students to concentrate their efforts in the areas of agricultural education; college teaching; curriculum and instruction leadership; environmental education; home economics education; math education; media, technology and computer education; reading and language arts; science education; social science education; teacher education; and vocational and postsecondary education.

An equally important mission of the department is expansion of the knowledge base related to understanding groups and institutions that comprise various educational settings, students and learning, teaching and planning for instruction, and the effects of various strategies whereby students have opportunities to practice teaching. Research and development efforts that have implications for improvement of practice and that clarify relationships among curricular decisions, instructional decisions, student outcomes, and educational equity are especially valued.

The department offers graduate courses in off-campus settings and collaborates closely with the Center for Economic Education, the Center for Science Education, and the Center for Extended Services to deliver quality courses, workshops, and consultancies for Kansas schools as well as educators in nonschool settings, such as the Cooperative Extension Service. These activities address inservice, recertification, and/or graduate program needs of educators.

## Secondary education courses

### Undergraduate and graduate credit in minor field

**EDSEC 502. Independent Study in Secondary Education.** (1–3) I, II, S. Selected topics in professional education. Maximum of 3 hours applicable toward degree requirements. Pr.: Consent of department chair.

**EDSEC 503. Teaching Adult Classes in Agriculture.** (2–3) 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.: EDSEC 620.

**EDSEC 505. Field Experience in Agricultural Education.** (2–3) On sufficient demand. A course for prospective teachers to help bridge the gap between classroom theory and student teaching. Emphasis will be on observation of and participation in school and community organizations and programs. Pr.: EDSEC 300 and EDCEP 215 and consent of instructor.

**EDSEC 560. Art for Exceptional Children** (3) II. Use of art courses and activities to meet th needs of the mentally retarded, physically impaired, emotionally disturbed, or gifted child. Three hours lec. Pr.: PSYCH 110. Same as ART 560.

**EDSEC 576. Safety Education** (2) II, S. Personal safety in home, school, community, and work place will be addressed. Special attention is given to local, state, and national resources related to safety practice and safety education.

**EDSEC 582. Teaching Participation in Music.** (8–12) I, II. Observation and teaching under the direction of selected music teachers in elementary, middle level, and secondary school music programs. Pr.: Admission to student teaching.

**EDSEC 586. Teaching Participation in Secondary Schools and Professional Development Seminar.** (Var.) I, II. Guided observation, teaching participation, and study of teaching practices under direction of selected teachers in middle/junior and senior high schools. Student teachers will participate in seminar sessions to discuss issues and experiences encountered during this school-based experience. Pr.: EDSEC 420, 476, and 477. Simultaneous enrollment required for EDCIP 455, EDCEP 525, and EDSEC 586.

**EDSEC 587. Supervised Practicum for Athletic Coaches.** (2) I, II. Observation and coaching participation under the direction of selected coaches in public school, club, city recreation, or other nonpublic school sport settings. Pr.: KIN 250, 315, and one coaching and officiating course.

## Undergraduate and graduate credit

**EDSEC 611. Coordination Techniques.** (1) II. Acquaints students with techniques in selecting, implementing, and coordinating occupational programs between the school and the business community. Pr.: EDSEC 620.

**EDSEC 612. Job Analysis.** (1) Acquaints students with techniques of analyzing jobs and tasks related to occupations. Pr.: EDSEC 620.

**EDSEC 614. Laboratory Techniques in Teaching Science.** (3) I, II. Rationale for laboratory in secondary school science. The design and implementation of laboratory activities and demonstrations in a high school science program. Pr.: EDSEC 476 (Science).

**EDSEC 620. Principles and Philosophy of Vocational Education.** (3) I, II, S. Provision for vocational education in Kansas and other states and countries; principles and philosophy underlying such education, relation of vocational education to school objectives and community, state, and national needs. Pr.: EDCEP 315.

**EDSEC 621. Program Planning in Vocational Education.** (2–3) I, II, S. The program development and planning process; development of guides for teaching and evaluating reimbursable secondary programs. Pr.: EDSEC 620.

**EDSEC 701. Administration and Supervision of Vocational Education.** (2–3) II, S. On sufficient demand. Emphasis on the duties and responsibilities of administrative and supervisory personnel responsible for the promotion, development, and coordination of comprehensive vocational–technical education programs at the local level. Pr.: Teaching experience or consent of instructor.

**EDSEC 704. Extension Organization and Programs.** (3) I, S. Development and objectives of Cooperative Extension and other university adult education programs; with emphasis on programs and procedures. Cross-listed as EDSEC/EDACE 704. Pr.: Senior standing or consent of instructor.

**EDSEC 705. Organization Problems in Teaching Agricultural Mechanics.** (Var.) On sufficient demand. Analysis of the agricultural mechanics course of study; needs and interests of students; learning difficulties; skills and technical knowledge required; correlation with agriculture; application of laws of learning to the teaching process; determination of objectives. Pr.: EDSEC 586.

**EDSEC 706. Principles of Teaching Adults in Extension.** (3) II, S. Methods and principles of adult teaching with emphasis on Cooperative Extension Service; application to various adult education programs. Cross-listed as EDSEC/EDACE 706. Pr.: Senior standing, juniors by consent of instructor.

**EDSEC 710. Occupational Home Economics Education.** (2) I. Principles and procedures in planning and organizing home economics-related occupational programs. The course includes an approved occupational experience in business/industry and consideration of methods and teaching materials peculiar to these programs. Pr.: EDSEP 215 and conc. enrollment.

**EDSEC 713. Occupational Analysis.** (2–3.) I, II, S. An introduction to various techniques used in analyzing occupations and jobs. Emphasis on developing and organizing related instructional materials and content. Cross-listed with EDACE/EDSEC 713. Pr. or conc.: EDSEC 620.

**EDSEC 715. Reading in the Content Areas.** (3) On sufficient demand. Information concerning the reading process and techniques for helping students develop reading and study skills needed in the content areas. Course is designed for classroom middle level and secondary teachers. Pr.: Senior standing.

**EDSEC 732–737. Practica in Education.** (1–6) On sufficient demand. Related occupational or professional experiences in approved industry, school, Cooperative Extension Service, or similar agency setting under faculty supervision. Pr.: Consent of instructor.

**EDSEC 732. Career Education.**

**EDSEC 734. Agriculture-Related Occupations.**

**EDSEC 735. Business and Office Occupations.**

**EDSEC 736. Extension Education.**

**EDSEC 737. Home Economics-Related Occupations.**

**EDSEC 740. Advising Youth Organizations.** (2–3) On sufficient demand. An examination of the role of an advisor in the effective operation of a youth organization. Pr.: PSYCH 110.

**EDSEC 741. German Culture in Second-Language Learning.** (3) Emphasis on the study of German culture and application to German curriculum, including the development of materials. Pr.: Twenty-four credits in 200 and above in German or equiv. (Same as GERMN 741).

**EDSEC 743. French-Speaking Cultures in Second Language Learning.** (3) On sufficient demand. Emphasis on the study of French culture and applications to the French curriculum, including the development of materials. Pr.: 24 credits at 200 and above in French or equiv. Cross-listed with modern languages FREN 743.

**EDSEC 770. Methods for Second Language Acquisition/Learning.** (3) On sufficient demand. Study of the development of second language instruction, both historical and current. Syntax, morphology, discourse analysis, and global proficiency evaluation are foci for analysis of methods and for the development of a personal method of teaching. Pr.: EDSEC 476 and 24 credits in one second language at 200 level and above or equivalent.

**EDSEC 775. Readings in Secondary Education.** (1–3) I, II, S. Readings in research and application in specialized areas in education. May be taken more than once. Pr.: EDCEP 215.

**EDSEC 776. Teaching in the Middle/Junior High School.** (3) On sufficient demand. Several instructional approaches consistent with the characteristics of the emerging adolescent student (grades 5–9) will be examined in relation to current research. Direct development of alternative curricular programs. Appropriate use of interdisciplinary activities and nontraditional materials will be emphasized. Pr.: EDCEP 315, middle-level field experience, elementary or secondary content methods course.

**EDSEC 777. Hispanic Cultures in Second-Language Learning.** (3) Emphasis on the study of Spanish culture and applications to Spanish curriculum, including the development of materials. Pr.: Twenty-four credits in Spanish at 200 and above or equivalent. Same as SPAN 777.

**EDSEC 786. Topics in Secondary Education.** (1–3) I, II, S. Examination of current topic in area of specialization of faculty. Varied topics offered each semester so course may be repeated. Pr.: EDCEP 215.

**EDSEC 791. Career Education.** (2–4) On sufficient demand. Emphasis on providing for prevocational and adult experiences including orientation and exploratory and applied experiences in school and nonschool situations. Cross-listed with EDACE/EDSEC 791. Pr.: Teaching experience or consent of instructor.

**EDSEC 795. Problems in Secondary Education.** (Var.) I, II, S. Independent study of a specific problem in curriculum or instruction. Pr.: Junior standing or higher.

## Graduate credit

**EDSEC 809. The Athletic Directorship.** (3) II. The administration of the intercollegiate or interscholastic athletic program with focus on the problems facing the chief administrator of the programs. Areas of study include association rules and regulations, implications or legislation, crowd control and management, scheduling, and budget. Pr.: EDSEC 359 or EDCEP 410.

**EDSEC 810. In-Service Education for Beginning Home Economics Teachers.** (2–3) I, II, S. For beginning teachers who desire assistance with vocational program management, instructional planning and delivery, professional role development, and the organization of information related to vocational home economics teaching. Pr.: EDSEC 476 or equiv.

**EDSEC 811. Consumer Education.** (3) S. Evaluate syllabi and approaches to teaching consumer education. Relate consumer education to consumer economics and consumer affairs. Cross-listed with EDACE 811. Pr.: EDSEC 476 or consent of instructor.

**EDSEC 822. Young Farmer and Adult Farmer Education in Agriculture.** (2–3) I, II, S. Organization, objectives, and procedures of conducting young farmer and adult farmer classes. Designed for teachers in service. Pr.: Experience in teaching vocational agriculture.

**EDSEC 823. Agricultural Education for Beginning Teachers.** (1–3) I, II. Securing and organizing information and planning teaching activities which will help the beginning vocational agriculture teacher. Pr.: Graduation from the curriculum in agricultural education.

**EDSEC 834. Trends in Home Economics Teaching.** (Var.) I, II, S. Advanced study of evolving trends and materials for secondary programs; application to teaching and curriculum. Pr.: EDSEC 621 and teaching experience.

**EDSEC 840. Curriculum Development in Agriculture I.** (2–3) 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.

**EDSEC 842. Curriculum Development in Agriculture II.** (2–3) S. Continuation of EDSEC 840. Pr.: EDSEC 840 or consent of instructor.

**EDSEC 844. Curriculum Development in Vocational Home Economics.** (3) I, S. The course focuses on current trends in vocational home economics curricula. Designed especially to assist home economics teachers and supervisors in the articulation of secondary programs, analysis, and development of curriculum models for specific school situations. Pr.: EDSEC 620.

**EDSEC 845. Field Studies in Agricultural Education.** (2–3) 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.

**EDSEC 849. Directed Professional Development/ Secondary.** (5) On sufficient demand. 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.

**EDSEC 864. Assessment in Home Economics Education.** (3) II, S. A study of evaluation theory and techniques for home economics educators. The primary emphasis will be placed upon program, process, and product evaluation relative to federal, state, and local home economics education programs. Pr.: EDCEP315 or equiv.

**EDSEC 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.: EDCIP 803.

**EDSEC 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.: EDCIP 803, experience teaching mathematics.

**EDSEC 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.: EDCIP 803.

**EDSEC 877. The Foreign Language Curriculum.** (3) On sufficient demand. New trends and materials in teaching the foreign languages, based on recent research and experimental programs. Pr.: EDCIP 803.

**EDSEC 878. The Language Arts 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.: EDCIP 803.

**EDSEC 886. Seminars in Secondary Education.** (Var.) On sufficient demand. Intensive discussion of research or problems of current professional interest based on study of pertinent original literature. Pr.: Teaching experience.

**EDSEC 898. Master's Report.** (Var.) I, II, S. Pr.: Permission by department head.

**EDSEC 899. Master's Research.** (Var.) I, II, S. Pr.: Permission by department head.

**EDSEC 910. 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.

**EDSEC 914. Technical Education.** (3) I, S. An analysis of the evolving role of technical education and other postsecondary occupational education with emphasis upon principles underlying organization and practice unique to technical education. Cross-listed with EDACE/EDSEC 914. Pr.: Graduate standing.

**EDSEC 929. Supervision in Occupational Education.** (2–3) I, S. Philosophy and principles of effective supervision related to occupational education programs; application of principles to problems met by student teacher supervisors. Pr.: Teaching experience or consent of instructor.

**EDSEC 940. Organization and Administration of Occupational Education.** (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.: EDSEC 701 or consent of instructor.

**EDSEC 986. Advanced Seminars in Secondary Education.** (Var.) On sufficient demand. These seminars will critically consider recent research in the designated fields. The emphasis will be upon individual studies and small group interaction. Enrollment is restricted to those students who have been admitted to the doctoral program in education and who have completed substantial amounts of graduate study in the designated fields. Pr.: Consent of instructor.

**EDSEC 991. Internship in Secondary Education.** (Var.) I, II, S. 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 6 credit hours may be chosen from the areas listed. Pr.: Consent of department head.

**EDSEC 999. Research in Secondary Education.** (Var.) I, II, S. Pr.: EDCEP 817 and/or consent of instructor.

# Special Education

**Norma Dyck,** Chair
301 Bluemont Hall, (913) 532-5542

**Professors**

**Peggy Dettmer,** Ph.D., 1979, Kansas State University. Constructive use of individual differences, staff development, school consultation skills, education of gifted, creativity.

**Norma Dyck,** Ed.D., 1972, University of Kansas. Learning disabilities, reading comprehension, curriculum based assessment, cooperative learning.

**Warren J. White,** Ph.D., 1980, University of Kansas. Mental retardation, transition education, career education, handicapped adolescents and adults.

**Robert H. Zabel,** Ph.D., 1977, University of Minnesota. Behavior disorders, teacher preparation.

**Associate professors**

**Linda P. Thurston,** Ph.D., 1977, University of Kansas. Applied behavior analysis, parent involvement/training, rural issues, life skills.

**Mary Kay Zabel,** Ph.D., 1977, University of Minnesota. Working with handicapped young children and their families, intervention strategies in behavior disorders, issues in cultural and linguistic diversity.

## Program

Special education programs at K-State serve three purposes: to provide support to undergraduate education students; to prepare teachers at the graduate level for teaching exceptional children and youth in special education programs; and to prepare personnel for special education administration and/or coordination of special education programs.

Kansas State University prepares special education teachers at the graduate level in four categorical areas: behavior disorders, learning disabilities, mental retardation, and education of gifted. A cross-categorical program is available in early child handicapped education. Also, advanced programs in supervision and special education administration are available.

The Department of Special Education administers the granting of M.S. and Ed.D. degrees in special education. M.S. students may elect to write a thesis, a nonthesis report, or complete a comprehensive written examination. Ed.D. students must write a dissertation based on independent and original research.

## Special education courses

### Undergraduate and graduate credit in minor field

**EDSP 502. Independent Study in Special Education.** (1–3) I, II, S. Selected topics in professional education. Maximum of three hours applicable toward degree requirements. Pr.: Consent of department chair.

### Undergraduate and graduate credit

**EDSP 700. Introduction to Human Exceptionality.** (3) I, II, S. Survey of history and legal aspects of service, etiologies, characteristics, and special needs of exceptional individuals. Pr.: EDCEP315 or PSYCH 110.

**EDSP 710. Education of Exceptional Individuals.** (3) I, II. A general study of special education, with emphasis on legislation, Individual Education Plans, cross-cultural assessment and intervention, and strategies for exceptional students at the preschool, elementary, and secondary levels. Pr.: EDCEP 315 and EDSP 323 or EDSP 324 or EDSP 700.

**EDSP 721. Characteristics of Learning Disabilities.** (3) I, II. An explanation of important concepts and practices in the area of learning disabilities. Emphasis will be placed upon diagnosis of underlying causes and their characteristics. Pr.: EDSP 323 or 324, and EDCEP 315.

**EDSP 724. Characteristics of Mental Retardation.** (3) On sufficient demand. Etiological, psychological, sociological, and educational aspects of mental retardation. Pr.: EDSP 323 or 324, and EDCEP 315.

**EDSP 728. Characteristics of Emotional and Behavioral Disorders.** (3) I, II. Study of conceptional models for understanding emotional and behavioral disorders of childhood and adolescents,. and their implications for educators. Pr.: EDCEP 315 and EDSP 323 or EDSP 324 or EDSP 700.

**EDSP 730. Assessment in Special Education.** (2) II. Strategies and techniques for systematically collecting data upon which decisions about education programs for exceptional students may be made. Pr. EDSP 710, EDCEP 715.

**EDSP 750. Introduction to Education of the Gifted.** (3) On sufficient demand. An overview of historical perspectives related to gifted child education, various facets of intellectual and creative functioning, national and state guidelines for planning and implementing gifted programs, modifying curriculum and classroom strategies to nurture gifted potential, current issues in gifted education. Pr.: EDSP 323 or 324 or 700.

**EDSP 755. Guidance of the Exceptional Individual.** (3) On sufficient demand. Strategies for teachers in working with the academic, vocational, personal, and social adjustment of the exceptional individual. The course will focus on the individual in preschool, elementary, secondary, postsecondary, and adult settings. Pr.: EDSP 722 or 763.

**EDSP 775. Readings in Special Education.** (1–3) I, II, S. Readings in research and application in specialized areas in education. May be taken more than once. Pr.: EDCEP 215.

**EDSP 777. Behavior Management for Exceptional Individuals.** (3) II, S. Theoretical and practical applications of behavior analysis with emphasis on preventing and remediating behavior problems of students with disabilities. Pr.: EDCEP 315.

**EDSP 778. Technology for Special Education.** (2) I. Designed to help special educators develop an awareness of technology that can assist in the lives and learning of students receiving special education. Administrative applications of technology related to special education will also be covered. Pr.: EDETC 718.

**EDSP 786. Topics in Education.** (1–3) I, II, S. Examination of current topic in specialization of faculty. Varied topics offered each semester so course may be repeated. Pr.: EDCEP 215.

**EDSP 787. Field Experiences in Special Education.** (1–3) On sufficient demand. Observation and supervised activities in schools, camps, clinics, or institutions related to student's area of special interest or preparation. Pr.: EDSP 722 or 763.

**EDSP 795. Problems in Special Education.** 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

**EDSP 833. Administration of Special Education Programs.** (2–3) On sufficient demand. The study of administrative units for special education, placement procedures, federal and state legislation, and program reimbursement and funding. Pr.: EDADM 818 or 811.

**EDSP 841. Interventions: Moderately Mentally Retarded.** (3) II. Curriculum content, methods, and organization of educational programs for children with moderate mental retardation. Pr.: EDSP 724 and EDSP 842 or EDSP 843.

**EDSP 842. Interventions: Emotional and Behavioral Disorders.** (3) I. Educational planning assessment, instructional methods, curricular modification, media and materials, teacher competencies, and model programs for students with emotional and behavioral disorders. Pr.: EDCEP 315 or EDSP 710.

**EDSP 843. Interventions: Academic Disabilities.** (3) II. Educational planning, instructional methods, and curricula modifications for students with academic learning disabilities. Pr.: EDCEP 315 or EDSP 710.

**EDSP 844. Special Education in Secondary Schools.** (2) S. Educational perspectives in service delivery options, educational planning, general instructional approaches, learning strategies, and adaptions and modifications of instructional materials and settings for the secondary student in special education. Pr.: EDCEP 315, EDSP 710 and EDSP 843.

**EDSP 845. Special Education Programming: Parental Involvement.** (2) I, S. An in-depth consideration of the role of home and parents in the educational programming for exceptional children. Emphasis on practical and positive strategies used in working with parents. Pr.: EDSP 710.

**EDSP 846. Interventions: Early Childhood Special Education.** (3) II. Strategies, policies, and procedures for the education of young children (0–5 years of age) with disabilities. Areas of emphasis include Individual Service Plans, interagency collaboration, and specific strategies for parents and young children. Pr.: EDSP 710.

**EDSP 847. Curriculum for the Gifted.** (3) On sufficient demand. Theories and strategies for differentiating the curriculum for gifted students, emphasis on appropriate methods and materials. Pr.: EDSP 750.

**EDSP 848. Transitions in Special Education.** (2) I, S. A study of transition models, curricula, assessment, career development, community resources and agencies, and materials. Pr.: EDSP 710.

**EDSP 850. The Consulting Process in Special Education.** (3) S. A course to prepare special education teachers with skills for consulting effectively with classroom teachers, related services personnel, administrators, and parents about curriculum and program alternatives for exceptional children. Emphasis is upon developing collaborative consultation processes through communication, cooperation and coordination techniques. Pr.: EDSP 323 or 324 or 700, and EDSP 750 or 842 or 843 or 847 or 848.

**EDSP 885. Practicum in Education of Exceptional Individuals.** (1–6) On sufficient demand. Observation and participation in teaching exceptional individuals under the supervision of selected teachers in special education programs. Pr.: EDSP 841 or EDSP 842 or EDSP 843 or EDSP 846.

**EDSP 886. Seminars in Special Education.** (Var.) On sufficient demand. Intensive discussion of research or problems of current professional interest based on study of pertinent original literature. Pr.: Teaching experience.

**EDSP 898. Master's Report.** (Var.) I, II, S. Pr.: Permission by department head.

**EDSP 899. Master's Research.** (Var.) I, II, S. Pr.: Permission by department head.

**EDSP 986. Advanced Seminar in Special Education.** (Var.) On sufficient demand. These seminars will critically consider recent research in the designated fields. The emphasis will be upon individual studies and small group interaction. Enrollment is restricted to those students who have been admitted to the doctoral program in education and who have completed substantial amounts of graduate study in the designated fields. Pr.: Consent of instructor.

**EDSP 991. Internship in Special Education.** (Var.) I, II, S. 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 6 credit hours may be chosen from the areas listed. Pr.: Consent of department head.

**EDSP 999. Research in Special Education.** (Var.) I, II, S. Individual investigation in the field of a student's specialization. Pr.: Sufficient training to carry on the line of research undertaken.

# Engineering

## Agricultural Engineering

**Head: Stanley J. Clark**

**Professors**

**Do Sup Chung,** Ph.D., Kansas State University (Conditioning, drying and storage of grain; separation and cleaning of grain; grain postharvest technology for developing countries).

**Stanley J. Clark,** Ph.D., Purdue University (Tillage and traction mechanics; hydrogen combustion and storage; internal combustion engine simulation; instrumentation and controls).

**Dennis K. Kuhlman,** Ph.D., Oklahoma State University (Agricultural sprayer systems; chemical spray metering and control; harvester component performance).

**Harry L. Manges,** Ph.D., Oklahoma State University (Drip irrigation; surface irrigation; irrigation scheduling; drainage; animal waste management).

**Mark D. Schrock,** Ph.D., Kansas State University (Tillage systems; harvesting systems; combine grain yield mapping; harvester component performance and design; alternate energy sources).

**Charles K. Spillman,** Ph.D., Purdue University (Wheat Hardness testing; grain handling and processing; information processing by computers).

**James L. Steele** (Research Agricultural Engineer, U.S. Grain Marketing Research Laboratory and Adjunct Professor), Ph.D., Iowa State University (Grain quality and inspection; grain marketing).

**James M. Steichen,** Ph.D., Oklahoma State University (Hydrology; soil erosion; water quality; movement of pesticides and other chemicals in surface water and the soil).

**Associate Professors**

**Cheng S. Chang** (Research Agricultural Engineer, U.S. Grain Marketing Research Laboratory and Adjunct Associate Professor), Ph.D., North Carolina State University (Aeration of grain; modeling temperature and moisture during grain storage; flow regulators for grain dust control; devices for spreading grain during bin filling).

**Joseph P. Harner, III,** Ph.D., Virginia Polytechnic Institute and State University (Conditioning, handling and storage of grain).

**Albert J. Heber,** Ph.D., University of Nebraska-Lincoln (Agricultural building environment; ventilation fan performance; particle technology; electrical harmonics; alternate energy systems).

**Danny H. Rogers,** Ph.D., Oklahoma State University (Irrigation system management; irrigation scheduling).

**John W. Slocombe,** Ph.D., Iowa State University (Tillage and planting production systems; soil compaction; agricultural machinery management; use of energy in agriculture).

**Assistant Professors**

**Rolando A. Flores,** Ph.D., Kansas State University (Mechanization and automation of small food processing plants; simulation of food processing systems; flour milling processes).

**Lawrence J. Hagen** (Research Agricultural Engineer, Wind Erosion Research Unit, USDA–ARS, and Adjunct Assistant Professor), Ph.D., Kansas State University (Wind erosion mechanics; evaluation of wind erosion control systems; development of simulation models to predict soil erosion; air pollution caused by eroded soil particles).

**Chi-Tai Huang,** Ph.D., University of Massachusetts (Physical and rheological properties of biological materials; unit operations for food processing; extrusion technology).

**Larry E. Wagner** (Agricultural Engineer, Wind Erosion Research Unit, USDA–ARS, and Adjunct Assistant Professor), Ph.D, Kansas State University (Tillage processes and wind erosion; wind erosion prediction modeling; methods for measuring soil aggregate properties).

**Naiqian Zhang,** Ph.D., Virginia Polytechnic and State University (Instrumentation and controls; sensor development; geographical information systems).

### The department

The Department of Agricultural Engineering offers courses of study leading to the master of science in agricultural engineering, and the doctor of philosophy in engineering.

The department consists of 14 full-time graduate faculty members, about 30 graduate students, and four adjunct professors. On-campus research is performed in departmental laboratories. Field studies may be carried out at experiment fields near Topeka, Belleville, and St. John and at research/extension centers near Garden City and Colby. Opportunities exist for research in the laboratories of the Grain Marketing Research Laboratory and the Wind Erosion Research Unit, USDA–ARS, both located in Manhattan.

### Master of science in agricultural engineering

Master of science students may specialize in (1) power and machinery; (2) soil and water; (3) feed and food processing; (4) energy use in agriculture; and (5) agricultural building environment. Minimum degree requirements are 30 semester hours of graduate credit, including a master's thesis of 6 semester hours based upon original research or a master's report of 2 semester hours of research or of problem work.

### Doctor of philosophy degree

A generalized Doctoral program is offered by the College of Engineering through the various departments. The traditional areas of specialization are integrated into the following five interdisciplinary areas: (1) energy utilization, (2) informational systems, (3) materials engineering, (4) systems engineering, and (5) bio-environmental engineering. Award of a doctorate requires the successful completion of the equivalent of at least three full years of full-time study beyond the baccalaureate as well as the completion of a major research study reported in a doctoral dissertation.

### Admission

Admission with full standing requires a bachelor of science in agricultural engineering or its equivalent. Graduates from other engineering curricula or either a strong physical science or biological science curriculum may be admitted provisionally with undergraduate deficiencies specified. Full standing is attained automatically upon the removal of any deficiency specified at the time of admission. Of special importance is the desire for continued study and intensive research in some area of agricultural engineering along with minimum prerequisites for admission to the program.

Application for admission to a graduate program in agricultural engineering should be made four to six months prior to the start of the term in which enrollment is desired. Additional information on graduate programs and an application for admission to the Kansas State University Graduate School may be obtained by writing or calling:

Graduate Committee Chairperson
Department of Agricultural Engineering
Kansas State University
147 Seaton Hall
Manhattan, KS 66506–2906
Telephone: (913) 532-5580
FAX: (913) 532-6944

A Test of English as a Foreign Language (TOEFL) score of 550 or higher is required of those students whose national language is not English. This level of competency is required to assure that progress towards a degree is not jeopardized by language difficulties. We will admit students to the Graduate School on provisional status who meet all requirements for admission except for the TOEFL score. The student may enroll upon scoring 550 or more on a subsequent TOEFL or successfully completing the English Language Program at K-State.

### Financial support

Students are admitted into the agricultural engineering graduate program either with an assistantship that pays a stipend from University funds or with their own source of financial support. A limited number of assistantships, providing teaching and research experience, are available. Graduate assistant appointments are usually at four-tenths time. Fees are assessed at the same rate as university employees for graduate teaching assistants and graduate research assistants. Graduate teaching assistants are eligible for a further reduction in incidental fees. Students appointed to a four-tenths graduate teaching assistantship or graduate research assistantship are required to enroll in 12 credit hours per semester and 6 credit hours during the summer.

### Agricultural engineering courses

### Undergraduate and graduate credit in minor field

**AGE 500. Properties of Biological Materials.** (2) II. Characterization of biological material properties that affect the design and analysis of material handling equipment and processes. Physical, electrical, thermal, mechanical, aerodynamic, hygroscopic, and rheological properties of grain and other agricultural products will be examined. One hour rec. and three hours lab a week. Pr.: PHYS 213.

**AGE 510. Environmental Design of Agricultural Buildings.** (3) I. Theory and application of psychrometrics, air dilution, and heat and mass transfer; study of animal's interaction with its environment; computer-aided design and analysis of environmental control systems for plants and animals. Two hours rec. and three hours lab a week. Pr.: AGE 320 or IE 372. Pr. or conc.: ME 513.

**AGE 512. Functional Analysis of Agricultural Machinery.** (3) II. Kinematics, power transmission, and basic hydraulics as applied to tillage, planting, and harvest machinery. Two hours rec. and three hours lab a week. Pr.: ME 512.

**AGE 520. Energy Use and Control in Agricultural Systems.** (3) II. Energy and material balances, process analysis and efficiency, fuel properties, electric motor and engine performance measurement, alternative energy sources, and energy system analysis. Two hours rec. and three hours lab a week. Pr. or conc.: ME 513.

**AGE 530. Soil and Water Engineering.** (3) II. Principles and measures for controlling storm water runoff and soil erosion; design of water handling structures for land drainage, flood protection, and irrigation; agricultural surveying. Two hours rec. and three hours lab a week. Pr.: AGE 551, AGRON 305; Pr. or conc.: ME 571.

**AGE 536. Agricultural Engineering Design I.** (3) I. Analysis and design of agricultural machines and equipment. Two hours rec. and three hours lab a week. Pr.: AGE 512. Pr. or conc.: CE 533.

**AGE 551. Hydrology.** (2) I, II. A study of the sources of supply and movement of underground and surface waters. Two hours rec. a week. Pr.: PHYS 113 or 213. Same as CE 551.

**AGE 566. Design of Agricultural Structures.** (3) II. Application of statics and strength of materials to the design and analysis of light-frame structures of wood, steel, and concrete; estimation of wind, snow, grain, and soil loads; stress analysis of beams, columns, frames, trusses, and foundations; computer-aided drafting and introduction to finite element analysis. Three hours rec. a week. Pr.: CE 533.

**AGE 575. Fundamentals of Agricultural Process Engineering.** (3) I. Application of basic science and engineering fundamentals for the analysis and design of agricultural processes. Two hours rec. and three hours lab a week. Pr. or conc.: CHE 314 or ME 571.

**AGE 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

**AGE 620. Problems in Agricultural Engineering.** (Var.) 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.

**AGE 625. Thermal Processing Operations in Food Engineering.** (2) II, in odd years. Analysis of thermal processing operations such as dehydration, drying, evaporation, canning, freezing, and freeze drying. Two hours rec. a week. Pr.: CHE 531 or AGE 575.

**AGE 630. Food Process Engineering Laboratory.** (1) II, in odd years. Laboratory studies of food processing unit operations and applications with emphasis on heat and mass transfer operations. Three hours lab a week. Pr.: AGE 575 or CHE 531. Pr. or conc.: AGE 625.

**AGE 635. Food Plant Design.** (3) II. Synthesis and design of different food processing plants such as cereal, dairy, fruit, and vegetable. Two hours rec. and three hours lab a week. Pr. or conc.: AGE 625. AGE-635-1-0903

**AGE 636. Agricultural Engineering Design II.** (Var.) II. Fabrication, evaluation, and refinement of a prototype machine or device designed in AGE 536. Pr.: AGE 536.

**AGE 640. Design of Control Systems for Agricultural Machines and Processes.** (3) II. Fundamentals of control engineering with primary emphasis on automatic controls for agricultural machinery and processes. Control system analysis and design. Computer-based applications. Two hours rec. and three hours lab a week. Pr.: EECE 510 or EECE 519 and MATH 240.

## Graduate credit

**AGE 700. Agricultural Process Engineering.** (3) II. Theory, equipment, and design techniques in processing agricultural products. Two hours rec. and three hours lab a week. Pr.: AGE 575.

**AGE 705. Irrigation and Drainage.** (3) II. Design and operative problems involved in irrigation or drainage of agricultural land. Two hours rec. and three hours lab a week. Pr.: AGE 551 and AGRON 305. Pr. or conc.: ME 571.

**AGE 710. Advanced Farm Power and Machinery.** (3) I. Analytical study of design, construction, and operating characteristics of tractors and selected farm machines. Two hours rec. and three hours lab a week. Pr.: AGE 536.

**AGE 780. Measurement Systems.** (3) II. 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.: EECE 510 or EECE 519.

**AGE 810. Research in Agricultural Engineering.** (Var.) 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. Pr.: Approval of department head.

**AGE 811. Particle Technology.** (3) I. Science and behavior of airborne particles or aerosols. Technology and methods for measuring, controlling, and utilizing aerosols in the agricultural and food industries. Specific topics include basic particle mechanics; principles of particle measurement; particle statistics; electrostatic precipitation; condensation; evaporation; dust generation; and filtration. Two hours rec. and three hours lab a week. Pr.: STAT 703 an PHYS 113 or 213.

**AGE 815. Graduate Seminar in Agricultural Engineering.** (1), I, II. Presentation and discussion of research philosophies, procedures, and results. One hour rec. a week. Required of all graduate students in agricultural engineering. Pr.: Graduate standing.

**AGE 820. Topics in Agricultural Engineering.** (Var.) On sufficient demand. A course reserved for study of current topics in agricultural engineering. Topics announced when offered. May be repeated up to a maximum of 9 credit hours. Pr.: 9 credit hours of graduate courses.

**AGE 898. Master's Report.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

**AGE 899. Master's Thesis.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

**AGE 999. Dissertation Research.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

# Architectural Engineering

**Department Head**

**Charles L. Burton,** P.E., M.S. Architectural Engineering, University of Kansas (Building Systems Design), design engineer for mechanical, plumbing and electrical system in buildings and acceptance testing.

**Professors**

**Bryon W. Jones,** P.E., Ph.D., Oklahoma State University (Heat and Mass transfer: Thermal Physiological Responses to non-uniform environments; Energy Efficient Building monitoring; Thermal Conductance of Aircraft Cabin insulation).

**Charles R. Bissey,** P.E., M.S., Architecture, Kansas State University (Structural Design; cold-formed steel design and analysis; roofing specification design and installation).

**Associate Professors**

**Richard B. Hayter,** P.E., Ph.D., Kansas State University (Energy Management in Building Systems and Heat transfer; effective temperature (ET) as a predictor of Thermal Comfort; Solar Heating and Cooling project experience).

**Harry D. Knostman,** P.E., Ph.D., Colorado University (Finite Element Methods of Structural Analysis and Design); stability analysis; stress analysis; vibrations).

## The department

The Department of Architectural Engineering and Construction Science offers courses of study leading to the master of science degree. The department has ABET accreditation (Accreditation Board for Engineering and Technology, Inc.).

The department consists of five full-time graduate faculty members, and four temporary graduate faculty. The research interest of the staff cover major areas of modern building systems design: structural analysis, cold-formed steel design, energy analysis, energy auditing, acceptance testing, and indoor air quality. Several faculty members direct research and utilize this research in the enhancement of both graduate and undergraduate teaching. The objective of the program is to provide advanced studies in engineering analysis and design of all the disciplines in building systems. The department has excellent facilities which include design drafting rooms, classrooms, faculty offices, an outstanding electrical and lighting laboratory for research and teaching and access to the most recent computer technology.

## The master of science degree

The minimum requirement for course work is 30 semester hours of graduate credit with options as specified in the this catalog and required undergraduate work which is subject to the approval of the department. Depending on the selected degree options a student has a significant range of elective courses from which to choose with the approval of the students' graduate committee. The program is structured to permit the student, by diligent work, to complete the M.S. requirement in one calendar year. Substitution for one or more of the specified courses may be made if the department judges that equivalent study has been successfully completed.

## Architectural engineering courses

### Undergraduate and graduate credit in minor field

**ARE 523. Timber Structures.** (2) I, II. Analysis and design of timber structures using solid and laminated materials. Two hours rec. a week. Pr.: CE 537.

**ARE 524. Theory of Structures II.** (3) I. Analysis and design of metal structures; emphasis on buildings. Two hours rec. and three hours lab a week. Pr.: CE 537.

**ARE 528. Theory of Structures III.** (3) II. Design of reinforced concrete building frames; footings, columns, and floor systems, attention being given to costs and economical design. Two hours rec. and three hours lab a week. Pr.: CE 537.

**ARE 532. Lighting Systems Design.** (2) I. Study of human needs in lighting, lighting sources, lighting systems design and application. Two hours rec. a week. Pr.: PHYS 114 or 214.

**ARE 533. Building Electrical Systems.** (3) II. Study of basic design of building electrical systems including circuit design, power distribution and service equipment, communications systems, and special electrical systems. Three hours rec. a week. Pr.: EECE 519.

**ARE 534. Thermal Systems.** (3) I, II. Study of 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 engineering design. Three hours a week. Pr.: PHYS 214 and CNS 321.

**ARE 535. Lighting Systems.** (3) I, II. Design of building electrical systems including basic lighting, circuit design, and distribution with emphasis on the National Electrical Code. Three hours rec. a week. Pr.: CNS 321. Pr. or conc.: EECE 519.

**ARE 536. Sanitation Systems.** (3) I, II. Stream and water pollution, sewage disposal systems, building piping systems, space relationships, equipment requirements as related to architectural design, structural systems, construction materials, and techniques. Three hours a week. Pr.: PHYS 213 and CNS 321.

**ARE 537. Acoustic Systems.** (2) I, II. Hearing and the ear, sound generation, acoustical correction, noise reduction, and sound transmission all as integral parts of architectural design. Two hours a week. Pr.: PHYS 113 or 213.

**ARE 539. Architectural Engineering Management.** (3) I, II. General business and management procedures. Drawings, specifications, and conceptual estimating. Contracts, bonds, liability, arbitration, and insurance. Project financing. Pr.: ARE 412.

**ARE 595. Senior Project.** (5) I, II. Student working individually with laboratory support will prepare and present a project of appropriate scope and complexity with emphasis on structural, mechanical, acoustical, and electrical requirements. Fifteen hours lab a week. Pr.: ARE 412, 523, 524, 528, 534, 535, 536, and 537.

**ARE 596. Senior Project II.** (2) II. Continuation of ARE 595. Pr.: ARE 595.

**ARE 620. Problems in Architectural Engineering.** (Var.) I, II, S. A study of specific design problems under the direct supervision of a member of the architectural engineering faculty Pr.: Approval of the department head.

**ARE 640. Building Mechanical Systems.** (3) II. Study of heat gain using computers, pump laws, fan laws, various types of HVAC air systems, chilled water systems, heat pump systems, refrigeration, introduction to mechanical system controls. Pr.: ARE 534.

**ARE 710. Building Energy Analysis.** (V) I. Study of building energy consumption and current modeling techniques to analyze overall energy usage including auditing of existing buildings, economic evaluation, and energy efficient system selection for new construction. Two *or* three hours rec. a week. Pr.: ARE 534.

**ARE 724. Advanced Sanitation Systems.** (3) I. Water quality and treatment, pressure control, and hydraulics in domestic water and waste systems. Three hours rec. a week. Pr.: ARE 536 or CNS 536.

**ARE 731. Advanced Lighting Design.** (3) I. Design of all types of building lighting including exterior and site lighting. Calculations and layout utilizing zonal cavity, point by point, and computer-assisted lighting calculations methods. Three hours rec. a week. Pr.: ARE 635.

**ARE 734. Building Thermal Systems Design.** (3) I, II. Design and specifications of selected thermal and mechanical systems for structures. The course uses all the modern techniques of thermal/mechanical system design for buildings. Students are required to develop term research design projects. Two hours rec. and three hours lab a week. Pr.: ARE 640.

**ARE 735. Electrical System Design.** (3) II. Complete design and specifications of electrical systems for a selected structure. The course uses the National Electrical Code in conjunction with all the modern techniques of electrical system design for buildings. Students are required to develop term research design projects. Two hours rec. and three hours lab a week. Pr.: ARE 533.

**ARE 740. Environmental Control Systems in Buildings.** (3) II. Electric, electronic, and pneumatic control systems to optimize energy usage and environmental comfort in buildings. Three hours rec. a week. Pr.: ARE 634 and 635.

**ARE 742. Communications and Energy Management Systems Design.** (3) II. Detailed design and analysis of special electrical systems for buildings including, but not limited to, energy management, fire alarm, and communications systems. Three hours rec. a week. Pr.: ARE 635.

**ARE 780. Theory of Structures IV.** (3) II. Continuation of Theory II, and III, with special emphasis on the complete problem of the structure as a whole. Three hours a week. Pr.: CE 537 or ARE 522 and 523, 524, and 528.

**ARE 834. Advanced Building Thermal Systems Design.** (3) I. Applications of special requirements in heating, ventilating, and air conditioning systems design. Three hours rec. a week. Pr.: ARE 634.

**ARE 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.: ARE 780.

## Construction science courses

### Undergraduate and graduate credit in minor field

**CNS 522. Theory of Structures.** (3) I, II. The elastic analysis of determinate and indeterminate structures. Emphasis on equilibrium equations, shear and moment diagrams and solving forces in trusses. Includes solutions of indeterminate structures by moment distribution and matrix stiffness method: with microcomputer applications. Three hours rec. a week. Pr.: CE 331.

**CNS 523. Timber Construction.** (2) I, II. Principles of design, fabrication, and erection of timber structures including both solid and laminated materials. Two hours rec. a week. Pr.: ARE 522.

**CNS 524. Steel Construction.** (3) I, II. Principles of design, fabrication, and erection of structural steel in conformance with codes. Two hours lec. and three hours lab a week. Pr.: ARE 522.

**CNS 528. Concrete and Masonry Construction.** (3) I, II. Principles of design, fabrication, and erection of concrete and masonry structures. Two hours lec. and three hours lab a week. Pr.: ARE 522.

**CNS 534. Heating and Air Conditioning.** (3) I, II. Principles of designing, applying, installing, and estimating heating and air conditioning systems for buildings. Three hours rec. a week. Pr.: PHYS 113 and CNS 321.

**CNS 535. Electrical Service and Installation.** (3) I, II. Basic design and construction of building electrical, lighting, and distribution systems with emphasis on the National Electrical Code and installation. Three hours rec. a week. Pr.: PHYS 114 and CNS 321.

**CNS 536. Water Supply and Sanitation.** (3) I, II. Principles and practices of sanitation and water supply in buildings including code requirements and estimating. Pr.: PHYS 113 and CNS 321.

**CNS 540. Construction Methods and Equipment.** (3) I, II. Practical problems encountered in the erection of buildings and use of construction equipment. Pr.: CNS 250 and 321.

**CNS 544. Problems in Construction Science.** (Var.) I, II, S. A study of specific design problems under the direct supervision of a member of the construction science faculty. Pr.: Junior standing.

**CNS 545. Construction Problems.** (2) I. Analysis of form-work design for standard and unusual wall and floor shapes. Analysis of temporary construction structures. Study of concrete placement techniques, construction failures, advanced construction techniques, time-motion studies, and equipment management. Pr.: CNS 540, 523, 325. Pr. or conc.: CNS 524.

**CNS 634. Building Systems Installation and Commissioning.** (3) I. Principles and methods for proper installation, commissioning and maintaining of efficient performance of mechanical and electrical systems in buildings. Three hours rec. a week. Pr.: CNS 534, CNS 535, CNS 536.

**CNS 641. Construction Estimating.** (3) I, II. Understanding estimating procedures, quantity surveying, specification reviews, pricing of an estimate, market analysis, subcontractor and supplier solicitation, and risk management, following the CSI format. Nine hours lab a week. Pr.: CNS 325 and 540.

**CNS 642. Construction Management I.** (3) I, II. An introduction to the business of construction; study of legal considerations, contract documents, bonds and insurance. Evaluation of the characteristics of the construction firm, organization structure, and financial performance. Three hours rec. a week. Pr.: CNS 540.

**CNS 643. Construction Management II.** (3) I, II. Principles and practices of project operations and project scheduling; study of quality and safety management; personnel management; construction marketing and strategic planning. Three hours rec. a week. Pr.: CNS 310, CNS 641, and 642.

**CNS 738. Mechanical and Electrical Estimating.** (2) I, II. Techniques of mechanical and electrical building systems estimating. Procedure for evaluating relative costs of different systems. Development of computer aided finite and conceptual estimating techniques.Two three-hour labs a week. Pr.: ARE 534 and 535 or CNS 534 and 535.

# Chemical Engineering

**L. T. Fan,** university distinguished professor and head. Ph.D. 1957, West Virginia University. Fluidization, biochemical engineering, energy engineering, transport phenomena, chemical process dynamics, reaction engineering, environmental engineering, process system engineering, knowledge engineering.

**Richard G. Akins,** professor. Ph.D. 1963, Northwestern University. Fluid mechanics, heat transfer, mass transfer, process control, digital computation.

**James H. Edgar,** associate professor. Ph.D. 1987, University of Florida. Processing of materials for solid state devices, epitaxy, reaction mechanisms, chemical equilibria.

**Larry E. Erickson,** professor. Ph.D. 1964, Kansas State University. Biochemical engineering, environmental engineering, biological waste treatment, process design and synthesis, transport theory, chemical process dynamics.

**Larry A. Glasgow,** professor. Ph.D. 1977, University of Missouri. Fluid mechanics, behavior of dispersed-phase entities in turbulent flows, coagulation, flocculation, and environmental control related to energy conversion processes.

**Benjamin G. Kyle,** professor. Ph.D. 1958, University of Florida. Thermodynamics, phase equilibria, adsorption, separational process.

**John C. Matthews,** professor. D.Sc. 1965, Washington University. Fluid mechanics, heat transfer, reaction engineering.

**John R. Schlup,** associate professor. Ph.D. 1981, California Inst. of Technology. Chemical processing of materials, infrared spectroscopy (photo-thermal beam deflection), thermal analysis.

**Walter P. Walawender, Jr.,** professor. Ph.D. 1969, Syracuse University. Rheology of suspensions, flow in non-uniform conduits, gaseous permeation, non-Newtonian fluid viscometry, energy conversion, fluidization.

## Research facilities

The Department of Chemical Engineering has well-equipped research laboratories for transport phenomena, coal conversion, powder technology and solids mixing, thermodynamics and transport properties, environmental pollution control, materials science and engineering, chemical reaction engineering, biochemical engineering, food processing, particle dynamics, energy resources conversion, and natural convection. Specialized instrumental capabilities include interferometry, laser-Doppler velocimetry, Fourier-transform infrared spectrometry, scanning electron microscopy, and dynamic mechanical analysis.

The department also houses the Institute for Systems Design and Optimization, where several artificial intelligence work stations are located for research in process design and synthesis, and process control.

In addition to the research laboratories, the department operates a pilot plant for research on the scale-up and performance of fluidized-bed and packed-bed reactors. The pilot plant houses bench and pilot-scale fluidized-bed and moving-bed gasifiers, several cold-fluidized beds, an on-line process gas chromatograph, an elemental analyzer, a thermogravimetric analyzer, a differential scanning calorimeter, a probability analyzer-correlator and a power spectrum analyzer for stochastic studies of fluidization.

## Program description

The department offers M.S. and Ph.D. programs in chemical engineering and in interdisciplinary areas of systems engineering, food science, and environmental engineering.

Areas of study and research include transport phenomena, energy engineering, biomass and coal conversion, thermodynamics and phase equilibrium, biochemical engineering, process dynamics and control, chemical reaction engineering, materials science and engineering, solids mixing, catalysis and fuel synthesis, process system engineering, fluidization, and environmental pollution control.

## Program requirements

The Ph.D. degree requires 90 credit hours. This is divided in approximate thirds for major course work, minor subjects, and research work. The ability to translate one foreign language is required. A diversified and flexible choice of minor subjects and a good selection of research topics are available. Qualified students may bypass the master's degree and work directly toward the Ph.D. degree.

For the M.S. degree, 30 credit hours are required, with 24 hours devoted to course work and 6 hours to a thesis. A variety of minor areas are available, with a good choice of research topics offered. The department applies the same standards of quality to all its graduate degrees and considers the M.S. degree valuable to a student desiring a career in industry.

## Financial support

Graduate research assistantships and industrial fellowships are available to qualified students. Several offer stipends up to $15,000 and some include waiver of tuition and fees. Work can be used toward thesis credit. Supplemental industrial grants also are offered to outstanding candidates.

For information or application forms, write to:

Professor B. G. Kyle
Department of Chemical Engineering
Kansas State University
Durland Hall
Manhattan, KS 66506–5102
Phone: (913) 532-5584
FAX: (913) 7372

## Chemical engineering courses

### Undergraduate and graduate credit in minor field

**CHE 516. Chemical Engineering Computational Techniques II.** (1) I. Application of digital computers to chemical engineering problems. Three hours of lab a week. Pr.: CHE 316 or conc.: CHE 550 and 560.

**CHE 520. Ch.E. Thermodynamics I.** (2) I. A study of the first and second laws of thermodynamics, real gases, heat of solution and reaction. Two hours rec. a week. Pr.: CHE 320. Pr. or conc.: CHM 585.

**CHE 521. Ch.E. Thermodynamics II.** (3) II. A continuation of the study of the second law, thermodynamic analysis of processes, phase equilibrium, chemical reaction equilibrium. Three hours rec. a week. Pr.: CHE 520.

**CHE 522. Chemical Engineering Laboratory I.** (2) II. Laboratory experiments on momentum and heat transfer. Five hours lab a week. Pr.: CHE 520 and 530.

**CHE 530. Transport Phenomena I.** (3) I. A unified treatment of the basic principles of momentum, energy, and mass transport. Three hours rec. a week. Pr.: CHE 320 and MATH 240.

**CHE 531. Transport Phenomena II.** (3) II. Continuation of Transport Phenomena I with special emphasis on mass transfer. Three hours rec. a week. Pr.: CHE 530.

**CHE 532. Chemical Engineering Laboratory II.** (2) I. Laboratory experiments on heat and mass transfer. Five hours lab a week. Pr.: CHE 521 and 531.

**CHE 542. Chemical Engineering Laboratory III.** (3) II. Laboratory experiments on classical unit operations, e.g., distillation, absorption, extraction, and on chemical kinetics and process dynamics. Eight hours lab a week. Pr.: CHE 516, 550 and 560. Pr. or conc.: CHE 561.

**CHE 550. Chemical Reaction Engineering.** (3) I. Applied chemical kinetics and catalysis including the analysis and design of tubular, packed bed, stirred tank, and fluidized bed chemical reactors. Three hours rec. a week. Pr.: CHE 521 and 531. Conc.: CHE 516.

**CHE 560. Separational Process Design.** (3) I. Development of the basic theory and design of separational processes such as distillation, gas absorption, liquid extraction, adsorption, and ion exchange. Three hours rec. a week. Pr.: CHE 521 and 531. Conc.: CHE 516.

**CHE 561. Chemical Process Dynamics and Control.** (3) II. A study of the unsteady state behavior and control of chemical processes. Three hours rec. a week. Pr.: CHE 550.

**CHE 570. Chemical Engineering Systems Design I.** (2) I. Basic concepts of process economics with application to the design of chemical processes. Two hours rec. a week. Pr. or conc.: CHE 550 and 560.

**CHE 571. Chemical Engineering Systems Design II.** (4) II. Basic concepts of process optimization with application to the synthesis and design of chemical processing systems. Emphasis will be on the solution of comprehensive systems design problems. Two hours rec. and six hours lab a week. Pr.: CHE 516, 550, 560, and 570. Pr. or conc.: CHE 561.

**CHE 580. Problems in Chemical Engineering or Materials Science.** (Var.) I, II, S. An introduction to chemical engineering research. Pr.: Approval of department head.

### Undergraduate and graduate credit

**CHE 626. Bioseparations.** (2) II, in even years. Study of separations important in food and biochemical engineering such as leaching, extraction, expression, absorption, ion exchange, filtration, centrifugation, membrane separation, and chromatographic separations. Two hours rec. a week. Pr.: CHE 531 or AGE 575.

**CHE 648. Processing of Composite Materials.** (3) I, II. Principles of composite materials, including ceramic, metal, and polymer matrix composites; properties and processing of fibers; role of interfaces in composites; basic concepts in mechanics, failure, and testing of composite materials. Three hours lec. a week. Pr.: CHE 350 or 352.

**CHE 650. Hazardous Waste Engineering Seminar.** (1) I, II, S. Topics in hazardous materials management and control, waste reduction and minimization, hazardous substance tracking, and hazardous waste engineering. One hour rec. a week. Pr.: CHM 230.

**CHE 653. Ceramic Materials.** (3) I, II. Structure and bonding in glasses and ceramics; phase equilibria and transformation kinetics; defects and microstructure within ceramic materials; mechanical, thermal, optical, electrical, and magnetic properties of ceramics and glasses. Three hours rec. a week. Pr.: CHE 350 or 352.

**CHE 661. Processing of Materials for Solid State Devices.** (3) I, II. Structure, properties and processing of materials for solid state devices. Crystal growth, epitaxy, oxidation, diffusion, lithography, and etching as applied to device fabrication. Three hours rec. a week. Pr.: CHE 350 or 352.

**CHE 664. Electrochemical Engineering.** (3) I, II. Thermodynamics, electrode kinetics, and transport phenomena of electrochemical systems. Three hours rec. a week. Pr.: CHE 521 and 531.

**CHE 681. Engineering Materials II.** (3) I, II, S. The structure and bonding in crystalline and amorphous materials; crystallography; thermodynamic stability in materials; equilibrium diagrams and the phase rule; rate theory and kinetics of solid-state transformations; mechanical behavior of engineering materials; dislocations; failure mechanisms. Three hours lec. a week. Pr.,: CHE 350 or 352.

**CHE 682. Surface Phenomena.** (2) I, II, S. Principles and application of interfacial phenomena, including capillarity, colloids, porosity, adsorption, and catalysis. Two hours rec. a week. Pr.: CHE 520.

**CHE 715. 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.: CHE 550.

**CHE 725. Biotransport Phenomena.** (3) I, II. Principles of transport phenomena applied to biological and physiological processes. Membrane transport processes, circulatory system transport phenomena, transport and distribution of drugs. Pr.: CHE 530.

**CHE 735. 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.: CHE 530.

**CHE 745. Analysis of Physiological Processes.** (3) II. Principles of process and systems analysis applied to problems in biology and medicine. Analysis of mixing in-flow systems, principles and applications of tracer analysis, analysis of kinetic and adsorption processes. Pr.: CHE 550.

### Graduate credit

**CHE 802. Selected Topics in Materials Science.** (Var.) I, II, S. Areas of current interest in materials including solidification, transformations, solutions, dislocations, creep, fracture, failure analysis, and failure prevention. Pr.: CHE 681.

**CHE 805. Selected Topics in Biochemical Engineering.** (3) II, S. Subjects of current interest in the broadest sense of biochemical engineering. These involve not only chemical engineering problems which contain biochemical biological, or medical elements but also applications of chemical engineering principles and methodologies to biochemical, biological, medical, and ecological problems. Pr.: CHE 715.

**CHE 810. Research in Chemical Engineering.** (Var.) 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.

**CHE 815. Advanced Chemical Engineering Thermodynamics.** (3) I, II, S. Advanced topics in thermodynamics, with emphasis on a chemical and physical equilibria and the estimation of thermodynamic properties. Three hours rec. a week, Pr.: Graduate standing in chemical engineering.

**CHE 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.: CHE 550.

**CHE 826. Advanced Unit Operations I.** (3) I, II, S. Advanced study of mass transfer operations. Three hours rec. a week. Pr.: CHE 560.

**CHE 832. Advanced Unit Operations II.** (3) I, II, S. Advanced study of the operations involving mechanical separation of materials. Three hours rec. a week. Pr.: CHE 560.

**CHE 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.

**CHE 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.: CHE 735.

**CHE 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.: CHE 862.

**CHE 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.: CHE 571 and 735.

**CHE 875. Graduate Seminar in Chemical Engineering.** (1) I, II. Discussion of current advances and research in chemical engineering and related fields.

**CHE 898. Master's Report.** (Var.) I, II, S. Topics selected with approval of department head and major professor.

**CHE 899. Master's Thesis.** (Var.) I, II, S. Topics selected with approval of department head and major professor.

**CHE 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.: CHE 822 and one course in chemical engineering numbered 851 or higher.

**CHE 910. Selected Topics in Transport Phenomena.** (3) I, II, S. Subjects of current interest such as surface phenomena, turbulent transport, droplet mechanics, multicomponent systems. Three hours rec. a week. Pr.: CHE 867.

**CHE 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 Lyapunov theorems and the maximum principle are examples of the methods to be studied. Three hours rec. a week. Pr.: CHE 850 and one graduate course in chemical engineering numbered 851 or higher.

**CHE 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.: CHE 826 or 832 and one course in chemical engineering numbered 851 or higher.

**CHE 925. Selected Topics in Process Design and Optimization.** (3) I, II, S. Study of advanced methods of process design and optimization, such as modern variational methods and dynamic programming. Applications to be chosen mainly from the chemical and allied industries to include stochastic as well as deterministic problems. Three hours rec. a week. Pr.: CHE 871.

**CHE 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.: CHE 815 and one course in chemical engineering numbered 851 or higher.

**CHE 999. Dissertation Research.** (Var.) I, II, S. Topics selected with approval of department head and major professor.

# Civil Engineering

**M. Katherine Banks,** Assistant Professor, Ph.D. 1989, Duke University, Biological wastewater treatment, bioremediation of hazardous wastes, mathematical modeling of biological systems, biochemical engineering.

**Peter B. Cooper,** Professor, Ph.D. 1965, Lehigh University. Behavior and load carrying capacity of steel members, experimental and ultimate strength analysis.

**Mustaque Hossain,** Assistant Professor, Ph.D. 1990, Arizona State University. Pavement design, evaluation, performance and management, non-destructive testing of pavements, highway materials, soil stabilization.

**Kuo-Kuang Hu,** Professor, Ph.D. 1969, Kansas State University. Mechanics of materials, structures, numerical modeling for solving linear and nonlinear engineering problems.

**James K. Koelliker,** Professor, Ph.D. 1972, Iowa State University. Hydrology, sanitary-environmental engineering, water resources engineering, water quality.

**Alexander P. Mathews,** Professor, Ph.D. 1975, University of Michigan. Physicochemical processes and their application to water and wastewater treatment, contaminant transport in subsurface environment, hazardous waste engineering.

**Hani G. Melhem,** Assistant Professor, Ph.D. 1989, University of Pittsburgh. Fatigue and fracture of steel bridges, expert systems and interactive video disc, computer-controlled structural testing, finite elements and computational methods.

**Lakshmi N. Reddi,** Assistant Professor, Ph.D. 1988, Ohio State University. Geotechnical engineering, environmental geotechnology, flow through porous media, in-situ recovery of immiscible contaminants, stochastic methods.

**Eugene R. Russell,** Professor, Ph.D. 1974, Purdue University. Urban transportation planning, transportation systems analysis and simulation, railroad grade crossing safety, hazardous materials transportation.

**Robert R. Snell,** Professor, Ph.D. 1963, Purdue University. Structural mechanics, structural modeling, optimization applied to civil engineering problems.

**Robert W. Stokes,** Associate Professor, Ph.D. 1984, Texas A&M University. Urban transportation planning, transportation systems analysis, traffic flow theory, travel demand modeling/forecasting, statistics, public transportation planning and operations, traffic engineering, urban planning.

**Stuart E. Swartz,** Professor, Ph.D. 1968, Illinois Institute of Technology. Structural analysis and design, structural modeling and testing, mathematical modeling, behavior of reinforced concrete, fracture mechanics of concrete, computer-aided engineering.

## Program description

The Department of Civil Engineering at Kansas State University offers comprehensive programs leading to the degrees of master of science within the department and doctor of philosophy within the College of Engineering. Established programs of study are available in structural analysis and design, geotechnical engineering, water resources engineering, environmental engineering and transportation engineering and materials. An active research program is conducted in each of these areas, and it is the goal of the department to maintain a close association between graduate study, research, teaching, and engineering practice.

## Program requirements

The general requirements for admission to the civil engineering graduate program include the receipt of a bachelor of science degree from an accredited civil engineering department and evidence that the applicant has the ability to do satisfactory graduate work. However, students not possessing a degree in civil engineering may be admitted if their undergraduate work is closely related to a specific discipline within the civil engineering program and they complete a core program of undergraduate civil engineering course work.

Students admitted for work toward a master of science degree can select a program of study requiring the completion of a master's thesis or a master's report within their area of interest. Students admitted for work toward a doctor of philosophy degree are required to develop an original research program, and complete a doctoral dissertation under the guidance of faculty members from the College of Engineering.

## Research facilities

The Department of Civil Engineering has several laboratories which can be used to perform a wide variety of graduate research projects. These include laboratories in the areas of environmental engineering, hydraulic engineering, materials testing, soil mechanics, and water resources engineering.

In addition, the department has extensive computing facilities, including a number of personal computers, an Apollo Workstation operated by the department, and access to SUN workstations. The university's main frame computer and supercomputers located at national centers can be accessed from terminals located within the department.

## Financial support

The department has several graduate research assistantships and graduate teaching assistantships available. These positions are generally 0.4 or 0.5 time appointments and the stipends vary accordingly. In addition, a number of graduate research assistantships are supported through externally funded research projects obtained by individual faculty members. Student fees are assessed at the in-state level for graduate students who receive the research or teaching assistantships.

## Career opportunities

Graduate study in civil engineering will provide students with training for a wide variety of academic, technological, and public service careers. Students completing the master of science degree program typically find employment related to their chosen discipline in either private consulting firms or governmental agencies. Students completing the doctor of philosophy degree program can also expect to find employment in academic positions, or in government and private research laboratories.

## Faculty contact

For additional information, please contact:

Dr. Stuart E. Swartz, Head
Department of Civil Engineering
119 Seaton Hall
Kansas State University
Manhattan, KS 66506–2905

## Areas of emphasis

Environmental and water resources engineering: Banks, Koelliker, Mathews, and Reddi
Structural analysis and design: Cooper, Hu, Melhem, Snell, Swartz
Geotechnical engineering: Reddi
Transportation and materials engineering: Hossain, Russell, Stokes

## Civil engineering courses

### Undergraduate and graduate credit in minor field

**CE 522. Soil Mechanics I.** (3) I, II. Identification, classification, and engineering properties of soils; theory and application of consolidation, compressibility, and strength of soils; ground water retention and movement; slope stability and lateral earth pressures; stress distribution in soil. Two hours rec. and three hours lab a week. Pr: CE 533.

**CE 528. Foundation Engineering.** (3) I. Prediction of soil variation, soil investigations; stress distribution and bearing capacity; dewatering analysis and procedures; retaining structures and lateral earth pressures; shallow foundations, pile foundations; underpinning and grouting. Two hours rec. and three hours lab a week. Pr: CE 522. PR. or conc.: CE 544.

**CE 530. Statics and Dynamics.** (4) I, II. A shortened combined course in (1) statics, including a study of force systems, free-body diagrams, and problems in equilibrium, friction, centroids, and moments of inertia; and (2) dynamics, including a study of the kinematics and kinetics of particles and rigid bodies using the methods of force-mass acceleration, work-energy, and impulse-momentum. Four hours rec. a week. Pr: MATH 222 and PHYS 213.

**CE 533. Mechanics of Materials.** (3) I, II. 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: CE 333 or CE 530. Pr. or conc.: MATH 222.

**CE 534. Mechanics of Materials Laboratory.** (1) I, II. 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.: CE 533.

**CE 537. Introduction to Structural Analysis.** (4) I, II. Elastic analysis of determinate and indeterminate beams, frames, and trusses; construction of shear and moment diagrams and influence lines; calculation of deflections using conjugate beam and virtual work; solution of indeterminate structures by consistent deformation, slope-deflection, moment distribution, and matrix stiffness method; with microcomputer applications. Four hours rec. a week. Pr: CE 533. Pr. or conc.: CE 380.

**CE 542. Structural Engineering in Steel.** (3) II. Introduction to design of steel structures. Theoretical, experimental and practical bases for proportioning members and their connections. Two hours rec. and three hours lab. a week. Pr: CE 537.

**CE 544. Structural Engineering in Concrete.** (3) I. 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: CE 537.

**CE 551. Hydrology.** (2) I, II. A study of the sources of supply and movement of underground and surface waters. Two hours rec. a week. Pr: PHYS 113 or 213. Cross-listed with AE 551.

**CE 552. Hydraulic Engineering.** (3) II. Applications of the principles of fluid mechanics to control and use of water; reservoir, dam, and spillway design; enclosed conduit and open-channel design; hydraulic machinery and hydro-power development; principles of fluid measurement; laboratory-flow and velocity metering, hydraulic models, pipe losses, open-channel flow. Two hours rec. and three hours lab. a week. Pr: ME 571. Pr. or conc.: CE 551.

**CE 553. Hydrologic Methods Laboratory.** (1) I, II. Applications of hydrologic methods in design; precipitation data analysis; evapotranspiration; stream gauging; hydrograph generation and flood routing; rainfall and flood frequency analysis; design of multipurpose reservoirs; ground water flow analysis and water well design. Three hours lab a week. Pr. or conc.: CE 551 and NE 385.

**CE 563. Environmental Engineering Fundamentals.** (3) I, II. Basic physical, chemical, and biological concepts and the applications to the protection of the environment with emphasis on techniques used in water and wastewater treatment. Two hours rec. and three hours lab a week. Pr: CHEM 230 and MATH 222.

**CE 565. Water and Wastewater Engineering.** (3) 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: CE 563, PHYS 214, and ME 571.

**CE 570. Transportation Planning.** (3) Intersession. Fundamentals of transportation planning. Historical development and current status of techniques used in travel demand forecasting; trip generation, trip distribution, mode choice, and traffic assignment. Current microcomputer models and applications. Pr: CE 380 or equivalent and junior standing.

**CE 572. Highway Engineering and Management.** (3) I. Applications of the principles of highway planning, design, and capacity analysis techniques to analyze, design and maintain street and highway systems. Assessment of the impact of activity center development or redevelopment on the surrounding surface transportation system. Two hours rec. and three hours lab a week. Pr: CE 411 and 522.

**CE 585. Civil Engineering Project.** (1–3) I, II. A comprehensive civil engineering project. Requires integration of skills acquired in civil engineering elective courses. Students must prepare and present written and oral design reports. One hour rec. and two three-hour labs a week. Pr: ENGL 415 and 6 hours of CE electives. Pr. or conc.: 6 additional credit hours of CE electives.

### Undergraduate and graduate credit

**CE 641. Civil Engineering Materials I.** (3) I. Properties and behavior of structural metals, timber, portland cement concrete, and bituminous concrete; standard specification and methods of test; inspection and control; long-term protection and durability. Two hours rec. and three hours lab a week. Pr: CE 534 and ENGL 415. Pr. or conc.: either CE 528 or 542 or 544.

**CE 680. Economics of Design and Construction.** (3) II. 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.

**CE 686. 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. Pr: Senior standing in engineering or graduate standing in regional and community planning.

**CE 718. Engineering Photo Interpretation.** (3) II. Photo interpretation techniques, types of aerial photographic film and their uses; application 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 instruction.

**CE 724. Advanced Soil Testing for Engineering Purposes.** (3) II. Physical characteristics and classification of soil materials; consolidation and compressibility tests; unconfined, direct, and triaxial shear tests. One hour rec. and six hours lab a week. Pr: CE 522.

**CE 725. Seepage in Permeable Materials.** (3) I, in alternate years. Analysis of seepage; groundwater movement in slopes, embankments, dams, and earth-supporting structures; construction of flow nets; dewatering systems; filter and drain design. Three hours rec. a week. Pr.: CE 522 and CE 552.

**CE 728. Advanced Geotechnical Design.** (3) II. Advanced studies of soil investigations; design of retaining structures and reinforced earth walls, sheet piles, anchored bulkheads, underground conduits and tunnels; analysis and repair of failed structures. Two hours rec. and three hours lab a week. Pr.: CE 528.

**CE 732. Advanced Structural Analysis I.** (3) I. Classical methods of analysis of statically indeterminate structures; deflections and influence lines for indeterminate structures; analysis of space frames and trusses. Three hours rec. a week. Pr: CE 537.

**CE 741. Civil Engineering Materials II.** (3) II. Advanced study of civil engineering materials including concrete, steel and bituminous concrete. Two hours rec. and three hours lab a week. Pr.: CE 641 or CHE 350.

**CE 742. Advanced Steel Design.** (3) II. Plastic design of steel structures; stability problems in plastic design; design of complex steel structures. Three hours rec. a week. Pr: CE 542.

**CE 743. Advanced Reinforced Concrete Theory.** (3) II. Advanced theories and methods of design and analysis of reinforced concrete structures. Three hours rec. a week. Pr: CE 544.

**CE 751. Hydraulics of Open Channels.** (3) I. Properties of open-channel flow; types of open channels; conservation of mass, momentum, and energy; critical, uniform, and gradually varied flow; design of erodible channels; rapidly varied flow. Three hours rec. a week. Pr: CE 552.

**CE 752. Advanced Hydrology.** (3) I. Review of basic principles; point and regional rainfall and flood frequency analyses; hydrologic and hydraulic flood routing; drainage and flood control facilities design; hydrologic modeling and simulation flood plain analysis and planning. Three hours rec. as week Pr.: CE 551.

**CE 762. Water Treatment Processes.** (3) I. Physical and chemical process principles and their application to water treatment plant design. Three hours rec. a week. Pr.: CE 565.

**CE 766. Wastewater Engineering: Biological Processes.** (3) II. Biological process principles and their application to the design of wastewater treatment plants. Three hours rec. a week. Pr.: CE 565.

**CE 771. Urban Transportation Analysis.** (3) II. 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: CE 572 or consent of instructor.

**CE 774. Pavement Design.** (3) I. On sufficient demand. Methods of evaluating the load-carrying capacity of soil subgrade, subbase, 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: CE 522.

**CE 775. Traffic Engineering I.** (3) II. Traffic operations of roads, streets, and highways; traffic engineering studies; use of signs, signals, and pavement markings as traffic control devices; highway and intersection capacity, design and operation of traffic signals; current microcomputer models and applications. Two hours rec. and three hours lab a week. Pr.: CE 572.

**CE 776. Pavement Performance and Management Systems.** (3) I, in alternate years. Pavement management systems including pavement condition and structural evaluation, analysis, and optimization. Economics analysis and rehabilitation planning including computer applications. Three hours rec. a week. Pr.: CE 572.

**CE 790. Problems in Civil Engineering.** (Var.) I, II, S. Pr: Approval of instructor.

## Graduate credit

**CE 791. Research in Civil Engineering.** (Var.) I, II, S. Original investigation or advanced study in some field related to the practice of civil engineering. Pr: Approval of department head.

**CE 801. Computational Methods in Civil Engineering.** (3) I, in alternate years. Theory and application of interpolation, differentiation, integration, iterative solution methods, finite differences, finite elements and other approximate techniques for numerical solutions to problems in civil engineering. Three hours rec. a week. Pr.: Graduate standing.

**CE 802. Advanced Mechanics of Materials.** (3) I. Two- and three-dimensional stress-strain transformations, finite deformation and theories of failure. Advanced topics in bending, shearing, torsion and combined loads, thick walled cylinders and rotating disks. Introduction to theory of elasticity, plasticity and plates and shells. Three hours rec. a week. Pr.: CE 533.

**CE 822. Soil Mechanics of Embankments.** (3) I. Application of soil mechanics to cutting and filling operations for the construction of embankments, soil investigations, slope stability, stability and settlement of embankments, structures in embankments. Water control in and through embankments. Three hours rec. a week. Pr..: CE 728.

**CE 823. Engineering Properties of Cohesive Soils.** (3) I. Mineralogy and structures of clay minerals; fabric and bonding of the clay particles; compressibility and strength characteristics of clays; moisture effects, retention, and movement through clay. Three hours rec. a week. Pr.: CE 522 and CE 725.

**CE 825. Environmental Geotechnology.** (3) I, in alternate years. Soil/environment and soil/pollutant interactions; pollutant effect on soil strength and behavior; design and performance of waste containment structures; clay liners, surface seals, and slurry walls; slope stability problems for landfills. Three hours rec a week. Pr.: CE 725.

**CE 828. Advanced Soil Mechanics.** (3) II, in alternate years. Application of theory of elasticity of geotechnical problems; two- and three-dimensional consolidation theories; slope stability analyses; advanced study of strength and compressibility of soil; numerical method applications in consolidation and seepage. Three hours rec. a week. Pr.: CE 522 and CE 802.

**CE 833. Advanced Structural Analysis II.** (3) II. Application of matrix methods of analysis to complex structures; structural optimization, selected advanced topics in structural analysis. Three hours rec. a week. Pr.: CE 537.

**CE 836. Energy Methods and Applied Variational Principles.** (3) II, in alternate years. Theory and applications of virtual work, minimum potential, and variational principles using generalized coordinates, displacements, and forces to derive and solve advanced problems in structural, soil and hydrodynamic problems. Three hours rec. a week. Pr.: CE 801.

**CE 837. Structural Stability.** (3) II. Analysis of flexible members. Linear and nonlinear buckling of beams, frames, plates and complicated structural systems; post buckling behavior of steel structures. Three hours rec. a week. Pr.: CE 802.

**CE 844. Prestressed Concrete Design.** (3) I. Study of prestressing methods including strength and load-balancing approaches and their application to the analysis and design of beams, slabs, and axially loaded members. Flexural, shear, torsion, and anchorage-zone analysis. Study of deflection and time-dependent losses. Three hours rec. a week. Pr.: CE 544.

**CE 854. Analysis of Groundwater Flow.** (3) II. Principles of flow through porous media; applications of flow theory to well analysis and design; groundwater resource evaluation and regional groundwater systems analysis. Three hours rec. a week. Pr: CE 552.

**CE 861. Environmental Engineering Chemistry.** (3) I. Chemical kinetics and equilibria, acid-base chemistry, complex formation, precipitation and dissolution processes, and applications to the analysis of environmental engineering problems. Three hours rec. a week. Pr.: CE 565, CE 762.

**CE 863. Water Supply and Wastewater Collection Systems.** (3) I, in alternate years. Analysis and design of water distribution networks, pump stations and storage reservoirs; wastewater collection and pump station system design; computer applications and systems optimization. Three hours rec. a week. Pr.: CE 565, CE 801.

**CE 873. Airport Design.** (3) II, on sufficient demand. Planning and design of a regional airport, including site selection in conformance with state and federal regulations; layout and design of runway system; size and layout of terminal buildings, landside facilities, parking lots, and circulation system. Two hours rec. and three hours lab a week. Pr.: CE 572.

**CE 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: CE 675. Pr. or conc.: STAT 510.

**CE 890. Graduate Seminar in Civil Engineering.** (0) I, II. Discussion of current advances and research in civil engineering. One hour seminar biweekly. Pr: None.

**CE 898. Master's Report.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

**CE 899. Master's Thesis.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

**CE 916. Advanced Topics in Civil Engineering.** (Var.) I, II, S. On sufficient demand. A course reserved for study of current topics in civil engineering. Topics announced when offered. Pr: Eighteen hours graduate credit in areas approved by instructor.

**CE 930. Advanced Topics in Geotechnical Engineering.** (Var.) I, II, on sufficient demand. Advanced study of selected topics in geotechnical engineering. Topics announced when offered. Pr.: Eighteen hours graduate credit in areas approved by instructor.

**CE 935. Structural Dynamics.** (3) I, in alternate years. Analysis of structures subject to dynamic loadings. Optimization of structural systems to minimize earthquake hazards. Three hours rec. a week. Pr.: CE 802.

**CE 938. Theory of Plates and Shells.** (3) I, in alternate years. Equations and solutions of bending of thin plates of various edge conditions and shapes. Membrane and bending theory of shells of revolution. Nonlinear theory of plates and shells. Three hours rec. a week. Pr.: CE 802.

**CE 950. Advanced Topics in Structural Engineering.** (Var.) I, II, on sufficient demand. Advanced study of selected topics in structural engineering. Topics announced when offered. Pr.: Eighteen hours graduate credit in areas approved by the instructor.

**CE 967. Physiocochemical Processes.** (3) II, in alternate years. Advanced study of physical and chemical processes in the movement and removal of particulates and organics in natural and engineered systems. Three hours rec. a week. Pr.: CE 861.

**CE 970. Advanced Topics in Environmental and Water Resources.** (Var.) I, II, on sufficient demand. Advanced study of selected topics in environmental and water resources engineering. Topics announced when offered. Pr.: Eighteen hours graduate credit in areas approved by the instructor.

**CE 980. Advanced Topics in Transportation and Materials Engineering.** (Var.) I, II, on sufficient demand. Advanced study of selected topics in transportation engineering and civil engineering materials. Topics announced when offered. Pr.: Eighteen hours graduate credit in areas approved by the instructor.

**CE 999. Dissertation Research.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

# Computing and Information Sciences

**Chairman**

**Virgil Wallentine,** Ph.D., Iowa State University, 1972, operating systems, computer networks, programming languages, concurrent and parallel programming systems.

**Professors**

**William Hankley,** Ph.D., Ohio State University, 1967, software engineering (environments, specification, verification), languages (Ada, PROLOG, object-oriented programming), graphic interaction.

**Elizabeth Unger,** Ph.D., University of Kansas, 1978, database management systems: integrity and confidentiality, and formal models.

**Associate professors**

**Myron Calhoun,** Ph.D., Arizona State University, 1967, computer architecture, computer-aided design, digital systems design, microcomputer applications.

**David Gustafson,** Ph.D., University of Wisconsin–Madison, 1979, software engineering including software measures, software testing, software reliability, formal approaches, and expert systems applications.

**David Schmidt,** Ph.D., Kansas State University, 1981, denotational semantics, intuitionistic type theory, psychoceramics.

**Maarten van Swaay,** Ph.D., Leiden, 1956, Princeton, 1956, social and ethical issues in computer science.

**Assistant professors**

**Jan Chomicki,** Ph.D., Rutgers University, 1990, databases, programming languages and environments, and logic programming.

**Rodney Howell,** Ph.D., University of Texas-Austin, 1988, design and analysis of algorithms, computational complexity, parallel and distributed computing, Petri nets, real-time scheduling.

**Masaaki Mizuno,** Ph.D., Iowa State University, 1987, operating systems, distributed systems.

**K. Ravindran,** Ph.D., University of British Columbia, 1987, distributed systems, distributed programming languages, high-speed computer networks, real-time systems, computer architectures.

**Gurdip Singh,** Ph.D., State University of New York-Stony Brook, 1991, concurrent and distributed systems, network management protocols, modular verification, specification languages, and database concurrency control.

**Maria Zamfir–Bleyberg,** Ph.D., University of California-Los Angeles, 1982, formal models in artificial intelligence applications, formal models for concurrent computing, and algebraic semantics of programming languages.

## Background

The Department of Computing and Information Sciences offers courses of study leading to the master of science and doctor of philosophy degrees. As of fall 1992 the department consisted of 13 graduate faculty members, 2 postdoctoral research fellows, 2 full-time technical support staff, 42 M.S. students, and 17 Ph.D. students. During the 1990–1991 year, 24 M.S. degrees and 2 Ph.D. degrees were granted. Recent faculty research projects have been funded by the National Science Foundation, Office of Naval Research, National Security Center, U.S. Air Force, Bureau of the Census, Hewlett Packard, Xerox, AT&T, and the Advanced Manufacturing Institute.

## Objectives

The department is committed to excellence in scholarly activities and research; interdepart-

mental and interuniversity collaborative projects are particularly emphasized. Key research areas include: programming languages, distributed systems, databases, software engineering, and theoretical computer science.

### Research groups

Programming languages research in the department focuses upon the design and implementation of correct and efficient compilers, interpreters, and environments. Denotational semantics definitions are used to automatically synthesize compilers, and partial evaluation is applied to make the compilers operate efficiently. Foundational research in domain theory, language congruences, continuation passing-style transformations, and type theory ensures the quality of the results.

Research performed by the distributed systems research group broadly falls under the following categories: distributed programming structures and models, replication and fault-tolerance, concurrency control on shared data, distributed network protocols and algorithms, distributed and parallel discrete event simulation, parallel programming and synchronization, real-time systems, and high speed network architectures. In each category, issues in formal modeling, specification and verification, and implementation are investigated. Formal modeling provides the theoretical basis for the analysis of distributed systems; specification and verification validates the correctness of distributed programming primitives and communication protocols during system design; and implementation allows building of prototype systems that encapsulate newly designed primitives, abstractions, and protocols.

Database research in the department centers on three main themes: database integrity and security, distributed databases, and logic and databases. Specific topics developed within these themes include: security and confidentiality; static and dynamic integrity constraints; and deductive, object-oriented and temporal databases. Both theoretical and practical issues are pursued.

The department's software engineering research encompasses measures, testing, reliability, specification, and expert system application. Software measures research applies measurement theory to the development of practical software measures and specification methodologies. Software testing and reliability research involves formal models for testing, comparing testing methods, and predicting software reliability. Software specification research uses formal approaches for specifying programs in Ada-like languages. Finally, expert system research seeks expert system solutions to software engineering problems.

The tools for algorithm analysis and NP-completeness help determine which programming problems are computationally tractable. The department's theory group applies these tools to real-time embedded systems problems, as arise in medical, avionics, and military applications, where tasks must meet specified deadlines. Many problems underlying schedulability are computationally intractable, so the tractable cases must be identified and the intractable ones must be solved by approximation algorithms. The research will contribute to the future construction of large, real-time, embedded systems.

In addition to research projects in mainstream areas of computing, the department actively seeks to synthesize the knowledge of computing specialists with that of engineers and scientists in a wide spectrum of academic disciplines. Such interaction will stimulate interdisciplinary knowledge production and contribute to the solution of "grand challenges" in such subject areas as general computing robotics, simulation, manufacturing, computational mathematics, computational biology, computational physics, and computational chemistry.

### Research facilities

The department maintains a large network of minicomputers, workstations, and graphics display terminals for graduate study and research. Servers include a Solbourne symmetrical multiprocessor and systems manufactured by Sun, Harris, and AT&T. Access to these servers are available in offices and laboratories equipped with over 120 workstations, including Sun workstations, X window system terminals, PCs, Macintoshes, and data terminals. Direct access to NSFNet and Internet permit communication with computer science researchers worldwide. Programming languages include Ada, C, C++, Concurrent C, Fortran-77, LISP, Miranda, ML, Pascal, Prolog, and Scheme. Numerous other software packages are available, including CASE tools, databases, simulation, expert systems and document publishing.

Additional campus-wide computer facilities are provided by the Central Computing and Network Services organization. These facilities include an IBM 3084 mainframe, a Solbourne symmetrical multiprocessor, Sun workstations, and several labs throughout campus with PCs, Apple Macintoshes, and data terminals.

### Master of science degree

The M.S. degree requires a minimum of 30 credit hours of graduate level course work. The program option can take one of three forms: non-thesis-report option requiring 33 hours; a report option requiring 30 hours; and a thesis option requiring 30 hours. An oral presentation is required for each option and further original research is required for the thesis option.

Course work must include background requirements: CIS 606; seminar requirement: CIS 897; implementation requirement: one of the following, CIS 606, CIS 620, CIS 630, CIS 636, CIS 690; theory requirement: one of the following, CIS 770 or CIS 775; breadth requirement: three of the following courses, CIS 705, CIS 720, CIS 730, CIS 740, CIS 745, CIS 761, or CIS 771; specialization requirement: one course numbered CIS 800 or higher (excluding seminar, projects and M.S. research/report courses).

The student must receive a grade of B or better for each course used to satisfy the above requirements.

The department reserves the right to change the requirements for the degree at any time. Contact the department for exact requirements.

### Doctor of philosophy

The Ph.D. degree requirements include 90 semester hours of graduate-level credit. At least 60 percent of Ph.D. work must be at the 800 or 900 level. A 3.0 GPA must be maintained in all course work used to satisfy the requirements and participation in teaching is a requirement. All work must be completed within seven years. The Ph.D. program is offered jointly by Kansas State University and the University of Kansas, Lawrence.

General requirements include: write an initial research paper within the first year; compose a supervisory committee; take and pass a preliminary examination; write a research proposal about the dissertation research; submit for publication at least one paper based upon the research; and write and successfully defend the dissertation in an open forum.

Course work requirements include: 24 hours of course credit at Kansas State University or the University of Kansas beyond the master's degree level; 60 percent of course credit at Kansas State University or the University of Kansas must be 800 level or above with 9 credits being at the 900 level or above; one or more courses in theoretical or fundamental topics; and at least 30 hours of Ph.D. research credits.

The department reserves the right to change the requirements for the degree at any time. Contact the department for specific requirements.

### Admission

A bachelor's degree from an accredited institution with at least a B average (or equivalent) is required for admission to the Master's degree program. An applicant's background must include mainstream computing science, namely block structured and nonprocedural programming languages, data structures, architecture, operating systems, software engineering, and computing-related mathematics. An applicant must take the GRE verbal, quantitative, and analytical exam. Foreign students must take the TOEFL exam and receive a minimum score of 575.

In addition to the requirements for admission to the master's degree program, an applicant for the Ph.D. program must have a master's degree in computing science (or its equivalent). The course work should include compiler construction, theoretical computer science, and one or more breadth areas, e.g., operating systems, database systems, and software engineering.

Applications materials can be obtained by writing the Graduate Admissions Secretary, Department of Computing and Information Sciences, 234 Nichols Hall, Kansas State University, Manhattan, KS 66506.

## Computing and information science courses

**CIS 500. Analysis of Algorithms and Data Structures.** (3) I. Analysis of data structures and computer algorithms for trees, lists, graphs, and sets. Measures of performance and complexity of algorithms and structures. Pr.: CIS 300.

**CIS 520. Operating Systems.** (3) I. Basic operating systems concepts and services; interrupt processing; processes, concurrency, deadlock, resource scheduling and system structure; resource management: real and virtual storage, input/output systems, disk scheduling and file systems; design and construction of concurrent programs. Pr.: CIS 350 or EECE 631; and CIS 500.

**CIS 521. Real-Time Programming Laboratory.** (3) I. Project-oriented introduction to asynchronous processes and related system software: device drivers, event-driven operations, hierarchical and time-sliced process scheduling, spooling operations, interjob and intermachine communications. Projects will be built on a single-use environment. Pr.: EECE 241 and CIS 350, conc.: CIS 520.

**CIS 525. Telecommunications and Data Communication Systems.** (3) Basic concepts including OSI 7 layer model, data transmission methods, medium access, link control, connections management; network applications including electronic mail, file transfer, distributed computing, window systems; network management including OSI and Internet management frameworks. Pr.: CIS 300.

**CIS 540. Software Engineering Project I.** (3) I. Current practices of software development, requirements, design, prototyping, measures and evaluations. Specification, design, and prototyping of a software system. Pr.: CIS 500.

**CIS 541. Software Engineering Project II.** (3) II. Final implementation, integration, and testing of a software system. Introduction to configuration management, project management, and software maintenance. Pr.: CIS 500; CIS 540 (which must be taken in the preceding semester).

**CIS 560. Introduction to Data Management Systems.** (3) II. Representation of information as data, storage, and manipulation of large amounts of data, logical data models, data storage techniques, data retrieval, integrity, and security. Pr.: CIS 500.

**CIS 570. Theoretical Foundations of Computing.** (3) I. Specification and correctness of algorithms, formal languages and automata, introduction to computability, computational complexity of algorithms. Pr.: PHIL 220, MATH 510, CIS 300.

**CIS 580. Numerical Computing.** (3) I. Introduction to numerical algorithms fundamental to scientific computer work, including elementary discussion of error, roots of equations, interpolation, systems of equations, quadrature, and introduction to methods for solution of ordinary differential equations. Pr.: CIS 300, MATH 221 and MATH 551.

**CIS 591. Computer Science Applications.** (3) I, II, S. Programming, program libraries, and design of algorithms. For students with minimal background in computer science. Not for credit by CIS majors. Pr.: Graduate standing in student's own area and knowledge of at least one procedural programming language.

**CIS 600. Microcomputer Software.** (3) I. Contemporary software packages for microcomputers, including graphics, word processing, spreadsheets, desktop publishing. Events, resources, and the graphical user interface. Student programming project. Pr.: CIS 300.

**CIS 604. Set Theory and Logic for CS.** (3) Informal and axiomatic set theory, propositional and predicate logic, proof techniques. Pr.: graduate standing.

**CIS 605. Programming Languages.** (3) II. History, processors, programming environments; types, scopes and extent, abstraction mechanisms, exceptions and concurrency; functional and object-oriented languages; formal syntax and semantics; structure of compilers for block-structured languages. Pr.: CIS 300.

**CIS 606. Translator Design I.** (3) Compilers and interpreters, including description of languages, finite state scanners. LL(1) parsing, symbol tables, syntax-directed semantics, simple code generation. Constructing a simple PASCAL compiler. Pr.: CIS 300, 500, 605.

**CIS 620. Operating System Practices.** (3) Structure and functions of modern operating systems. Emphasis on reading and modifying the source code of a working operating systems. This includes memory management, input/output, process management, file systems, and network interconnection software construction. Pr.: CIS 500, 520.

**CIS 625. Parallel Programming.** (3) Basic concepts of concurrent and distributed programming; parallel computing architectures; real-time programming; parallel simulation; fault-tolerant programming; partitioning, mapping, and granularity of parallel programming such as communication systems; grid, N-body simulation, and matrix problems; and embedded systems control. Pr.: CIS 500, 520.

**CIS 630. AI Programming Techniques.** (3) I. Techniques of logic and/or functional programming used in areas of artificial intelligence. Pr.: CIS 605.

**CIS 635. Introduction to Computer-Based Knowledge Systems.** (3) I. Introduction to the application of artificial intelligence concepts to solving knowledge dependent tasks. Review of knowledge-representation ideas. Survey of expert system design. Introduction to existing knowledge-based tools available on personal computers. Development of an intelligent system. Pr.: CIS 300.

**CIS 636. Interactive Computer Graphics.** (3) I, II. Devices and software for graphics display and user interaction, development of software for direct graphic manipulation applications. Pr.: CIS 300.

**CIS 690. Implementation Project.** (3) I, II, S. The department will suggest various design or implementation projects for individuals or groups in areas such as translators, interpreters, microprogramming, minicomputer operating systems, graphics, numerical software, etc. Pr.: Junior standing.

**CIS 697. Seminar In Computer Science.** (1–3) Pr.: Junior standing.

**CIS 705. Programming Language Design.** (3) Fundamental design principles: abstraction, parameterization, qualification. Lambda-calculus as a metalanguage for design and analysis. The role of data typing, predicate calculus-based typing. Intuitionistic Type Theory. Pr.: CIS 605 or equivalent experience.

**CIS 707. Fundamentals of Algebraic Semantics.** (3) Fundamentals of algebraic specification techniques for specifications, initial algebra semantics, the equational calculus, term rewriting, corrections and extension of specifications. Pr.: CIS 500, 604, 605.

**CIS 710. Computer Simulation Experiments.** (3) Principles of digital computer simulations; discrete and continuous simulation method, statistics of simulations; implementations. Pr.: CIS 300.

**CIS 720. Advanced Operating Systems.** (3) Process synchronization and communication, distributed programming primitives, transactions and concurrency control, distributed scheduling, distributed storage, deadlock, security. Pr.: CIS 520.

**CIS 725. Advanced Computer Networks.** (3) Network algorithms: routing and congestion control; protocol engineering: protocol decomposition, specification and verification, synthesis; protocols for high speed networks, parallel implementations, light-weight protocols. Pr.: CIS 520, and CIS 525 or permission of the instructor.

**CIS 730. Principles of Artificial Intelligence.** (3) Introduction to the fundamental concepts and techniques of AI: problem solving, search and planning, knowledge representation and qualitative reasoning, expert systems, natural language processing and cognitive modeling, computer vision, and machine learning. Pr.: CIS 630, 771.

**CIS 736. Computer Graphics.** (3) Topics in computer representation and display of images and graphic interaction. Pr.: CIS 636.

**CIS 740. Software Engineering.** (3) Software life cycle, requirements, specifications, design, validation, measures, and maintenance. Pr.: CIS 540.

**CIS 746. Software Measurement.** (3) Measurement theory; development, validation and use of software measures; software measures in the life cycle, including cost estimation, design measures, software complexity and software reliability. Pr.: CIS 540.

**CIS 750. Advanced Computer Architecture Experiments.** (3) Characteristics of various computers including those with execution support of multiprocessing, multiprogramming, microprogrammable, highlevel language, stack processing, and communication architectures. Two hours lecture and three hours lab a week. Pr.: CIS 350 or 407.

**CIS 761. Data Base Management Systems.** (3) Data models and languages, hierarchical, network, relational systems; implementation and operational requirements; programming projects using data base management systems. Pr.: CIS 560.

**CIS 762. Office Automation.** (3) Characteristics of information work; modeling systems for characterizing aspects of office environment; form-based systems; office automation and description languages, ergonomics, local area networks and tools used in the automation of offices. Pr.: CIS 525, 560; or permission of instructor.

**CIS 770. Formal Language Theory.** (3) Regular languages, finite automata, context-free languages, pushdown automata, context-sensitive languages, linear bounded automata, recursively enumerable languages, Turing machines. Pr.: CIS 570.

**CIS 771. Programming Science.** (3) Use of formal logic for specification and verification of programs; abstractions and assertions for data structures, procedures, packages, loops, and tasks. Pr.: CIS 604, 605.

**CIS 775. Analysis of Algorithms.** (3) Study and application of techniques and procedures used in the analysis of algorithms including the worst and average cases of both time and space. Study of the P and NP classes. Pr.: MATH 220, CIS 500, 604.

**CIS 798. Topics in Computer Science.** (Var.) I, II, S. Pr.: Prerequisite varies with the announced topic.

**CIS 801. Translator Design II.** (3) LR parsing, storage allocation, code generation, data flow optimization, compiler generators. Pr.: CIS 606.

**CIS 806. Semantics of Programming Languages.** (3) Introduction to formal semantics description methods for programming languages; comparison of operational, denotational, algebraic, and axiomatic methods; analysis of relationship of formal semantics definitions to computer implementation. Pr.: CIS 771.

**CIS 810. Logic Programming.** (3) Selected topics; constraint logic programming, deductive databases, concurrent logic programming, object-oriented logic programming, mathematical theory of logic programming specification and transformation of logic programs. Pr.: knowledge of Prolog.

**CIS 820. Topics in Theory of Asychronous Systems.** (3) Safety and liveness properties, synchronous and asychronous message passing systems, virtual circuit and datagram communication, process failure, concepts of composition and superimposition, temporal logic, reachability analysis, theory of concurrency control, atomic commitment, replica control. Pr.: CIS 720.

**CIS 825. Topics in Distributed Systems.** (3) Models of distributed computation, events and global states, failure semantics, communication abstractions, synchronization in distributed programs; distributed algorithms: election, termination and deadlock detection, broadcast programming and algorithms. Pr.: CIS 720; or CIS 725 and permission of the instructor.

**CIS 830. Current Topics in Artificial Intelligence.** (3) Advanced techniques and new ideas in artificial intelligence. Includes applications and case studies of artificial intelligence in action. Pr.: CIS 730.

**CIS 840. Advanced Topics in Software Engineering.** (3) Studies of one or more of the following topics: AI techniques in software engineering, formal specification methods and systems, software measures, software testing, programming environments. Topics will be announced. May be repeated for credit. Pr.: CIS 740, 771.

**CIS 860. Distributed Data Bases.** (3) Investigation of topics such as backend machines, redundancy, security, concurrency control, recovery, performance models, data distribution models, managerial considerations, and implementation issues. Pr.: CIS 761.

**CIS 870. Theory of Computability.** (3) Formal models for computability; universal programs; Church's thesis; unsolvable problems and reducibilities; partial recursive functions; recursive and recursively enumerable sets; s-m-n theorem and the recursion theorem. Pr.: CIS 770.

**CIS 890. Special Topics in Computer Science.** (2–4) Topics of the current state-of-the-art of computer science. Pr.: Prerequisite varies with the announced topic.

**CIS 897. Seminar in Computer Science.** (1–3) I, II, S. Required for graduate students in computer science. Pr.: Full graduate standing in CIS.

**CIS 898. Master's Report in CIS.** (1–2) I, II, S. Pr.: CIS 897.

**CIS 899. Research in Computer Science.** (1–6) I, II, S. Pr.: CIS 897.

**CIS 901. Topics in Translator Design.** (3) On sufficient demand, in alternate years. Topics involving incremental, extensible, conversational compilers; program development systems, portability and validation of compilers; compiler generators. Pr.: CIS 801.

**CIS 905. Theory of Programming Languages.** (3) In alternate years. Formal definition languages; operational and formal semantic models; equivalence of semantic models; formal properties of programming languages. Pr.: CIS 806.

**CIS 920. Research Topics in Distributed Systems.** (3) Topics on current state-of-the-art research in distributed systems. Pr.: permission of the instructor.

**CIS 926. Computation Structures.** (3) In alternate years. Petri nets, flowgraph schemata, dataflow models; relationships between abstract computational models and hardware models and programming languages. Pr.: CIS 771.

**CIS 930. Expert Systems.** (3) Advanced theory and techniques in the development of expert systems. Focuses on knowledge acquisition and knowledge organization used in expert systems. Includes design, implementation, and evaluation of an expert system. Pr.: CIS 830.

**CIS 940. Research Topics in Software Engineering.** (3) Research on one of the topics in CIS 840. May be repeated for credit. Pr.: CIS 840.

**CIS 960. Theory of Data Base Systems.** (3) In alternate years. Advanced topics in data base systems including distributed data bases, integrity, security, normalization, data base machines, performance models, query languages. Pr.: CIS 840.

**CIS 990. Research Topics.** (2–3) Study of current topics in computer science. Pr.: Consent of instructor.

**CIS 999. Research in Computer Science.** (Var.) I, II, S. Pr.: CIS 897.

# Electrical and Computer Engineering

**Head**

**David L. Soldan,** Professor, Ph.D. 1980, Kansas State University: Reliability/fault tolerance of computer systems; testing; computer networks.

**Professors**

**Kenneth H. Carpenter,** Ph.D. 1966, Texas Christian University: Electromagnetics; computing applications.

**Norman G. Dillman,** Ph.D. 1965, Iowa State University: Solid-state electronics; VLSI analog and digital design; instrumentation and sensors; semiconductor processes and devices.

**Stephen A. Dyer,** Ph.D. 1977, Kansas State University: Signal processing; Hadamard transform spectrometry; digital communication systems; digital systems design.

**Eddie R. Fowler,** Ph.D. 1969, Oklahoma State University: Machine intelligence; intelligent process control.

**Richard R. Gallagher,** Ph.D. 1968, Iowa State University: Bioengineering; circuits and control systems theory as applied to bioinstrumentation and physiological control systems.

**Donald R. Hummels,** Ph.D. 1969, Arizona State University: Communication theory; Signal detection and estimation.

**Gary L. Johnson,** Ph.D. 1966, Oklahoma State University: Wind electric systems; transmission lines.

**Donald H. Lenhert,** Ph.D. 1966, University of New Mexico: Microprocessor applications; design and testing of digital systems; built-in self-test.

**Michael S. P. Lucas,** Ph.D. 1964, Duke University: Computer-based instrumentation and data acquisition.

**Associate Professors**

**D. V. Satish Chandra,** Ph.D. 1984, Auburn University: Computer arithmetic; image processing; computer vision; parallel processing.

**John J. Devore,** Ph.D. 1984, Kansas State University: Digital image processing; digital hardware design; computer algorithms.

**Ruth A. Dyer,** Ph.D. 1980, University of Kentucky: Bioengineering; signal processing; control systems.

**Brian K. Harms,** Ph.D. 1985, Kansas State University: Communication theory; signal processing; instrumentation.

**Medhat M. Morcos,** Ph.D. 1984, University of Waterloo: Power electronics; power systems; electrical insulation; control systems.

**Anil Pahwa,** Ph.D. 1983, Texas A & M University: Load management; distribution automation; computer methods for power systems; artificial intelligence applications in power systems.

**Andrzej Rys,** Ph.D. 1983, Texas Tech University: Solid-state electronics; design and technology of semiconductor devices; device and process modeling; VLSI circuit design; electrical and optical characterization of III-V semiconductors.

**Assistant Professors**

**Dwight D. Day,** Ph.D. 1987, Oklahoma State University: Machine vision; time-spectral analysis; parallel processing; speech processing.

**Rodney O. Fox,** Ph.D. 1987, Kansas State University: Nonlinear dynamical systems; stochastic processes and statistics; turbulent reactive flow modeling; supercomputing applications.

**Dwight W. Gordon,** Ph.D. 1988, Lehigh University: Microprocessor systems; design and test of digital systems; robotics.

**William B. Hudson,** Ph.D. 1990, New Mexico State University: Neural networks; speech processing; rehabilitative engineering; computer architecture.

## Program description

The Department of Electrical and Computer Engineering offers a master of science in electrical engineering and participates in the College of Engineering doctor of philosophy program. Several areas of specialization are available at the graduate level. Major areas are bioengineering, communications systems, computer systems, control systems, electromagnetics, power systems, instrumentation, signal processing, and solid-state electronics.

At the master's level there are three options: thesis, report, and course work only. All require a minimum of 30 hours of credit. The Ph.D. program requires 60 hours beyond the master's, including original research of sufficient quality and importance to merit publication in a refereed journal.

## Program requirements

Most incoming students have undergraduate degrees in electrical engineering or computer engineering. Students with backgrounds in physics, mathematics, computer science, and other areas are also accepted into the program. These students may be required to complete undergraduate electrical engineering courses prior to full graduate admission. GRE scores are required for all students who do not have an electrical or computer engineering degree from an ABET-accredited program.

Applications for international students must be received by April 15 for fall admission and September 15 for spring admission.

## Research facilities

The department is located in Durland Hall. This 100,000-square-foot facility has been designed to provide an excellent academic environment. There are numerous well-equipped instructional and research laboratories including the computer laboratories, signal and image processing laboratory, instrumentation lab, test and measurements laboratory, bioengineering laboratory, energy systems laboratory, and solid-state electronics laboratory.

Extensive computing resources are available to the department. These cover a wide range: PCs, workstations, and special purpose computers. Most of these are connected to networks. K-State's computer center provides service with mainframe access. Access to supercomputers are also available.

## Financial support

Research and teaching assistantships are available on a competitive basis. Most graduate assistants will have both teaching and research responsibilities. For the 1992–1993 year, four-tenths time appointment stipends for master's students were $750 a month and for Ph.D. students were $860 a month. These normally increase each year. Students on four-tenths time assistantships pay in-state fees.

## Career opportunities

Graduate study in electrical engineering will prepare engineers to pursue careers in many diverse, high-technology areas. These careers can be in government, industry, or academia. Possible areas of employment are communications systems, medical equipment design, computer design and applications, power generation and distribution, automotive systems, manufacturing systems, and so on. Electricity and electronics are so necessary for our quality of life that it is difficult to find an area in which electrical engineers are not employed.

## Faculty contact

For additional information, please contact:

Dr. David L. Soldan, Head
Department of Electrical and Computer Engineering
Durland Hall
Kansas State University
Manhattan, KS 66506–5105
Phone: 913-532-5600

## Electrical and computer engineering courses

### Undergraduate and graduate credit in minor field

**EECE 501. 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.: EECE 241 and 510. Pr. or conc.: EECE 511 and 525.

**EECE 502. Electrical Engineering Laboratory II.** (2) I, II. Continuation of Electrical Engineering Laboratory I. Three hours lab a week. Pr.: EECE 501, 511, and 525. Pr. or conc.: EECE 526.

**EECE 510. 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.: CIS 200, MATH 222, and PHYS 213.

**EECE 511. Circuit Theory II.** (3) I, II, S. Analysis of electric circuits using differential equations, state equations, transform techniques and linear algebra. Three hours rec. a week. Pr.: PHYS 214, MATH 240, and EECE 510.

**EECE 512. Linear Systems.** (3) I, II. An introduction to linear system fundamental concepts and analytical methods. Analytical concepts presented are signal representation and classification, statistical parameters, convolution, Fourier analysis signal sampling, and discrete transforms. Three hours rec. a week. Pr.: EECE 511, STAT 510, and CIS 208.

**EECE 519. 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. Not open to EECE students. Pr.: PHYS 214.

**EECE 525. Electronics I.** (3) I, II. Fundamentals of electronic components, devices, and circuits. Three hours rec. a week. Pr.: EECE 510 or 519 or ET 530.

**EECE 526. Electronics II.** (3) I, II. Continuation of Electronics I. Three hours rec. a week. Pr.: EECE 511 and 525.

**EECE 530. Control Systems Design.** (3) I, II. Modeling, analysis, and design of control systems. Three hours rec. a week. Pr.: EECE 512.

**EECE 544. Computer Engineering Laboratory II.** (2) I, II. Practical aspects of digital systems design, including the design and operation of small computer systems. Three hours lab a week. Pr.: EECE 444 and 501. Pr. or conc.: EECE 557 and 649.

**EECE 557. Electromagnetic Theory I.** (4) I, II. Vector analysis, electrostatics, magnetostatics, Faraday's Law, Maxwell's Equations, transmission lines, and applications. Four hours rec. a week. Pr.: PHYS 214 and EECE 510.

**EECE 571. Introduction to Biomedical Engineering.** (1) I. Introduction to quantitative analysis techniques as applied to the study of physiological systems and their associated biological signals. One hour rec. a week. Pr.: MATH 222.

**EECE 581. Energy Conversion I.** (3) I, II. Energy conversion principles and their application to electric energy converters operating in the static and the dynamic mode. Three hours rec. a week. Pr.: EECE 510. Pr. or conc.: EECE 557.

**EECE 589. Circuits and Machines Lab.** (2) I, II. Practical aspects of electrical circuits, transformers, and electrical motors and generators. One hour lec. and two hours lab a week. Not open to EECE students. Pr.: EECE 519.

**EECE 590. Seminar.** (1) I, II. Preparation and oral presentation of a written technical report. One hour rec. a week. Pr.: ENGL 415.

### Undergraduate and graduate credit

**EECE 603. Advanced Electrical Engineering Laboratory.** (2) I, II. A project-oriented laboratory in which a small group of students works with a faculty member in a special area of interest. Projects usually involve design, measurement methods, or experimental work. May be repeated once. Pr.: EECE 502.

**EECE 624. Power Electronics.** (3) I. Theory and application of semiconductor devices to the control and conversion of electric power, control of DC and AC machines, design of electronic power circuits such as inverters, controlled rectifiers, and choppers using diodes, diacs, thyristors, triacs, and power transistors. Three hours rec. a week. Pr.: EECE 581 and 512. Pr. or conc.: EECE 526.

**EECE 625. Integrated Circuits Engineering.** (3) II. An introduction to integrated circuit fabrication processes including oxidation, diffusion, masking, etching, process monitoring, and device characterization. Design of bipolar and MOS circuits through laboratory experiments and computer simulations. Two hours recitation and three hours lab a week. Pr.: EECE 525 and CHE 350.

**EECE 627. Communication Electronics.** (3) I. An introduction to analog communication systems. Includes amplitude modulation (AM) and frequency modulation (FM) by analog signals and the determination of signal-to-noise ratio in AM and FM systems. Design of simple oscillators, modulators, mixers, and detectors. Three hours rec. a week. Pr. or conc.: EECE 512.

**EECE 628. Electronic Instrumentation.** (3) I, II. Applications of electronics in the design of analog and digital systems for the measurement of physical variables and in the transduction of these variables into a useful form for both recording and control. Two hours rec. and three hours lab a week. Pr.: EECE 502 and 526.

**EECE 631. Microcomputer Systems Design.** (3) I, II. Engineering application of microcomputers to instrumentation, control, and communications. Two hours rec. and three hours lab a week. Pr.: EECE 241, 525 or equiv., and CIS 200.

**EECE 632. Engineering Applications of Microcomputer Systems.** (3) I. Elements of digital building blocks and number systems. Computer systems organization, memories, microcomputer fundamentals. Applications of microcomputer systems. Not available for students with credit for EECE 241. Two hours rec. and three hours lab a week. Pr.: PHYS 214; high-level programming language.

**EECE 636. Introduction to Computer Graphics.** (3) I, II. An introduction to the hardware and software aspects of graphics generation. Programming assignments will provide practical experience in implementing and using standard graphics primitives and user interfaces. Three hours rec. a week. Pr.: CIS 208 and 300.

**EECE 641. Design of Digital Systems I.** (3) I, II. Design of combinational and sequential circuits, computer subsystems, and peripheral interfaces. Emphasis is placed on nonideal digital device phenomena, electromagnetic interference, radio frequency interference, shielding, and timing. Three hours rec. a week. Pr.: EECE 444 and 510, CIS 200.

**EECE 642. Design of Digital Systems II.** (3) On sufficient demand. Hardware aspects pertaining to special purpose counters, computer input-output devices, A–D and D–A conversion, magnetic memory devices and systems, clocks, and interfacing. Three hours rec. a week. Pr.: EECE 645 and 641.

**EECE 645. Digital Electronics.** (3) I, II. The characteristics and performance of the major contemporary digital logic families. Three hours rec. a week. Pr.: EECE 525, 557, and 641.

**EECE 647. Digital Filtering.** (3) I. Difference equation characterization of digital filters, transient and steady-state analysis of digital filters using the Z-transform, spectral analysis of digital signals, design and implementation of digital filters. Three hours rec. a week. Pr.: EECE 512.

**EECE 649. Computer Design I.** (3) I, II. Basic concepts of computer design. Arithmetic and logic unit design for fixed and floating point operations. Hardwired and microprogrammed control design with emphasis placed on instruction sets and addressing modes. Memory system design including virtual memory organization, caches, and associative memories. I/O design methods, interrupt mechanisms, DMA and I/O processors are covered. Three hours rec. a week. Pr.: EECE 641.

**EECE 659. Wave Guides, Antennas, and Propagation.** (3) On sufficient demand. Applications of Maxwell's equations to boundary value problems, guided transmission, cavities, radiation, and propagation. Three hours rec. a week. Pr.: EECE 557.

**EECE 661. Digital Communication Systems.** (3) II. An introduction to digital communication systems including modulation, transmission, demodulation, and random noise. Principles of optimum digital receiver design and evaluation of receiver performance are included. Three hours rec. a week. Pr.: EECE 512.

**EECE 662. Design of Communication Circuits.** (3) I, II. The design and performance testing of common communication circuits. Topics include tuned amplifiers, impedance matching, oscillators, filters, transmission lines, and phase locked loops. Two hours rec. and three hours lab a week. Pr.: EECE 526 and 502.

**EECE 663. Digital Error Control Coding.** (3) II. An introduction to the subject of error-correcting and error-detecting codes, both block and convolutional. Emphasis is placed on practical means of encoding and decoding the most commonly used codes such as Hamming, BCH, and Reed-Solomon codes. Three hours rec. a week. Pr.: EECE 241, STAT 510, and CIS 208.

**EECE 670. Engineering Applications of Machine Intelligence.** (3) II. Study concepts and applications of machine intelligence in functional models of engineering systems. Develop, as a term project, an expert system simulation/model for an engineering system that runs on a personal computer and develop the supporting documentation. Two hours rec. and three hours lab a week. Pr.: CIS 535.

**EECE 681. Wind Engineering.** (3) II. Wind characteristics, turbine performance, synchronous and asynchronous electrical loads, siting, economics, and wind farm design. Three hours rec. a week. Pr.: ME 512 or CE 530; and EECE 525 or 519.

**EECE 682. Energy Conversion II.** (3) On sufficient demand. Continuation of EECE 581. Three hours rec. a week. Pr.: EECE 581.

**EECE 683. Power Devices.** (3) II. The design of systems for the control and measurement of large voltages and currents, using power MOSFETs, other solid state switches, resonant transformers, Hall effect sensors, optoisolators, and fiber optics. Two hours rec. and three hours lab a week. Pr.: EECE 501, 525, and 581.

**EECE 685. Modeling, Computer Simulation, and Design of Electric Power Systems.** (3) I. A comprehensive study of modeling of the electric power system components and computer simulation of interconnected power systems in steady state. Vector-matrix descriptions are emphasized. Three hours rec. a week. Pr.: EECE 581.

**EECE 686. Fault Analysis and Protection of Electric Power Systems.** (3) II. Analysis of symmetrical and unsymmetrical faults on power systems using symmetrical components technique. Study of protective relaying for protection of power systems against faults. Vector-matrix descriptions and computer solutions are emphasized. Three hours rec. a week. Pr.: EECE 581.

**EECE 690. Problems in Electrical and Computer Engineering.** (Var.) I, II, S.

**EECE 694. Optoelectronics.** (3) I. Applied geometric and physical optics, optical radiation, and the interaction of light and matter. The theory and application of photodetectors, lasers, and other photoemitters. Introduction to fiber optical waveguides, sensors, and systems. Three hours rec. a week. Pr.: EECE 525, 557, and CHE 350.

**EECE 696. VLSI Circuit Design.** (3) I. Study of silicon NMOS and CMOS technologies in contemporary very large scale integrated circuits. The complete design of the circuit and lithographic masks on the Computer Aided Design (CAD) station. Two hours rec. and three hours lab a week. Pr.: EECE 241 and 525.

**EECE 728. Mixed Signal Measurements.** (3) On sufficient demand. Signal classification, noise and uncertainty, TRMS conversion, quantization and ADCs, repetitive sampling and signal recovery techniques, vector voltmeters, basic network analyzers. Three hours rec. a week. Pr.: EECE 512 or graduate standing.

**EECE 730. Control Systems Analysis and Design.** (3) II. Use of classical analysis techniques for control system compensation. State space control theory fundamentals are presented in addition to an introductory treatment of several major systems areas. Three hours rec. a week. Pr.: EECE 530 or ME 640. Same as ME 730.

**EECE 731. Advanced Microcomputer System Design.** (3) II. Design and engineering applications of 16 and 32 bit microprocessors. Utilization of peripheral and co-processor chips. Two hours rec. and three hours lab a week. Pr.: EECE 631.

**EECE 736. Discrete-Time and Computer-Control Systems.** (3) II. Analysis and design of discrete-time, sampled-data, and computer-control systems using discrete-state equations and Z-transforms. Three hours rec. a week. Pr.: EECE 526, 530, and 581.

**EECE 742. Data Communications.** (3) I, in odd years. The design and testing of popular local area networks for computers. Topics include topologies, media, signalling and modulation, testing, system design and installation. Emphasis on physical and data link layers of the Open System Interface (OSI) model. Three hours rec. a week. Pr.: EECE 512 or CIS 500.

**EECE 746. Fault Diagnosis in Digital Systems.** (3) II, in even years. Hazards, fault detection in combinational circuits, and sequential machines using path sensitizing and fault-matrix methods, state table analysis, etc.; system reliability through logical redundance. Three hours rec. a week. Pr. or conc.: EECE 641 or 631.

**EECE 747. Digital Signal Processing Laboratory.** (3) II. Digitization of analog signals; demonstration of aliasing problems; spectral analysis of digital signals using Fourier and other signal representation techniques; digital filtering problems; applications related to biomedical and speech data. Two hours lec. and three hours lab a week. Pr.: EECE 512. Pr. or conc.: EECE 647.

**EECE 749. Computer Design II.** (3) I. Study of alternate computer hardware structures. Investigation of engineering tradeoffs in implementation of alternative instruction sets and computing structures. Emphasis will be placed on a quantitative approach to cost/performance evaluations including simulation of hardware structures. Three hours rec. a week. Pr.: EECE 649.

**EECE 758. Electromagnetic Theory II.** (3) On sufficient demand. Continuation of EECE 557. Three hours rec. a week. Pr.: EECE 557.

**EECE 771. Control Theory Applied to Bioengineering.** (3) II. 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.: EECE 530 or ME 640, and a basic physiology course.

**EECE 772. Theory and Techniques of Bioinstrumentation.** (3) I. Theoretical aspects of biological signals, electrodes, transducers, and processing equipment with emphasis on the acquisition and recording of the responses to electrical potentials, pressure, and flow measurements. Three hours rec. a week. Pr.: EECE 771 or consent of instructor.

**EECE 773. Bioinstrumentation Laboratory.** (1) I. Practical experience with and evaluations of laboratory and clinical techniques related to electrodes, transducers, and monitoring equipment. Emphasis is on instrumentation for the respiratory, cardiovascular, and nervous systems. Three hours lab a week. Pr.: Conc. enrollment in EECE 772 and AP 773.

**EECE 791. Matrix Methods Applied to Electrical Engineering.** (3) On sufficient demand. Applications of matrices and linear vector spaces to electrical systems. Three hours rec. a week. Pr.: EECE 512.

**EECE 795. Solid State Electronic Devices.** (3) I, on demand. Introduction to quantum mechanics, crystal structures, and the semiconductor material properties. Diodes, bipolar transistors, and field effect transistor structures. Analysis of second order effects in real transistors. Three hours rec. a week. Pr.: EECE 525, 557, and CHE 350.

## Graduate credit

**EECE 828. Topics in Instrumentation.** (3) On sufficient demand. Selected topics related to the general field of electronic instrumentation. May be repeated. Three hours rec. a week. Pr.: EECE 628.

**EECE 830. Advanced Systems Theory.** (3) II. State space description and analysis of continuous and discrete time dynamic systems including optimal control solutions. Both linear and nonlinear systems are considered. Three hours rec. a week. Pr.: EECE 530 or ME 640.

**EECE 840. Computer Engineering Methods for Analysis, Simulation, and Design.** (3) I. Computer-aided and numerical techniques applicable to problems in electrical and computer engineering. Emphasis is on implementation of these techniques on the computer. Three hours rec. a week. Pr.: EECE 512.

**EECE 842. Parallel Processing.** (3) I (in odd years). Parallel processing application in signal and image processing. Array processors, pipeline processors, systolic and wavefront arrays, interconnection networks, performance analysis. Three hours rec. a week. Pr.: EECE 512, 649.

**EECE 845. Sequential Machines.** (3) II. Theory and mathematical framework of digital hardware will be developed. Limitations and fault detection of these machines will be explored using the theoretical basis of sequential machines. Three hours rec. a week. Pr.: MATH 510 and EECE 649.

**EECE 846. Computer Engineering Methods for Analysis, Simulation, and Design II.** (3) II. Continuation of EECE 840. Pr.: EECE 840.

**EECE 849. Topics in Computer Engineering.** (3) On sufficient demand. Selected topics relating to current developments in computer engineering. Topics may include computer architectures, computer networking, multiprocessing, and computer interfaces. May be repeated. Three hours rec. a week. Pr.: EECE 649.

**EECE 855. Advanced Topics in Electromagnetic Theory.** (3) On sufficient demand. Mathematical development of electromagnetic wave theory. Three hours rec. a week. Pr.: EECE 758.

**EECE 861. Noise Theory.** (3) I. Study of noise phenomena and measurement; the representation of noise by statistical parameters, the noise factor of undesired noise sources, and the measurement applications of noise generators. Three hours rec. a week. Pr.: EECE 512.

**EECE 866. Transform Processing of Digital Signals.** (3) II. Orthogonal transforms in digital signal processing with emphasis on one- and two-dimensional signals, generalized Wiener filtering, feature selection in pattern recognition, and elements of adaptive filtering techniques. Three hours rec. a week. Pr.: EECE 861.

**EECE 867. Digital Image Processing.** (3) I. Basic concepts and techniques of image formation, representation, analysis, restorations, enhancement, coding, segmentation, and description. Object recognition using shape descriptors and syntactic techniques. Image processing applications in remote sensing, computer vision, and medical diagnosis. Three hours rec. a week. Pr.: EECE 512.

**EECE 870. Neural Networks in Engineering.** (3) I, (in even years). Engineering applications of artificial neural networks and machine intelligence. Particular emphasis will be placed on determining appropriate applications of alternate computing approaches and establishing efficient hardware support to implement these computational approaches. Three hours rec. a week. Pr.: EECE 670.

**EECE 881. Advanced Topics in Electric Energy Systems.** (3) On sufficient demand. Subjects of current interest such as computer methods, distribution and transmission systems, systems planning and economics, extra high voltage transmission, exotic power sources. May be repeated. Three hours rec. a week. Pr.: EECE 686.

**EECE 895. Solid-State Electronic Devices** (3) I, on demand. Introduction to quantum mechanics, crystal structures, and the semiconductor material properties. Diodes, bipolar transistors, and field-effect transistor structures. Analysis of second-order effects in transistors. Three hours rec. a week. Pr.: CHE 350, EECE 557, and EECE 625 or EECE 696.

**EECE 890. Advanced Electrical Theory.** (Var.) I, II. For advanced study in specialized areas by M.S. students. Pr.: M.S. student.

**EECE 897. Research in Electrical Engineering.** (Var.) I, II, S. Special research problems in electrical engineering. Pr.: Consent of instructor.

**EECE 898. Master's Report.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

**EECE 899. Master's Thesis.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

**EECE 931. Advanced Topics in Control Theory.** (3) On sufficient demand. Study of advanced topics in optimal, time-varying, and stochastic control theory, or other recent developments in the control systems area. May be repeated. Three hours rec. a week. Pr.: EECE 830.

**EECE 949. Advanced Topics in Computer Engineering.** (3) On sufficient demand. Selected topics related to advanced computer hardware design, performance measurements, sequential machines, and/or advanced computer architectures. May be repeated. Three hours rec. a week. Pr.: EECE 845.

**EECE 962. Advanced Topics in Communications.** (3) On sufficient demand. Selected topics related to the design and performance analysis of communication systems. Topics may include advanced modulation techniques, optimum receiver design, nonlinear channels, multipath analysis, diversity systems, and others. Three hours rec. a week. Pr.: EECE 861.

**EECE 963. Signal Detection Theory.** (3) I. A study of optimum signal detection principles for analog and digital communication over the linear additive noise channel. Includes series representations for random signals and the derivation of minimum mean square error (MMSE) receivers for AM and FM and maximum likelihood (ML) receivers for FSK, MSK, and M-Ary PSK. Three hours rec. a week. Pr.: EECE 861.

**EECE 965. 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.: EECE 861.

**EECE 967. Advanced Topics in Digital Signal Processing.** (3) On sufficient demand. Selected topics related to adaptive digital filtering techniques; special purpose hardware for digital filtering; two-dimensional signal processing and classification. Three hours rec. a week. Pr.: EECE 866 or 868.

**EECE 968. Advanced Digital Filtering.** (3) II. Advanced treatment of the theory of digital filtering and digital signal processing. Emphasis is on analysis of random signals. Three hours rec. a week. Pr.: EECE 647 and 861.

**EECE 971. Advanced Topics in Bioengineering.** (3) On sufficient demand. Study of complex physiological system simulation and analysis techniques, modern experimental and clinical electronic bioinstrumentation systems. Topics selected according to graduate student's interests. May be repeated. Three hours rec. a week. Pr.: EECE 771 or 772.

**EECE 999. Dissertation Research.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

# Industrial Engineering

**Professors**

**Farhad Azadivar,** Ph.D. Purdue University 1980, manufacturing systems engineering, robotics, computer simulation, traffic and transportation.

**Mike Harnett,** Ph.D. University of Alabama in Huntsville 1974, operations research, large scale systems optimization, systems analysis and engineering.

**Steve Konz,** Ph.D. University of Illinois 1964, ergonomics, facility design.

**Stanley Lee,** Ph.D. Princeton University 1962, operations research, queuing theory, stochastic systems, uncertainty reasoning.

**Associate Professors**

**David Ben-Arieh,** Ph.D. Purdue University 1985, robotics, computer aided manufacturing, expert systems.

**Brad Kramer,** Ph.D. Kansas State University 1985, manufacturing systems engineering, computer aided manufacturing robotics.

**Assistant Professors**

**Shing Chang,** Ph.D. Ohio State University 1991, quality engineering, statistical process control, quality control.

**Malgorzata Rys,** Ph.D. Kansas State University 1989, ergonomics, occupational safety engineering.

**Evangelos Triantaphyllou,** Ph.D. Pennsylvania State University 1990, operations research, expert systems.

## Academic programs

The department conducts graduate programs emphasizing the following areas of industrial engineering: manufacturing systems, operations research, human factors (ergonomics) and engineering management. Master's and doctoral enrollments approximate 60 and 14, respectively. Students are encouraged to compose programs of study drawing supporting material from other departments including computing and information sciences, statistics, and others.

The Department of Industrial Engineering offers the following degrees/options at the graduate level.

M.S. in industrial engineering
M.S. in industrial engineering, manufacturing systems option
M.S. in industrial engineering, engineering management option
M.S. in operations research
Ph.D.

Master of science programs may be formulated using either thesis or report formats. Doctoral programs require a significant original research project documented in the form of an acceptable dissertation. The latter are expected to be suitable for publication in the open literature.

## Program requirements

To pursue the IE graduate degrees students must hold a B.S. degree in engineering and be versed in several of the basic areas of industrial engineering. Non-industrial engineering undergraduates generally require 15 semester credits of remedial courses.

The engineering management option may have special requirements for preparatory undergraduate courses, including industrial management, managerial accounting, business finance, and probability and statistics, depending on the student's choice of broadening courses to be included in the program of study.

Students will be able to pursue the M.S. in operations research if they hold degrees in engineering, mathematics, statistics, computing science, physical science, biological science, or economics and have a strong quantitative background.

## Research emphases

The research in the Department of Industrial Engineering is aligned in five primary areas.

### Ergonomics

• Investigations of cumulative trauma disorders which cost U.S. industry $27 billion annually in medical expenses and lost productivity. Projects include the development of expert systems to suggest ways of reducing cumulative trauma disorders via such measures as work station design, establishing exercise programs and scheduling rest breaks for workers.

• Investigations of the cost-effectiveness of highway sign systems as means of promoting public safety.

• Investigations of human performance in visual inspection systems.

• Investigations of office lighting schemes and their interaction with the ubiquitous computer screen.

### Manufacturing systems

• The integration of the product and production system design processes aimed at improving the efficiency of the process. This includes developing computer-based methodologies for planning the production processes and assembly sequences for a product and developing statistical tools for predicting production characteristics such as tolerances and surface finishes.

• Development of low-cost devices to facilitate automated production processes.

• Development of methodologies to optimize the scheduling of production operations.

### Operations research

• Expanding the methodologies available for optimizing linear decision problems to combine fuzzy and multiple-objective approaches.

• Developing uncertainty reasoning as a tool for controlling manufacturing operations.

• Developing methodologies to improve the efficiency and effectiveness of expert systems.

• Developing methods of large-scale systems optimization for scheduling corrective maintenance actions.

### Pollution control

• Solid waste minimization and management.

• Hazardous waste management.

### Quality engineering

• Diagnosis of quality problems.

• Improvement of product quality.

• Control of manufacturing cost through manufacturing process improvement.

## Major research facilities and equipment

The Department of Industrial Engineering has six well-equipped laboratories supporting some of its research activities. Some additional research is conducted using actual facilities, such as industrial facilities and waste processing facilities, rather than university laboratories.

The ergonomics laboratory contains measurement apparatus for assessing stress levels imposed on human workers by various job designs and work environments.

The VDT lighting laboratory simulates office settings and lighting systems for investigations of lighting system effects on human occupants.

The manufacturing processes laboratory consists of a wide range of manufacturing process equipment that can support research involving basic manufacturing processes. The laboratory includes numerous lathes and milling machines, a foundry with gas-fired and electric induction furnaces, molten salt heat treat facility, gas-flame metal cutting and joining processes, various welding processes, and material properties measurement equipment.

The integrated design, manufacturing, and assembly laboratory consists of a design cell, an industrial-grade CNC machining cell, and an assembly cell. The design cell includes a network of Apollo and Sun engineering graphics workstations and a VAX II microcomputer. The machining cell includes a four-axis Maho machining center with a rotary table and two pallets, a Mori Seiki turning center with live tooling and a Pratt & Whitney machining center all integrated by a Kraft Telerobotics six-axis robotic material handling system mounted on a three-axis gantry positioning system. The assembly cell includes a flexible, dual-line, palletized material handling system with bar code identification equipment, five manual assembly stations and three assembly stations equipped with Intelledex assembly robots.

The quality engineering laboratory supports demonstrations and projects involving the control of quality related aspects of manufacturing processes. The lab includes a computer-controlled, bench scale simulated manufacturing facility, a Sun workstation and a 486 microcomputer.

The departmental computing laboratory includes a 486 microcomputer network with 10 diskless units supported by a file server (the network also links microcomputers in faculty offices and the university mainframe computer) and a TI MicroExplorer for LISP implementations of AI/expert systems.

## Financial support

Financial support for a number of teaching and research assistants is available. However, the requests for this support regularly outstrips

the funding available. Awards are made on a competitive basis. The awarding of financial assistance is separate and distinct from admission to the graduate program. Many students choose to enroll without financial assistance to pursue the various graduate degrees/options in industrial engineering.

## Industrial engineering courses

### Undergraduate and graduate credit in minor field

**IE 501. Industrial Management.** (3) I, II. Basic functions in an industrial organization and their interrelationships; management considerations involving product, process, plant, and personnel. Three hours rec. a week.

**IE 530. Industrial Project Evaluation.** (3) I, II. The evaluation of industrial project alternatives by the construction and analysis of mathematical models. Basic concepts, with an emphasis on constrained and unconstrained deterministic and probabilistic evaluation methodology, data analysis, and replacement theory. Three hours rec. a week. Pr.: MATH 222 and IE 373.

**IE 541. Statistical Quality Control.** (3) I. Frequency distributions, normal, binomial and Poisson distributions. Control charts on means, fraction defective and number of defects. Dodge-Romig and Military Standard Sampling Plans. Three hours rec. a week. Pr.: STAT 511, IE 373.

**IE 555. Industrial Facilities Layout and Design.** (3) II. Design of industrial facilities with emphasis on manufacturing engineering and material handling. Two hours rec. and two hours lab a week. Pr.: IE 623.

**IE 560. Introduction to Operations Research I.** (3) I, II. A study of the methods of operations research including model formulation and optimization. Topics include: assignment/transportation problems, linear programming, network flows, simulation. Three hours lec. a week. Pr.: IE 373, MATH 222. Pr. or conc.: STAT 510.

**IE 564. Product and Process Engineering.** (3) I. A study of the interrelationships between product design and production process selection. Emphasis is on the development of economic production systems for discrete products in a competitive manufacturing environment. Concepts of design for manufacture and assembly, tool engineering, and manufacturing systems design are included. Two hours lecture, three hours lab per week. Pr.: CHE 352, IE 242. Pr. or conc.: IE 530.

**IE 575. Quantitative Techniques in Industrial Engineering.** (3) I, II. 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.

### Undergraduate and graduate credit

**IE 601. Introduction to Systems Management.** (3) I, II. A general introduction to the formulation and mathematical solution of management and business problems. Includes the formulation of business and management problems and their solutions, utilizing optimization theory, finite mathematics, and statistical techniques. Taught at Ft. Leavenworth only. Three hours rec. a week. Pr.: MATH 222 and consent of instructor.

**IE 602. Topics in Industrial Engineering.** (Var.) I, II, S. Lectures on recent topics in industrial engineering.

**IE 604. Independent Study in Industrial Engineering.** (Var.) I, II, S. This course involves independent study at the introductory graduate level.

**IE 605. Advanced Industrial Management.** (3) I. Managing groups of employees in engineering settings; theory of organization design; designing engineering and technological organizations; professionalism and ethical considerations in engineering. Three hours lec. a week. Pr.: IE 501.

**IE 610. Occupational Safety Engineering.** (3) II. An overview of factors affecting safety in organizations, emphasizing analysis techniques and design strategies. Topics include occupational safety, accidents, fire protection, industrial hygiene, hazardous waste, toxicology, radiation safety, product liability and federal standards. A project involving a hazard analysis and the design of solutions for a field location is required. Three hours lec. a week. Pr.: IE 242.

**IE 612. Hazardous Materials Management.** (2) I. All aspects from generation to final disposal will be studied, including: identifying hazardous materials, chemical safety, storing and shipping chemicals, and treatment and disposal of hazardous wastes. Two hours lecture a week. Pr.: CHM 230.

**IE 623. Industrial Ergonomics.** (3) I. Process analysis and charting; principles of motion economy and ergonomics; work stations and environments; micromotion analysis and an introduction to standard data systems. Two hours rec. and three hours lab a week. Pr.: IE 242.

**IE 625. Work Environments.** (3) II. Basic structure and performance of the human, viewed as a component in information processing and control systems. Effect of visual, auditory, toxic and thermal environments. Two hours rec. and two hours lab a week. Pr.: IE 242.

**IE 633. Production Planning and Inventory Control.** (3) I. Principles, techniques, and applications of production planning and inventory control. Design of control systems. Three hours rec. Pr.: IE 242. Pr. or conc.: IE 560.

**IE 643. Industrial Simulation.** (3) I, II. Computer simulation modeling of industrial systems emphasizing the design, verification and validation of the models and the use of the model as a systems design tool. Three hours rec. Pr.: 560. Pr. or conc.: STAT 511.

**IE 651. Standard Data Systems.** (3) I. Microscopic and macroscopic standard data systems; commercial versions; company-developed plans; programmed standard data systems. Taught at Ft. Leavenworth only. Three hours rec. a week. Pr.: NE 385.

**IE 652. Industrial Ergonomics.** (3) I, II. The design process, work analysis techniques, principles of work organization, work station and hand tools. Facilities management. Lighting, noise and industrial hygiene. Time determination. Work standards. Taught at Ft. Leavenworth only. Three hours rec. a week. Pr.: consent of instructor.

**IE 660. Introduction to Operations Research II.** (3) I. Continuation of IE 560. Topics include decision theory, Markov processes, queuing theory, nonlinear programming, dynamic programming. Three hours lec. a week. Pr.: IE 560.

**IE 662. Computer Aided Manufacturing.** (3) I. Concepts in CAM, integrated control of machine tools and transport devices with production control. Concepts of CAM and automated assembly in small lot production environment. Two hours lecture and three hours lab a week. Pr.: IE 242 and IE 373 or equivalents.

**IE 671. Topics in Automated Factory Concepts.** (3) I. Introduction to concepts of automation, automatic transfer lines and CAD/CAM. Emphasis on robots and their role in automated factories. Concepts of group technology, computer-aided process planning, automated material handling equipment for automated factories. Three hours lec. a week. Pr.: IE 633 and IE 662.

**IE 672. Robotic Applications.** (3) II. History, development of the work environment for robots, their application and implementation. Concepts of control and sensory feedback in robots are covered. Three hours lecture. Pr.: IE 242 and NE 385.

**IE 685. Principles of Manufacturing Information Systems.** (3) II. Introduction to the theory and concepts of information for manufacturing. Design of manufacturing systems such as MRP, SFRS, CAD/CAM, etc. Concerns of integration and man-machine interface in manufacturing systems. Three hours lec. a week. Pr.: IE 633.

**IE 751. Applied Decision Theory.** (3) II (alternate years). Bayes theorem, Bayesian estimators, utility, loss function and risk, minimax strategies, elementary game theory. Three hours rec. a week. Pr.: STAT 511 or equivalent.

### Graduate credit

**IE 802. Advanced Topics in Industrial Engineering.** (Var.) I, II, S. This course involves independent study of recent advanced topics in industrial engineering.

**IE 804. Advanced Independent Study in Industrial Engineering.** (Var.) I, II, S. Lectures on recent advanced topics in industrial engineering.

**IE 805. Engineering Administration.** (3) I. Engineering administration; organization factors in decision-making. Three hours rec. a week. Pr.: IE 501.

**IE 806. Engineering Project Management.** (3) II. Planning, scheduling, and controlling engineering projects. Includes determination of appropriate project team, cost/benefit analysis, PERT and CPM scheduling techniques, reporting, and use of computerized project management tools. Three hours lec. a week. Pr.: IE 501 and IE 530.

**IE 811. Advanced Production and Inventory Control.** (3) II. Analytical and mathematical methods of making decisions on production, inventories, human resources, and shipping in modern industrial plants. Three hours rec. a week. Pr.: IE 633.

**IE 820. Intelligent Manufacturing Systems.** (3) II. Concepts and applications of machine intelligence to manufacturing process and systems. Each student will develop a prototype system which demonstrates the appropriate application of machine intelligence to solve a practical integrated manufacturing systems problem. Two hours recitation and three hours lab a week. Pr.: IE 671 or equivalent.

**IE 830. Applied Fuzzy Set Theory.** (3) I. The emphasis will be on applicational aspects. Topics covered are elementary fuzzy set theory, fuzzy measure, possibility theory, fuzzy linear programming and other fuzzy optimization techniques, fuzzy linguistics and expert systems, fuzzy production and inventory control, and fuzzy operations research models. Three hours rec. a week. Pr.: STAT 510.

**IE 836. Operations Research and Artificial Intelligence.** (3) I, II. An introduction to the problems related to the development of expert systems and application of AI techniques to engineering. Emphasis is on using optimization techniques in dealing with large knowledge bases. Topics include question asking strategies, the clause satisfiability problem, and inferring rules from examples. Three hours lec. a week. Pr.: IE 560 and knowledge of a scientific programming language.

**IE 841. Advanced Topics in Quality Engineering.** (3) I. A survey of current advances in quality engineering. Includes both off-line and on-line quality engineering. Three hours lec. a week. Pr.: STAT 704, 705 and IE 641 and knowledge of Lotus 123 and (Fortran, Pascal or C).

**IE 842. Reliability Theory I.** (3) I. The mathematics of reliability theory. The hazard function. Calculation of failure density and mean life for series, parallel systems, and various types of standby systems. Hypotheses tests on mean life. Life testing with censoring. Three hours rec. a week. Pr.: STAT 511 or equiv.

**IE 843. Reliability Theory II.** (3) II (alternate years). Maintenance and repair models, availability, using Laplace transforms and Markovian analysis. Basics of Bayesian decision theory with applications to reliability theory. Three hours rec. a week. Pr.: IE 842.

**IE 850. Ergonomics (Human Factors) Engineering I.** (3) I. The design and analysis of applied experimental research on human behavior as applied to engineering systems. An experimental project. Two hours rec. and three hours lab a week. Pr.: STAT 702 or 703.

**IE 865. Simulation of Industrial and Management Systems.** (3) II. Simulating industrial management systems on computers utilizing Monte Carlo techniques and simulation languages. Numerical methods related to simulation. Three hours rec. a week. Pr.: IE 643.

**IE 867. Modeling of Manufacturing Systems.** (3) II. Discussion and application of various techniques used in modeling manufacturing systems. Techniques included are discrete event computer simulation, queuing models, network models and neural network models. Three hours lecture a week. Pr.: IE 643.

**IE 871. Advanced Topics in Computer Integrated Manufacturing.** (3) II. Modern issues of computerized manufacturing considering both hardware and software approaches and methods. Advanced concepts in intelligent machine programming and applications, group technology, computer aided process planning, and scheduling will be

discussed. Research issues will be presented. Three hours lecture a week. Pr.: IE 633, IE 662 or equivalents.

**IE 872. Industrial Forecasting Techniques and Applications.** (3) I. The problems of model construction for industrial forecasting. The application of least squares, regression, exponential smoothing, and adaptive fitting will be studied in solving industrial engineering problems. Three hours rec. a week. Pr.: STAT 511 or 705.

**IE 873. Industrial Systems Analysis.** (V) 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.: consent of instructor and IE 660.

**IE 881. Linear Programming.** (3) II (alternate years). Development of the theory of linear programming and related topics including simplex methods, 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.: IE 560.

**IE 885. Advanced Manufacturing Information Systems.** (3) I. Survey of topics in Computer Integrated Manufacturing. Issues such as the Manufacturing Automation Protocol (MAP), representation of solids in CAD, storage and retrieval of such information are considered. Three hours lecture a week. Pr.: IE 685 or equivalent.

**IE 892. Graduate Seminar in Industrial Engineering.** (0) I, II. Presentation and discussion of topics of contemporary interest in industrial or manufacturing engineering. M.S. and Ph.D. candidates make one presentation. One one-hour seminar meeting a week.

**IE 898. Master's Report.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

**IE 899. Master's Thesis.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

**IE 950. Human Factors.** (3) II. The design and execution of applied experimental research on human behavior as applied to engineering systems. An experimental project. Three hours rec. a week. Pr.: STAT 702 or 703.

**IE 971. Industrial Queuing Processes.** (3) I, II. Introduction to the queuing process and theory of queues; analysis of single and multistation queues; application to production, materials handling, inventory and maintenance systems. Three hours rec. a week. Pr.: STAT 510.

**IE 976. Scheduling Theory.** (3) I, II. Project scheduling, assembly line balancing, shop scheduling, basic structure, measures of performance, combinatorial and statistical aspects. Various approaches to the analysis of shop scheduling. Three hours rec. a week. Pr.: consent of instructor.

**IE 982. Nonlinear Programming.** (3) I, 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, quasilinearization, and invariant imbedding. Three hours rec. a week. Pr.: STAT 510.

**IE 983. Dynamic Programming.** (3) I, 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.: STAT 510.

**IE 990. 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.

**IE 991. Multiple Criteria Decision Making.** (3) I, II. Decision processes for problems involving multiple conflicting criteria; multiple attribute decision making; multiple objective decision making, and group decision making under multiple criteria. Various methods/approaches for different problems are discussed. Three hours rec. a week. Pr.: IE 560 and 874.

**IE 999. Dissertation Research.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

# Mechanical Engineering

**Professors**

**Fredric C. Appl,** Ph.D., Carnegie Mellon University: cutting mechanics, probabilistic machine design, numerical analysis.

**Naim Z. Azer,** Ph.D., University of Illinois: basic heat transfer, fluid mechanics, two phase flow, environmental engineering as it relates to human comfort.

**Allen C. Cogley,** Ph.D., Stanford University: radiative transfer, fluid mechanics, conductive heat transfer.

**Donald L. Fenton,** Ph.D., University of Illinois: thermodynamics, combustion, combustion system analysis, computer-aided thermal system design, digital simulation of internal combustion engines, refrigeration systems.

**Robert L. Gorton,** Ph.D., P.E., Kansas State University: thermal systems, industrial air conditioning, electric heating/storage systems, heated greenhouses, and fluid transients and control in piping systems.

**Chi-Lung Huang,** Ph.D., Yale University: nonlinear dynamic structural analysis, heat and mass transfer in porous media, theory of failure in composites.

**Byron W. Jones,** Director of the Institute for Environmental Research, Ph.D., P.E., Oklahoma State University: heat and mass transfer, thermal interaction between the human body and the environment, and thermal systems of buildings.

**Paul L. Miller,** Ph.D., P.E., Oklahoma State University: room air diffusion research using low temperature (40 F) air, heat transfer and instrumentation.

**J. Garth Thompson,** Ph.D., Purdue University: integration and automation of design and manufacturing of mechanical objects using expert, feature-based methods and on intelligent, hierarchical automatic control-systems.

**Ralph O. Turnquist,** Ph.D., Case Institute of Technology: fluid power components and systems, hydrostatic and powershift transmissions, fluidics and automatic controls.

**Hugh S. Walker,** Ph.D., P.E., Kansas State University: storage of alternative diesel fuels (seed oils), solid mechanics, stress analysis, vibration, computing techniques and internal combustion engines, composite materials.

**Associate Professors**

**B. Terry Beck,** Ph.D., Oakland University: heat transfer, fluid mechanics and two-phase flow, optical probe for measurement of oil concentration in evaporating or condensing flows, development of Laser Doppler Velocimetry (LDV) Research Facility at the USAF Academy, development and application of a Scanning LDV System for measurement of local instantaneous vorticity.

**Prakash Krishnaswami,** Ph.D., University of Iowa: mechanical systems analysis and optimization, design automation, computer-integrated manufacture, design for manufactorability, expert systems for design.

**Daniel V. Swenson,** Ph.D., Cornell University: dynamic and static fracture, coupled non-linear problems (gas-driven fracture, fluid flow through faulted rock), finite element methodology, and interactive computer graphics.

**Warren N. White,** Jr., Ph.D., Tulane University: robot dynamics, kinematics, and control, optimal control of mechanical systems, and vibrations of nonlinear systems.

**Assistant Professors**

**Kirby S. Chapman,** Ph.D., Purdue University; thermal sciences, radiative heat transfer, computational fluid dynamics, combustion kinetics, internal combustion engines and pollution control.

**Mohammad Hosni,** Ph.D., Mississippi State University: fluid mechanics, heat transfer, experimental techniques, uncertainty analysis and design of experiments, surface roughness effects on turbulent flow and heat transfer.

## The department

The graduate faculty in mechanical engineering are engaged in biomedical and human thermal environmental engineering research with the Institute for Environmental Research, and participate actively in the Center for Research in Computer Controlled Automation.

The Institute for Environmental Research is an interdisciplinary research center for the study of the thermal interaction between people and their surroundings. Activities include human thermal response and modeling, thermal comfort and stress, building thermal environmental control, thermal protection of the human, and heat and moisture transfer through clothing.

The Center for Research in Computer Controlled Automation is an interdisciplinary unit for development of integrated design, manufacturing and assembly systems. The facility includes a network of workstations for engineering design, research, and software development along with unique and versatile manufacturing and assembly work cells.

The Department of Mechanical Engineering offers graduate study and research opportunities leading to the master of science and doctor of philosophy degrees. At the M.S. level, additional options exist for design-oriented thesis work and course-work-only programs. In keeping with the university tradition of providing a relevant engineering education, present course work and research (and design topics) are closely aligned with the technical problems of modern society. The development of a close student-faculty relationship is fostered by maintaining small class sizes and a low student-faculty ratio. Each program of study is tailored by the student and the faculty advisor to meet the student's needs and interests, while conforming to the academic requirements and standards of the department and the university. At the doctorate level, the student is expected to develop strength in the physical sciences and mathematics by taking course work in those fields deemed appropriate by his or her supervisory committee. The M.S. and Ph.D. degrees granted by the department are highly respected throughout the world.

The department consists of 17 full-time graduate faculty members and about 50 graduate students. The range of research interests of the faculty in mechanical engineering is quite broad, offering graduate students opportunities for advanced work in fluid and solid mechanics, heat transfer, thermodynamics, transport phenomena, automatic controls and dynamics, air conditioning, energy conversion, fluid and gas dynamics, environmental engineering, engineering design, kinematics, and vibrations. Laboratory facilities and basic instrumentation are available for experimental work in these areas. The faculty are also engaged in biomedical and environmental engineering research with the Institute for Environmental Research. Graduate students also have access to a variety of computers and the various engineering laboratories and shops.

While most course work is taken in the student's area of specialization, each student is

encouraged to take some courses from other specialty areas or from other departments. This flexibility is helpful to students who start a graduate program without being sure of their desired area of specialization and provides broader background that should be useful in the event of future change of occupation or interest.

Financial support is available for qualified applicants. Appointments are normally for nine months and require approximately 16 hours (0.4 time) of work per week. In some cases, these can be extended through the summer. In the usual case, the subject of the thesis is also the subject of the required work. Such appointments require a minimum enrollment of 12 semester hours. Stipends range from $6,300 through $9,000 for nine months. A student in the course-work-only M.S. option will probably not receive support from the department. Graduate teaching assistantships are also available.

Foreign applicants are required to demonstrate their facility in the English language by making a satisfactory score of 600 on the Test of English as a Foreign Language (TOEFL) (GC9-24-65).

All prospective graduate teaching assistants who are non-native speakers of English shall be required to achieve a minimum score of 240 on the TSE (Test of Spoken English) to be eligible for employment. *International students appointed as graduate teaching assistants must arrive on campus by July 1 to participate in English instruction and pass the TSE with a minimum score of 240.* All prospective graduate teaching assistants shall have their spoken English competency assessed prior to any teaching assignment through an interview with not less than three institutional personnel. Any graduate teaching assistant having classroom or laboratory instructional responsibility and/or direct tutorial responsibilities, other than for courses or sessions conducted primarily in a foreign language, found to be potentially deficient, shall be required to achieve a minimum score of 240 on the TSE even if such student has previously achieved such score prior to employment.

In addition to the TOEFL, GRE scores are required. The quantitative and analytical added together must equal 1350 or higher.

Application forms for admission can be obtained from the Department of Mechanical Engineering, 302 Durland Hall, Manhattan, KS 66506. Be sure to address all questions and/or inquiries about graduate studies in the department to the graduate studies coordinator in mechanical engineering.

### Master of science degree

A minimum of 30 credits must include one 800–900 level mechanical engineering course, and no more than two 600-level mechanical engineering courses. Candidates for the master's degree are required to spend one academic year in residence, except under special conditions, when the residence may be reduced to one and one-half semesters, or three summer sessions of full time graduate study. Offerings numbered at the 700- and 800-level are particularly designated as master's-level work, and they should comprise a major portion of the program of study for the master's degree. Courses at the 600-level may be included, but the use of 500-level courses is restricted, as these are expected to have been completed as undergraduate prerequisites to graduate study or as undergraduate deficiency courses assigned upon admission. Accordingly, the use of 500-level supporting courses in master's programs of study is limited as follows:

1. No course in the student's major area may be included.

2. Within the 30 to 32 credits normally required for the MA or MS no more than two courses nor more than 20 percent of the program of study may be at the 500-level. In other master's programs no more than 20 percent of the credit for the degree may be at the 500-level. (GC2-7-84)

### Doctor of philosophy degree

A minimum of 90 semester hours beyond the B.S. degree is required. A master of science degree is normally required for entrance into the Ph.D. program. A comprehensive examination and the writing and defense of a doctoral thesis are also required.

## Mechanical engineering courses

### Undergraduate and graduate credit in minor field

**ME 512. 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.: CE 333 and MATH 222.

**ME 513. 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 213; MATH 222.

**ME 523. Thermodynamics II.** (3) I, II. Continuation of Thermodynamics I. Gas mixtures, psychrometry, generalized thermodynamic relations and reactive systems. Three hours rec. a week. Pr.: ME 513.

**ME 533. Machine Design I.** (3) I, II. Displacement, velocity, and acceleration analysis of machine elements—cams, gears, and other mechanisms. A brief introduction to dynamics of machines. Three hours rec. a week. Pr.: ME 512.

**ME 535. Mechanical Engineering Laboratory I.** (3) I, II. Theory and application of mechanical engineering measurements, instrumentation, and computer-based data acquisition. One hour rec. and six hours lab a week. Pr.: ME 400, 513, and EECE 519.

**ME 560. Engineering Economics.** (3) I, II. Economic analysis of problems as applied in engineering. Three hours rec. a week. Pr.: ECON 110, junior standing in engineering.

**ME 563. 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.: CE 533 and ME 533.

**ME 571. 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.: ME 512. Pr. or conc.: ME 513.

**ME 573. Heat Transfer.** (3) I, II. Fundamentals of conduction, convection, and radiation; principles of heat exchanger design and dimensional analysis. Three hours rec. a week. Pr.: ME 571, MATH 240.

**ME 575. Mechanical Engineering Design Laboratory.** (3) 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.: ME 573 and 563.

**ME 583. Mechanical Engineering Laboratory II.** (2) I, II. Planning and executing experimental studies on mechanical and thermal systems; analysis of experimental results; oral and written reports. Six hours lab a week. Pr.: ME 535 and 571. Pr. or conc.: ME 573.

### Undergraduate and graduate credit

**ME 620. Internal Combustion Engines.** (3) I. Analysis of cycles, design and performance characteristics. Three hours rec. a week. Pr.: ME 523.

**ME 622. Environmental Engineering I.** (3) II. Psychrometry; heating-cooling system design; refrigeration basics. Three hours rec. a week. Pr. or conc.: ME 573.

**ME 628. Aerodynamics.** (3) I. A general introduction to aerodynamics including the analysis of lift, drag, thrust, and aircraft performance for subsonic aircraft. Three hours rec. a week. Pr.: ME 571, MATH 240.

**ME 631. Aircraft and Missile Propulsion.** (3) II. Mechanics and thermodynamics of aircraft and missile propulsion systems; combustion; air breathing jet engines; rockets; applied compressible flow; propellants; performance and design of propulsion systems. Three hours rec. a week. Pr.: ME 523, ME 571, MATH 240.

**ME 633. Thermodynamics of Modern Power Cycles.** (3) I. The first and second law analysis of modern steam cycles for both fossil-fuel and nuclear-fuel installations, Cycle efficiency and factors affecting performance, such as cycle design, load factor, and auxiliaries. Thermal pollution resulting from steam cycles. Three hours rec. a week. Pr.: ME 513.

**ME 635. Dynamics of Flight—Stability and Control.** (3) II. Stability and control of aircraft and missiles. Development of the general equations of unsteady motion for six-degree-of-freedom machines. Stability derivatives solution and analysis of the linearized problem. Longitudinal and lateral normal modes. Pr.: ME 512. Pr. or Conc.: ME 628, or consent of instructor.

**ME 640. Automatic Controls.** (3) I. Analysis of the dynamic behavior of mechanical, thermal, fluid and electrical elements using basic physical laws. Transient and frequency response characteristics, stability and sensitivity analysis. Design of automatic control systems. Three hours rec. a week. Pr.: ME 535.

**ME 645. Fluid Control Systems.** (3) II. Study of hydraulic, pneumatic, and fluidic control systems and their application in industry. Analysis and modeling of system components including pumps, valves, and actuators. Design techniques for both feedback and nonfeedback systems. Laboratory demonstrations. Three hours rec. a week. Pr.: ME 535.

**ME 650. Introduction to Computer-Aided Design.** (3) I. Scope of computer-aided design, computer-aided design workstations, interactive programming, numerical methods and computer graphics in computer-aided design, applications to design problems, introduction to finite elements, and optimal design. Pr.: ME 400, senior standing in engineering.

**ME 651. Introduction to Composites.** (3) II. The analysis and behavior of a laminate. Design, fabrication and testing of elements made of various composite materials. Two hours rec. and 3 hours lab a week. Pr.: CE 533, Senior standing in engineering.

**ME 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.: ME 512, MATH 240.

**ME 699. Problems in Mechanical Engineering.** (Var.) I, II, S. Pr.: Approval of department head.

**ME 716. 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.: ME 512, MATH 240.

**ME 720. Intermediate Fluid Mechanics.** (3) I. A continuation of ME 571 in the study of general topics in fluid mechanics including viscous flow, turbulence and boundary layer theory. Numerous applications utilizing computational fluid dynamics. Pr.: ME 571, MATH 240.

**ME 721. Thermal Systems Design.** (3) I. Thermal systems design including economics, simulation, and optimization. Includes heating, ventilating and air conditioning design and control. Pr.: ME 573.

**ME 722. Environmental Engineering II.** (3) I, even years. Characteristics of air conditioning compressors, condensers, evaporators; system characteristics; air conditioning system controls; refrigeration systems; acoustics. Three hours rec. a week. Pr.: ME 622.

**ME 730. Control Systems Analysis and Design.** (3) II. Use of classical analysis techniques for control system compensation. State space-control theory fundamentals are presented in addition to an introductory treatment of several major systems areas. Pr.: EECE 530 or ME 640. Cross-listed with EECE 730.

**ME 732. Robotic System Analysis.** (3) I, even years. Modeling the static position and dynamic motion of a serial link manipulator. Forward and inverse kinematics, differential motion, path description and generation, dynamic and static forces, dynamic formulations, and feedback control of joint actuators. Project work includes robot computer software development and laboratory exercises. Pr.: ME 512, Pr. or conc.: ME 640.

**ME 735. Geometric Modeling.** (3) II, even years. Geometric aspects of computer graphics. Two- and three-dimensional homogeneous transformations; hidden line and surface removal; space curves and surfaces, including Bezier and B-spline methods; solid modeling; applications and current topics. Cross listed with CMPSC 735. Pr.: ME 650 or CMPSC 636 or EECE 636.

**ME 736. Applied Elasticity.** (3) I. 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.: CE 533.

**ME 738. Experimental Stress Analysis.** (3) II, odd years. Experimental methods of investigating stress distributions. Photoelastic models, photoelastic coatings, brittle coatings, and resistance strain gauges applied to static and dynamic problems. Two hours rec. and three hours lab a week. Pr. or conc.: CE 533.

**ME 756. Machine Vibrations II.** (3) I, even years. 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.: ME 656.

**ME 757. Kinematics.** (3) I, odd years. Geometry of constrained motion applied to point paths, specific input-output relations, function generators, kinematic synthesis. Three hours rec. a week. Pr.: ME 533.

**ME 760. Engineering Analysis I.** (3) I. Methods of analysis employed in the solution of problems selected from various branches of engineering. Emphasis is on discrete systems. Three hours rec. a week. Pr.: MATH 240 or senior standing.

**ME 762. Finite Elements.** (3) I. The modeling of lumped parameter systems. Element formulation, assembly and solution are covered in detail. Standard element families, solution methods, energy techniques, display of results using computer graphics, and applications in heat transfer, fluid and structural mechanics. The student will develop a complete finite element program. Pr.: ME 400. Pr. or conc.: ME 573 or graduate standing.

**ME 773. Intermediate Heat Transfer.** (3) II. Conduction, convection and radiation, mass transfer, phase change, heat exchangers, introductory numerical methods. Three hours rec. a week. Pr.: ME 573.

**ME 775. Optimal Mechanical Design.** (3) II, odd years. The philosophy of optimal design; unconstrained minimization for single variable and multivariable cases; linear and quadratic programming; constrained nonlinear optimization; applications to design of structures, mechanisms, dynamic systems, components, control systems, etc. Pr.: ME 400, MATH 240, senior standing in engineering.

## Graduate credit

**ME 811. Thermodynamic Analysis.** (3) II. Basic considerations of the three laws of equilibrium thermodynamics. Availability analysis with applications including multicomponent systems. Three hours rec. a week. Pr.: ME 523, ME 571, MATH 240.

**ME 815. Gas Dynamics.** (3) II, in odd years. Properties of compressible fluids, subsonic and supersonic flow, steady and nonsteady motion, with emphasis on one-dimensional flow. Three hours rec. a week. Pr.: MATH 240, ME 523, ME 571.

**ME 818. Introduction to the Theory of Continuous Media.** (3) II, odd years. Analysis of strain, motion, and stress; fundamental laws; constitutive equations; applications to fluid, elastic, and plastic media. Three hours rec. a week. Pr.: ME 512, MATH 240.

**ME 831. Boundary Layer Theory.** (3) II, even years. 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.: ME 573.

**ME 836. Introduction to Fracture Mechanics.** (3) II, even years. This course provides an introduction to fracture mechanics concepts and applications. Topics include the asymptotic solution for stress at a crack tip, energy balance and crack propagation, computing stress intensity factors, fatigue crack growth, fracture of concrete, applications and current topics. Pr.: ME 736 or CE 730.

**ME 846. Random Vibration.** (3) I, odd years. Theory of random processes and application to random vibration of mechanical systems. Three hours rec. a week. Pr.: ME 656.

**ME 860. Engineering Analysis II.** (3) II. Continuation of Engineering Analysis I. Emphasis placed on continuous systems. Three hours rec. a week. Pr.: ME 760 or consent of instructor.

**ME 898. Master's Report.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

**ME 899. Master's Thesis.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

**ME 913. Thermodynamics and Transport Properties.** (3) I, odd years. Comprehensive study of the laws of thermodynamics. Use of kinetic theory and statistical thermodynamics for prediction of thermodynamic properties, thermodynamic equilibrium, transport properties, irreversible processes and fluctuations. Three hours rec. a week. Pr.: ME 811.

**ME 920. Advanced Topics in Thermal and Fluid Mechanics.** (Var.) On sufficient demand. Topics may include combustion, direct energy conversion, modeling and design of internal combustion engines, non-equilibrium multiphase and multicomponent systems, refrigeration, cryogenics, stability and turbulence. Pr.: ME 720 or ME 773 or ME 913.

**ME 921. Thermal System Analysis.** (3) II, odd years. Advanced study of steady-state and dynamic simulation of thermal systems; thermal systems optimization. Thermodynamic availability and probabilistics in thermal system design. Three hours rec. a week. Pr.: ME 721.

**ME 935. Heat Conduction in Solids.** (3) I, in odd years. General differential equation of heat conduction and methods of solution for steady-state and transient heat conduction, periodic heat flow, and internal heat sources. Three hours rec. a week. Pr.: ME 573.

**ME 940. Advanced Topics in Solid Mechanics and Machine Design.** (Var.) On sufficient demand. Topics may include advanced elasticity, plasticity, tribology, probabilistic machine design, robotics, advanced and computational dynamics and nonlinear mechanics. Pr.: ME 736 or ME 716 or ME 846.

**ME 942. Convection Heat Transfer.** (3) II, odd years. Energy and momentum equations in convective heat transfer, laminar and turbulent thermal boundary layers, steady and nonsteady convection problems. Three hours rec. a week. Pr.: ME 573.

**ME 943. Radiation Heat Transfer.** (3) I, even years. Basic theories of thermal radiation, shape factors; exact and approximate solutions of integral equations of radiation heat transfer between solid surfaces with absorbing or non-absorbing medium. Three hours rec. a week. Pr.: ME 573.

**ME 947. Boiling Heat Transfer.** (3) I, in alternate years. Principles of boiling heat transfer and thermal hydraulics of two-phase flow; computational methods; design and analysis applications. Three hours rec. a week. Pr.: NE 847 or ME 942. Cross listed with NE 947.

**ME 999. Dissertation Research in Mechanical Engineering. Ph.D. level.** (Var.) I, II, S. Pr.: Approval of department head and major professor.

# Nuclear Engineering

**Hermann J. Donnert,** Professor, Ph.D., Leopold-Franzens Universitat (radiation and nuclear physics; radiation effects; controlled thermonuclear reactions; plasma physics and diagnostics; neutron activation analysis).

**N. Dean Eckhoff,** Professor, Department Head, Ph.D., Kansas State University (neutron activation analysis; nuclear fuel cycle; numerical and engineering analysis; environmental restoration; data modeling; radiation detection and measurement; computer algorithm and program development).

**Richard E. Faw,** Professor, Ph.D., University of Minnesota (radiation shielding and dosimetry; radiological assessment, gamma-ray and electron transport, internal dosimetry).

**J Fred Merklin,** Professor, Ph.D., University of Minnesota (chemical and combustion kinetics; radiation chemistry; photochemistry; photoconductivity).

**J. Kenneth Shultis,** Professor, Ph.D., University of Michigan (radiation protection and shielding; radiological assessment, modeling and computation; neutron transport and radiative transfer, theory and numerics; probabilistic risk analysis; energy system analysis, utility economics, power transmission; combustion modeling, dynamics of single particles and suspensions; remote sensing, light scattering from vegetation).

**Gale G. Simons,** Professor and Associate Dean for Research, Ph.D., Kansas State University (radiation dosimetry; beta-particle, gamma-ray, and neutron spectroscopy; instrumentation system design; neutron activation analysis).

## Program description

Graduate study in nuclear engineering is based upon the proposition that students learn best when working individually or in small groups with a major professor. Most advanced graduate courses, are, therefore, taught in small classes or seminars that provide for the exchange of ideas among the students and instructors. The ultimate objective is to create the desire and capacity for independent study and research.

The nuclear engineering graduate program is designed to aid the student in achieving the maximum possible liberality in education while pursuing the specialized professional courses of study. The research and instruc-

tional programs, while solidly rooted in traditional nuclear engineering pursuits, extend into many areas not normally included in traditional nuclear engineering programs. Such diversity of interests enables students to gain a very broad technical perspective during their graduate studies.

The quality of the nuclear engineering graduate studies program has been recognized by awards for research support from outside agencies and for the acquisition of sophisticated research apparatus. Faculty members from various departments, including nuclear engineering, have pooled their talents and resources in cooperative research activities with the result that students' programs of study may readily cross traditional departmental boundaries.

### Career opportunities

Demand for graduates in nuclear engineering remains high and at very attractive salaries. The projected world energy demand and increasing environmental concerns with fossil power sources provide excellent opportunities for professional growth for individuals with advanced degrees in nuclear engineering.

### Research facilities

The Department of Nuclear Engineering has extensive laboratory, classroom, office, and shop facilities. Major research facilities include a TRIGA Mark II pulsing nuclear reactor, a laboratory for gamma-ray spectroscopy and neutron activation analysis, a full range of state-of-the-art nuclear instrumentation, a combustion laboratory equipped with a shock tube and associated diagnostics, and a thermoluminescence dosimetry measurement laboratory.

Graduate students also have ready access to a wide variety of campus computer facilities including an IBM mainframe, centralized and departmental UNIX facilities, VAX computers, as well as departmental and college microcomputers and work stations. With special arrangements students can access any of several supercomputers located throughout the United States. Research support for graduate students includes typing and copying services.

### Financial support

Wide support of research programs is provided through both external research funding and the Engineering Experiment Station of the College of Engineering. The experiment station offers backing for relevant research in many quarters of the campus beyond those traditionally identified with such a station.

Students may qualify for financial support through graduate research assistantships (GRA). The nuclear engineering department participates in programs sponsored by the Associated Western Universities, which will allow exceptional graduate students, who are U.S. citizens, to conduct part or all of their graduate research at national laboratories, such as the Argonne National Laboratory and the Los Alamos Scientific Laboratory. The faculty have also been quite successful at obtaining support for graduate students from the National Academy for Nuclear Training (NANT).

### Program requirements

Major work is offered leading to the master of science in nuclear engineering and doctor of philosophy in engineering.

Applicants for graduate status are expected to hold the bachelor's degree in engineering or a physical science with adequate preparation in mathematics. Programs of study will be arranged with a proper balance of subject matter from other fields to meet the needs of individual students.

### Areas of research emphasis

Combustion: chemical kinetics, numerical modeling

Instrumentation: system diagnostics, solid state devices, dosimetry

Nuclear radiation: effects and measurement, weapon effects

Nuclear power: reactor physics, gas centrifuges, nuclear fuel cycle, thermal hydraulics, radioactive waste disposal

Radiation chemistry: photochemistry, photoconductivity

Radiation dosimetry: radiation protection, radiation shielding, dosimetry design and evaluation

Spectroscopy: beta-particle, gamma-ray, and neutron; neutron activation analysis

Health physics: electron transport, pathway modeling, dose evaluation

Transport phenomena: gamma-ray, electron, and neutron, radiative transfer processes

## Nuclear engineering courses

### Undergraduate and graduate credit in minor field

**NE 500. Applied Engineering Analysis.** (3) II. Methods and applications of analytical, statistical, and numerical analysis in engineering, including computer programming. Three hours rec. a week. Pr.: NE 415.

**NE 501. Introduction to Nuclear Engineering.** (3) I, II, S. An overview course to acquaint non-nuclear engineers with introductory aspects of nuclear engineering. Three hours rec. a week. Pr.: Junior standing in engineering or physical sciences.

**NE 505. Elements of Nuclear Engineering.** (3) I. Introduction to radioactive decay, neutron reactions and interactions, radiation interaction with matter, and reactor physics. Three hours lec. a week. Pr.: MATH 221, PHYS 213.

**NE 512. Principles of Radiation Detection.** (3) II. Operating principles and general properties of devices used in the detection and characterization of ionizing radiation. Two hours rec. and three hours lab. a week. Pr.: NE 505.

**NE 515. Nuclear Engineering Materials.** (3) I. An investigation of the nuclear properties, metallurgy, the processing of nuclear materials, and the behavior of fuels and components in a radiation environment. Three hours lec. a week. Pr.: NE 505, CHE 352.

**NE 520. Neutron and Particle Interactions I.** (2) II. Neutron interactions and associated cross sections of importance to nuclear reactor theory; fission and its application to reactor design; energetics of multiple neutron scattering and neutron thermalization. Two hours rec. a week. Pr.: NE 505.

### Undergraduate and graduate credit

**NE 602. Radiation Protection Engineering I.** (3) II. Basic principles and concepts of radiation protection. Analysis of radioactive-decay systematics, dose and risk concepts description of natural and other sources of ionizing radiation, basic procedures of external and internal dose evaluation, waste storage and disposal. Three hours rec. a week. Pr.: NE 505.

**NE 620. Problems in Nuclear Engineering.** (Var.) I, II, S. Specific studies in current and advanced problems in various phases of nuclear engineering. Pr.: Consult head of department.

**NE 630. Applied Reactor Theory.** (3) I. Theory of diffusion and slowing down of neutrons with application to critical and sub-critical nuclear reactors. Measurement of various reactor physics parameters. Three hours rec. a week. Pr.: NE 520.

**NE 635. Plasma Physics.** (3) I. Fundamental properties of plasmas; motion of ions and electrons in electromagnetic fields; plasmas as magneto-hydrodynamic fluids; plasma waves; diffusion phenomenon in plasmas; electric resistivity of plasmas; equilibrium and plasma stability; kinetic theory of plasmas. Three hrs. rec. a week. Cross-listed with PHYS 635. Pr.: PHYS 532 or EECE 557, and PHYS 621.

**NE 647. Thermal Hydraulics Laboratory.** (1) I. A laboratory introduction to the fluid mechanics and heat transfer mechanisms in reactor cooling. Three hours lab. a week. Pr. or Concurrent: ME 571.

**NE 648. Reactor Operations Laboratory.** (2) II. Licensing, nuclear safety, and reactor operations. Measurement of nuclear reactor parameters. One hour lec. and three hours lab. a week. Pr.: NE 512, NE 630.

**NE 675. Neutron and Particle Interactions II.** (2) II. Engineering approach to the quantum mechanics of the interaction of neutrons and other nuclear radiations with matter; theoretical methods for the evaluation of nuclear reaction cross sections required for engineering applications. Two hours rec. a week. Pr.: NE 500, NE 520.

**NE 693. Radiation Shielding Design.** (3) I. Sources of radiation, kernel concepts, and application of diffusion and ray theory to shielding calculations and design, with applications principally in stationary nuclear reactor shielding. Three hours rec. a week. Pr: 602. Pr. or concurrent: NE 630.

**NE 694. Nuclear Reactor Thermal Design.** (3) II. Application of thermal-hydraulic principles to the design and analysis of nuclear power plants, with special emphasis on safety systems. Three hours rec. a week. Pr.: NE 630 and ME 573.

**NE 696. Nuclear Systems Design.** (3) II. Application of the principles of nuclear reactor kinetics and simulation, linear stability of reactor systems, and noise analysis to nuclear reactor systems. Three hours rec. per week. Pr.: NE 630.

**NE 697. Nuclear Engineering Design.** (2) II. Individually prepared report on the solution of a design problem. Regulations and economics of nuclear power facilities. Pr.: NE 630, NE 693.

**NE 750. Direct Energy Conversion.** (3) II. Principles and analysis of direct conversion phenomena, with special emphasis on direct conversion of nuclear energy including thermoelectric, thermoionic, photovoltaic, magneto-hydrodynamic and electrochemical processes. Three hours rec. a week. Pr.: NE 647.

**NE 761. Radiation Measurement Systems.** (4) I. Principles of systems used to measure radiation. Applications to radiation monitoring, dosimetry, and spectroscopy. Three hours rec. and three hours lab. a week. Pr.: NE 512.

**NE 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. a week. Pr.: EECE 510 or 519, and NE 512.

**NE 772. Radiation Effects on Materials I.** (3) I. General theory of radiation damage to solids. Specific effects of radiation on nuclear reactor components and material of construction. Applications to nuclear reactor design. Three hours rec. per week. Pr.: NE 520.

**NE 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.: NE 520 or CHEM 595.

**NE 799. Special Topics in Nuclear Engineering.** (Var.) (On sufficient demand.) Topical material of importance in nuclear engineering, such as controlled thermonuclear reactions, numerical analysis, Monte Carlo methods in radiation transport, effects of nuclear explosions, etc. Pr.: Consent of head of department.

## Graduate credit

**NE 806. Neutronics.** (3) I. Particle transport, theories of diffusion, numerical analysis of diffusion, transient core analysis. Three hours rec. a week. Pr.: NE 630.

**NE 810. Graduate Problems in Nuclear Engineering.** (Var.) I, II, S. Specific studies in advanced problems in various phases of nuclear engineering. Pr.: Graduate standing and consent of head of department.

**NE 847. Nuclear Power Engineering.** (3) II. Advanced techniques in thermal-hydraulic analysis as applied to nuclear power reactors, including computational methods used for conduction and convection heat transfer. Three hours rec. a week. Pr.: ME 573 or equivalent.

**NE 851. Nuclear Engineering Laboratory.** (2). I, S (on demand). Design of experiments for the TRIGA nuclear reactor. Six hours lab. a week. Pr.: NE 630 and NE 648.

**NE 860. Advanced Topics in Nuclear Engineering.** (Var.) I, II, S. A presentation of various special topics covering advanced nuclear engineering specialties. Pr.: Graduate standing and consent of head of department.

**NE 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.

**NE 899. Master's Thesis.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

**NE 947. Boiling Heat Transfer.** (3) I (alternate years). Principles of boiling heat transfer and thermal hydraulics of two-phase flow; computational methods; design and analysis applications. Three hours rec. a week. Pr.: NE 847 or ME 942 or equivalent (cross-listed with M.E. 947).

**NE 998. Selected Advanced Topics in Nuclear Engineering.** (Var.) II. (On sufficient demand.) Current topics of interest in nuclear engineering at an advanced level, such as controlled thermonuclear reactions, numerical analysis, Monte Carlo methods in radiation transport, etc. Pr.: Consent of department head.

**NE 999. Dissertation Research.** (Var.) I, II, S. Topics selected with approval of major professor and department head.

# Human Ecology

## Clothing, Textiles, and Interior Design

**Acting Department head**
**Virginia Moxley,** Ph.D., Kansas State University

**Professors**
**Elizabeth McCullough,** Ph.D., University of Tennessee
**Barbara Reagan,** Ph.D., Purdue University
**Betty Jo White,** Ph.D., Virginia Polytechnic Institute and State University

**Associate professor**
**Janice Huck,** Ph.D., Kansas State University
**May Don Peterson,** Ed.D., Oklahoma State University

**Assistant professors**
**Patty Annis,** M.S., University of Tennessee
**Bettie Minshall,** Ph.D., University of Minnesota
**Deanna Munson,** Ph.D., Kansas State University
**Pamela Radcliffe,** Ph.D., Florida State University
**Ludwig Villasi,** M.A., Wayne State University

### Programs

The Department of Clothing, Textiles, and Interior Design offers a master of science degree in clothing, textiles, and interior design. The department also participates in the College of Human Ecology Ph.D. program, offering an emphasis in textiles and apparel. Graduate study is structured to prepare students for professional employment in careers emphasizing research and scholarly contributions. A program of study is individually planned to meet the student's specific needs and career objectives. Areas of specialization include:

Consumer behavior in clothing and textiles
Functional apparel design
Historic costume and textiles
Housing
Interior design
Textile science
Thermal comfort of clothing and textiles

#### Objectives

The objective of the graduate programs in clothing, textiles, and interior design is to prepare students for positions in education, industry, and public service that require expertise in apparel, textiles, interior design, or housing. Students develop this expertise through course work, research experience, consultation with graduate faculty members, and internships.

#### Facilities

The classrooms and laboratories in the department are some of the finest facilities for graduate study in the United States. The textile facilities include a conditioning room and laboratories housing major chemical, physical, mechanical, spectroscopic, chromatographic/optical instrumentation, and dyeing and finishing equipment. The interior design studios contain state-of-the-art work stations, a production laboratory, and an extensive source library. Apparel design facilities include a computerized pattern design, grading, and marker making system plus industrial apparel production equipment. The computer-aided design laboratory with AutoCAD capabilities serves both apparel and interior design students. The historic costume and textiles collection with over 10,000 artifacts is adjacent to the conservation laboratory. The Environmental Research Institute's two thermal manikins, guarded hot plates, and environmental chambers are used in research on the thermal properties of apparel and textile systems. Interior design and housing students may pursue an interdisciplinary emphasis in gerontology, through K-State's Center for Aging. Graduate offerings in interior design and housing complement a FIDER-accredited undergraduate program.

### Master's degree in clothing, textiles, and interior design

The Department of Clothing, Textiles, and Interior Design offers a master's degree program with emphases in clothing and textiles and in interior design and housing. The master's program offers three options:
(1) 30 credit hours including 6–8 hours of thesis research and an oral examination,
(2) 32 credit hours including a 2-hour report, plus written and oral examinations, and
(3) 36 credit hours of course work and a written examination. The student and his or her supervisory committee plan the program of study together considering the student's interests and career goals. The program is very flexible in that only one-third of the student's course work constitutes required classes.

### Ph.D. in human ecology: textiles and apparel

The department also participates in the College of Human Ecology Ph.D. program, offering an emphasis in textiles and apparel. Course requirements for the Ph.D. program specify a minimum of 30 hours of course work (12 hours of core courses, a dissertation proposal seminar and other course work in major area); a minimum of 30 hours of dissertation research; and a minimum of 15–30 hours of supporting courses (a sequence of statistics courses, a research methods course, plus other supporting courses). A program of study will be individually planned to meet the specific needs and career goals of the student. Preliminary written and oral examinations and an oral defense of the dissertation also are required.

### Admission and application

#### Master's degree

Admission to the Graduate School requires a bachelor's degree from an accredited institution. Regular admission requires a minimum grade point average of 3.0 on a 4.0 scale for the junior and senior years of undergraduate study. The conditions of admission are based on recommendations by the department's graduate faculty to the dean of the Graduate School, who makes the final decision for admission. All required application materials should be sent to the Department of Clothing, Textiles, and Interior Design.

#### Ph.D. degree

Prospective students applying for admission to the Ph.D. program are encouraged to complete their application materials by February 1 for admission for the following fall semester. International students should have their application files completed at least one month before the Graduate School deadlines for processing, which are: June 1 for fall semester; November 1 for spring semester; and March 1 for summer School.

A personal interview with a faculty member in the intended field of specialization is recommended, and in some cases, it may be required by faculty in the specialization.

A complete application includes a Graduate School application, two official transcripts of all previous higher education credits and grades, a statement of objectives designating the area of specialization and emphasizing evidence of course work and/or professional experience appropriate for preparation, and at least three letters of reference.

In addition to the above credentials, international students must submit a TOEFL score, unless the student has a degree within the past two years from a college where English is the instructional language and a statement of financial support.

The application materials for the Ph.D. should be sent to Pat Haas, Ph.D. in Human Ecology program, Dean's Office, College of Human Ecology, Justin Hall 119, Kansas State University, Manhattan, KS 66506.

For applicants with master's degrees, a minimum graduate GPA of 3.5 on a 4.0 scale is required. In exceptional cases, admission into the Ph.D. program without a completed master's degree may be approved. The minimum undergraduate GPA for such applicants is 3.5 on a 4.0 scale. International students must score 550 or higher on the TOEFL for admission to K-State. Conditions of admission are based on recommendations by the graduate faculty members in the area of specialization who consider all relevant information in making admission decisions.

Normally, a student who enters the Ph.D. program with a completed master's degree will spend at least two years in residence. The Graduate School's minimum residency re-

quirements specify at least a year in residence at Kansas State University, which can be met by enrolling for 24 semester hours of course work (excluding dissertation hours) during 12 months of continuous enrollment. Graduate assistants must enroll in a minimum of 6 credit hours during a regular semester. Students appointed to teaching or research positions or assistantships in the College of Human Ecology are given credit for 6 additional hours of residency for each of two semesters during which they are enrolled.

### Assistantships/scholarships

Financial aid is available through teaching and research assistantships. Graduate students receive a monthly stipend and tuition fee reduction or waivers. Assistantship applications are due February 1 with a decision announced by March 15.

Graduate students may qualify for scholarships awarded by the College of Human Ecology or the Department of Clothing, Textiles, and Interior Design. To apply for a scholarship offered by the College, submit by February 1, a K-State scholarship application to the Office of Student Financial Assistance, Anderson Hall, Kansas State University, Manhattan, KS 66506-1405. Applications are available from the Office of Student of Financial Assistance or the College of Human Ecology Dean's Office. Scholarship recipients must enroll full time (9 or more credit hours) during the semester for which the award is made.

## Clothing and textiles courses

### Undergraduate and graduate credit in minor field

**CT 500. Intermediate Apparel Design.** (3) II. Creation and analysis of designs for body types in the size ranges produced by the apparel industry; creation and modification of industrial patterns suitable for mass production, industrial construction and production techniques. Introduction to computer-aided apparel design. Six hours lab a week. Pr.: CT 315, 410, or 420, 515 or conc.; CIS 110 or HDFS 120.

**CT 515. Theory of Pattern Design II.** (3) II. Advanced techniques of pattern development; elementary application of pattern techniques to original designs; introduction to industrial uses of pattern design. Six hours lab a week. Pr.: CT 410.

**CT 520. Textile Merchandise Profit Analysis.** (3) II, S. Concepts, practices, and procedures for analyzing textile merchandise profit including the development of user skills in the application of various software packages for data analyses and decision making in apparel and textile marketing. Pr: ACCTG 231; CIS 110 or HDFS 120; and MKTG 400 or conc. enrollment.

**CT 525. Pattern Drafting Techniques.** (3) Alternate S. Study of advanced pattern drafting techniques with emphasis on the bodice and pants for different figure types. Six hours lab a week. Pr.: CT 410.

**CT 536. Merchandising Concepts.** (4) I. Analysis of the elements, processes, and controls involved in fashion merchandising. Pr.: CT 230 and junior or senior standing.

**CT 540. Advanced Apparel Design.** (3) I. Analysis of high fashion from origin of the haute couture to contemporary designers; use of inspiration sources for executing original design solutions; development of design portfolio and resume; introduction to functional apparel design. Six hours lab a week. Pr.: CT 500 and senior standing.

**CT 545. Textile and Apparel Industry.** (3) I. Analysis of fiber, textile, and apparel production; industry structure; impact of government regulations on production. Pr.: ECON 110.

**CT 550. Apparel Design Field Experience.** (12) II. Preplanned and supervised off-campus work experience in the apparel industry. Pr.: CT 300, CT 500; junior or senior standing in Apparel Design; 2.5 cumulative GPA; 3.0 GPA in professional course work; consent of instructor.

**CT 570. Textiles for Merchandising.** (3) I. Properties of fibers, yarns, fabrics, finishes, and dyes; emphasis on end-use performance of textiles. Pr.: CT 155, CT 260.

### Undergraduate and graduate credit

**CT 600. Textile Analysis.** (3) Alternate S. Laboratory techniques used to characterize textile structures with emphasis on fiber, color, finish, care, and aging. Pr.: CT 260 and CHM 110. Not open to textile science majors.

**CT 610. Computer-Aided Design of Apparel.** (3) I. Overview of computer-aided design as it relates to the apparel industry; introduction and application of computer hardware and software to apparel design, including apparel illustration, pattern design, pattern grading, and pattern marker development by computer. Six hours of lab a week. Pr.: CIS 110 or HDFS 120.

**CT 630. History of Costume to 1780.** (3) II. Interrelationship of costume and social, cultural, political, and economic environments from antiquity to 1780 with emphasis on evolution of garment design and sources of costume information. Pr.: ART 195 and ART 196; or HIST 101.

**CT 631. History of Costume from 1780 to Present.** (3) II. Interrelationship of costume and social, cultural, political, and economic environments from 1780 to the present with emphasis on effects of the industrial revolution, dress reform movements, ready-to-wear development, and haute couture. Pr.: HIST 102.

**CT 635. Case Studies in Apparel and Textile Marketing.** (2) II. An integration of previous course work through the study of real-life and simulated problems in the apparel and textile marketing industries. Emphasis on decision-making and strategic planning. Pr.: CT 230; MKTG 400; CT 520 or concurrent enrollment.

**CT 650. Clothing and Textiles Study Tour.** (1–2) II, S. Supervised off-campus tour of facilities where textile products are designed, manufactured, tested, marketed, exhibited, and/or conserved. Pr.: CT 260 and six hours clothing and textiles.

**CT 680. Physical Analysis of Textiles.** (4) I. Theory, principles, and procedures in evaluating the physical properties of textile fibers, yarns, fabrics, and products for apparel, interior furnishings, and industrial uses. Three hours lec. and three hours lab a week. Pr.: CT 260.

**CT 710. Advanced Tailoring.** (3) II, alternate S. Construction of a garment, using different fabrics and custom tailoring techniques. Pr.: CT 400; and CT 410 or CT 420.

**CT 715. Advanced Pattern Design.** (3) I. Application of pattern design with emphasis on the development of patterns for original designs. Six hours lab a week. Can be repeated for credit. Pr.: CT 410.

**CT 720. Functional Apparel Design.** (3) I. The design process; criteria for design and evaluation of clothing systems for protection from various environmental hazards; design and evaluation of clothing systems with emphasis on functional aspects. Two hours lec. and two hours recitation. Pr.: CT 260; CT 410 or CT 420.

**CT 730. Textile Conservation.** (3) I, alternate years. Scientific theories of textile conservation related to fiber degradation, storage, repair, cleaning, and exhibition of historic items. Laboratory experience in solving conservation problems related to historic textiles. Two hours lec., two hours lab a week. Pr.: CHM 110 and CT 620 or IDH 680.

**CT 741. Polymer Science.** (3) I, alternate years. Theory, application, and methods of structural analysis with emphasis on synthetic polymers. Pr.: CHM 350 and junior standing.

**CT 742. Textile Fibers.** (3) I. In-depth study of fibers. Two hours rec. and three hours lab a week. Pr.: CT 260 and CHM 351.

**CT 746. Textile Dyeing and Printing.** (4) II. In-depth study of color systems, colorimetry, physical and chemical properties of dyes, methods of dye-fiber association, and industrial dyeing and printing methods. Two hours lec. and six hours lab a week. Pr.: CT 350 or 742.

**CT 747. Textile Finishes.** (3) II. Theory, application, evaluation, and identification of finishes and auxiliary products which are applied to textile fibers, yarns, and fabrics. Two hours lec. and three hours lab a week. Pr.: CT 350 or 742.

**CT 760. Clothing and Textiles Seminar.** (Var.) I,II. 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.

**CT 765. Chemical and Optical Analysis of Textiles.** (3) II, alternate years. Application of organic chemistry and optical analysis to fibers, dyes, and finishes. Two hours lec. and three hours lab a week. Pr.: CT 350 or 742.

**CT 770. Practicum in Clothing and Textiles.** (Var.) I, II, S. Preplanned and supervised off-campus experience in business, industry, museums, government agencies, or the cooperative extension service. May be repeated up to six hours. Pr.: Twelve hours in clothing and textiles and consent of department head.

**CT 775. Experimental Textiles.** (Var.) On sufficient demand. Individual investigation into textile research. Pr.: CT 350 or 742; CT 720.

**CT 780. Problems in Clothing and Textiles.** (Var.) I ,II, S. Work is offered in apparel designing, textiles, history of costume, clothing economics. Pr.: Senior or graduate standing; consent of instructor.

**CT 785. Problems in Apparel Design.** (Var.) I, II, S. Problems planned with the student to meet particular needs. Pr.: CT 500 or consent of instructor.

### Graduate credit

**CT 820. Textiles and the Thermal Environment.** (1–3) II, alternate years. Fundamentals of textile insulation, its measurement and prediction for different types of textile products; the study and measurement of human response to thermal environmental factors and textile insulation. Pr.: CT 260; and STAT 702 or 703.

**CT 825. Advanced Historic Textiles.** (3) I, alternate years. Analysis of the interaction of technology with worldwide historic textile designs from prehistoric to modern times (1900). Laboratory assessment of design production through fiber, yarn, fabric, finishing, and tools used in each area. Two hours lec., two hours lab a week. Pr.: ID 680.

**CT 831. Experimental Clothing Construction.** (2–3) I, alternate S. Recent developments in clothing construction, utilizing experimental projects and innovative methods. Six hours lab a week. Pr.: Six hours of clothing and textiles.

**CT 835. Textile and Apparel Economics.** (3) I. Analysis of the fiber, textile, and apparel industries. Issues in the production and distribution of textile products with emphasis on international trade and government involvement. Pr.: ECON 120, and six hours clothing and textiles at 400 level or above.

**CT 840. Family Consumption of Textile Products.** (3) II. Factors that affect family consumption of apparel, draperies, upholstery, floor coverings, wall coverings, and other textile products; changes in textile consumption patterns over the life cycle. Textile product characteristics, end-use performance, quality evaluation, and maintenance. Pr.: MKTG 540 or HDFS 605.

**CT 845. Clothing and Human Behavior.** (3) II, alternate years. Analysis of the effects of psychological, cultural, and social aspects of clothing upon human behavior. Pr.: CT 330 and 6 hours of clothing and textiles.

**CT 850. Clothing and Textile Literature.** (2) II, alternate S. Review of current literature with implications for future research; analysis of research methodologies. Pr.: A graduate level course in statistics and six hours in the field.

**CT 855. Readings in Clothing and Textiles.** (1–2) I, II, S. Directed reading and study of selected topics in clothing and textiles. Pr.: CT 850.

**CT 860. Contemporary Topics in Clothing and Textiles.** (2–3) I, alternate S. Analysis of social and environmental factors related to clothing and textiles. May be taken more

than one semester with consent of student's advisory committee. Pr.: Eight hours of credit basic to field.

**CT 865. Historic Costume and Textile Collection Management.** (2) II, alternate years. Collection policy development, registration, and cataloging of historic costume and textile collections, physical processing of objects, and usage of collections. One hour lec. and two hours lab a week. Pr.: CT 631 and 730; and ID 680.

**CT 898. Master's Report.** (1 or 2) I, II, S. Written report to meet the requirements for the degree master of science. Subject chosen in consultation with major instructor. Pr.: Consent of department head.

**CT 899. Master's Thesis Research in Clothing and Textiles.** (Var.) I,II,S. Research in clothing or textiles for the master's thesis. Pr.: Consent of major professor.

**CT 910. Advanced Textile Dyeing and Finishing.** (3) I, alternate years. Advanced study of the physical and chemical principles involved in the preparation, dyeing, and finishing of textiles. Two hours lec. and three hours lab a week. Pr.: CT 746 and 747.

**CT 980. Professional Development Seminar.** (3) II, alternate years. Current research, topics, and issues relevant to professionals in clothing and textiles. Pr.: CT 850.

**CT 990. Dissertation Proposal Seminar.** (1) I, II. Presentation and discussion of proposals for dissertation research. Pr.: Six hours of statistics, three hours of research design or methods, and consent of major professor.

**CT 999. Dissertation Research in Clothing and Textiles.** (Var.) I, II, S. Research in clothing or textiles for the doctoral dissertation. Pr.: Consent of major professor.

## Interior design and housing courses

### Undergraduate and graduate credit in minor field

**IDH 500. Intermediate Interior Design Studio.** (3) S. Problem-solving in interior design. May substitute for Interior Design studio IDH 445, IDH 545, or IDH 645. Students should plan to substitute this course for the next level studio in sequence. Pr.: IDH 315, IDH 345, IDH 435, and admitted to the Interior Design major.

**IDH 530. Interior Design Practices and Procedures.** (3) II. Ethics, business procedures, and professional development; contract services and administration; and preparation for job market entry as applied to the practice of interior design. Three hours lec. a week. Pr.: IDH 445 or conc. enrollment.

**IDH 545. Senior Interior Design Studio I.** (3) I. Designing solutions to environmental and behavioral problems related to non-residential interiors. Planning, space analysis, and coordination of furnishings, fixtures, materials, and equipment. Six hours studio per week. Pr.: IDH 530.

**IDH 600. Interior Design and Housing Internship.** (3–4) I, II, S. Supervised off-campus professional experience in appropriate design-related firms, government agencies, or the housing industry. Pr.: Senior standing; 2.2 cumulative GPA and 2.5 GPA in professional area; IDH 445, and consent of internship coordinator.

**IDH 610. Housing for Special Needs.** (3) I. Comprehensive overview of housing concerns and issues related to older adults, the disabled, lower-income people, minorities, and other groups. Encompasses physical, economic, and social-cultural factors and the residential alternatives available to these populations. Three hours lec. a week. Pr.: IDH 410.

**IDH 625. Consumer and Energy Issues in Housing.** (3) II. An examination of current housing issues including conditions, regulations, finance, and policy as they relate to the consumer. Pr.: SOCIO 211, ECON 110, and IDH 410.

**IDH 630. Household Equipment Theory.** (3) I. Analytical study of appliance design, performance, and evaluation concepts for application in consumer decision-making. Not open to students with credit in IDH 440. Six hours rec. and lab a week. Pr.: Four hours lab science course.

**IDH 645. Senior Interior Design Studio II.** (3) II. Advanced design problems dealing with human activities in the living environment. Solutions for systems and products based on social, cultural, and behavioral functions. Aesthetic coordination and selection of furnishings, finishes, art, and accessories. Six hours studio per week. Pr.: IDH 530.

**IDH 650. Advanced Design and Behavior in the Interior Environment.** (3) I. The design of interior environments explored in an ecological, behavioral, and cultural context. Three hours lec. per week. Pr.: IDH 345 or consent of instructor.

**IDH 651. Design for Exceptional Needs.** (3) II. Problems encountered in designing interiors for children, the elderly, and the physically disabled. Pr: IDH 410 and IDH 445, or consent of instructor.

**IDH 660. Kitchen and Utility Area Planning.** (3) II. Functional and research basis for planning and arranging based on activity analysis, equipment, materials, lighting, and ventilation. Two hours lec. and two hours lab a week. Pr.: HDFS 460 or IDH 345 or ARCH 261.

**IDH 680. Historic Fabric Design.** (3) I. Interrelationships of fabric design and social, cultural, political, economic, and geographical environments from prehistoric times to present. Pr.: HIST 501 or 101; and CT 260.

**IDH 710. Housing and Facilities Management Processes/Applications.** (3) II. Application of theories, principles, and practices used in managing physical facilities and the residents or workers they house. Issues and problems encountered by professional managers in providing quality living or working environments within cost-effective operations. Three hours lec. per week. Pr.: IDH 410, MANGT 420 or 720, and consent of instructor.

**IDH 740. Advanced Household Equipment.** (3) II. 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.: IDH 440, PHYS 115, and senior or graduate standing.

**IDH 760. Historic Preservation and Restoration of Interiors.** (3) I. Principles, guidelines, and qualities of preservation and restoration of interiors. Research and application. Pr.: IDH 320 and 360; or CT 630 and 631; or ENVD 250 and 251.

**IDH 780. Interior Design and Housing Seminar.** (2–3) II. Analysis of current developments and issues. May be taken more than one semester with a maximum of six credit hours. Pr.: Eight hours of credit basic to field and consent of instructor.

**IDH 782. Problems in Interior Design and Housing.** (Var.) I, II, S. Problems planned with the student to meet particular needs. Pr.: Six credits in IDH; Consent of instructor.

### Graduate credit

**IDH 800. Interior Design Studio VI.** (3) I, II, S. Advanced studio experiences in residential interior environments. May be repeated with a maximum of 6 hours applied toward a graduate degree. Pr.: IDH 545 or 645; and IDH 651 or conc. enrollment, or IDH 760 or conc. enrollment.

**IDH 820. Readings in Interior Design and Housing.** (2) I, II, S. Supervised independent study of current issues in interior design or housing. Pr.: IDH 410 or IDH 445.

**IDH 825. Social Effects of the Housing Environment.** (3) II. A critical analysis of the literature on the social influences on the family and the individual attributable to the nature of the housing and neighborhood environment. Alternative physical determinist and socio-cultural interpretations are developed. Pr.: IDH 410 and STAT 702 or STAT 703.

**IDH 840. Experimental Methods in Household Equipment.** (2) I, alternate years. Philosophy of household equipment evaluation and experimentation; emphasis upon instrumentation, selection of variables, and data analysis. Pr.: A course in statistics and IDH 740.

**IDH 899. Research in Interior Design and Housing.** (Var.) I, II. Research which may form the basis for the master's thesis. Pr.: CT 850; Graduate standing.

**IDH 920. Housing Economics.** (3) II. Analysis of economic research related to consumer and government decisions about housing, including financing, regulation, subsidy programs, energy conservation, and choice of characteristics. Pr.: ECON 520, course in statistics, and two courses in housing, urban economics, or planning.

# Foods and Nutrition

**Head**

**Jane Bowers,** Professor, Ph.D. 1967, Kansas State University: Muscle tissue and meat products emphasizing processing treatments and additive or ingredient effects on sensory, physical, chemical characteristics, and nutrient composition.

**Professors**

**Edgar Chambers IV,** Ph.D. 1980, Kansas State University: Sensory analysis and testing with trained panels and consumers. Research focuses on testing of sensory methodology with food and non-food products; food/beverage flavor; product development; flavor transfer in packaging; and sensory testing of textiles, paper, automotive finishes, and other consumer goods.

**Katharine K. Grunewald,** Ph.D., R.D. 1979, University of Kentucky: Nutrition and exercise, particularly effects on adiposity and muscle development; physical fitness; sports nutrition; and obesity.

**Sung I. Koo,** Ph.D. 1976, Clemson University: Interactive effects of microelements and dietary lipids on lipid and lipoprotein metabolism, formation of chylomicrons in the intestinal epithelium, biochemical regulation and mechanisms of intestinal transport of lipids and lipid-soluble vitamins involving chylomicrons.

**Karen P. Penner,** Ph.D. 1981, Michigan State University: Extension specialist in food science. Knowledge, attitudes and practice of consumers or the populations, particularly as they relate to food safety.

**Robert D. Reeves,** Ph.D. 1971, Iowa State University: Nutritional factors important in metabolic regulation. Emphasis is on lipid and lipoprotein metabolism, dietary fiber, diabetes, and nutritional regulation of somatomedin.

**Carole Setser,** Ph.D. 1971, Kansas State University: Instrumental and sensory measurements of bakery products. Focus is on understanding textural and appearance changes of reduced-calorie, high fiber products.

**Joseph F. Zayas,** Ph.D. 1962, D.Sc. 1970, Technological Institute, Moscow: Meat and food science; utilization of plant proteins, (corn germ, wheat germ, and soy concentrate and isolate) in meat systems; functionality of plant proteins in model systems and food products; content of amino acids, micro- and macroelements in foods containing plant protein additives, storage stability, textural properties of food systems, emulsion studies, ultrasound extraction of biologically active substances of animal (chymosin) and plant origin.

**Associate professors**

**Carole A. Z. Harbers,** Ph.D., R.D. 1979, Kansas State University: Physical, chemical, sensory, and nutritional aspects of corn-based products including ethnic foods and products containing high fructose corn syrup; food color involving both plant and animal pigments; microscopal (light and electron) evaluation of cooking methods and digestion of vegetable fiber in rats.

**Carol Ann Holcomb,** Ph.D. 1977, Oregon State University: Preventive health behaviors (including diet) and health status of special populations: older adults, rural residents, employed women, and ethnic minorities. Nutritional epidemiology and the readability of printed information are additional areas of interest.

**Meredith F. Smith,** Ph.D. 1978, Virginia Polytechnic Institute and University: Analysis of social, cultural, and economic factors affecting food consumption and nutritional status of low-income populations in the United States and developing countries; methodology for this research. Nutrition and food consumption changes as a result of changes in agriculture production systems are being investigated in the Dominican Republic and Africa.

**Assistant professor**

**Fadi Aramouni,** Ph.D. 1986, Louisiana State University: Extension specialist in Food Systems. Primary area of re-

sponsibility is to provide technical expertise to local food processing industries. Emphasis is on food quality and shelf-life, food safety and hazard analysis, food laws and regulations, food profitability, and new product development.

**Thomas J. Herald,** Ph.D. 1991, Michigan State University: Protein structure-function relationship in food systems. Emphasis is on rheological behavior, microstructure, secondary structure and thermal properties of egg proteins.

## Programs

The department offers M.S. and Ph.D. degrees. Graduate degrees are awarded in "foods and nutrition"; students may emphasize one of the various food or nutrition sciences. Additionally, the department participates in the interdepartmental graduate food science degree program, and a "food science" degree may be earned by graduate students.

A minimum of 30 semester hours of credit for the M.S. or 90 semester hours for the Ph.D. beyond the bachelor's degree is required. From 6 to 8 hours of credit for the M.S. thesis, 2 hours for the M.S. report, and a minimum of 30 hours for the Ph.D. dissertation are included in the total hours of credit required. No foreign language is required. Courses in microbiology and human physiology are required if not taken previously. Biochemistry and statistics are required in the graduate program. Programs of study are developed according to the interests, backgrounds, and career goals of the students.

In addition to graduate foods and nutrition courses and the requirements listed above, students often include courses from other departments such as animal sciences and industry; grain science and industry; biochemistry; chemistry; anatomy and physiology; kinesiology; psychology; and biology; from the Colleges of Business Administration and Education; and from interdisciplinary international courses.

## Admission

Entering students are expected to have a bachelor's degree from an accredited institution. Admission to graduate study at Kansas State University is granted on three bases: full standing, provisional, or probational. Recommendations concerning an applicant's qualifications and admission are made to the dean of the Graduate School by the department. The final decision regarding admission of an applicant is made by the dean of the Graduate School.

Admission in full standing 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 bachelor's degree are equivalent to those of Kansas State University. Applicants with grade point averages below 3.0 will be considered for probational admission provided there is evidence that the applicant has the ability to do satisfactory graduate work. Provisional admission may be granted to applicants who have subject deficiencies in undergraduate preparation or if there is uncertainty in evaluating the transcript. Normally, deficiencies will be made up by enrolling in courses for undergraduate credit. Entering students should have had college algebra, biology, organic chemistry, and foods and nutrition courses or must take those courses for undergraduate credit. The TOEFL for international applicants and the GRE are required for all applicants.

Applications are evaluated by the admissions committee. If the minimum requirements for admission are met applications are reviewed by graduate faculty.

A faculty member must agree to be an applicant's advisor before a recommendation can be made to the Graduate School that the applicant be admitted. The files of all applicants will be considered for institutional or departmental awards and graduate assistantships.

A limited number of 0.4 time teaching (GTA) and research (GRA) assistantships are available. In addition, Nina Browning Fellowships of up to $15,000 annually are awarded to outstanding students, as well as awards of lesser amounts to other students each year.

GTAs are appointed for nine months and GRAs for 9 or 12 months. Graduate assistants may enroll in 12 credit hours per semester and 6 credit hours per summer session. International students will be considered for assistantships after they have successfully completed one or two semesters of graduate work at K-State. Applications for admission will be considered for both fall and spring semesters and summer session.

If an applicant is awarded a fellowship, a temporary advisor is assigned until a permanent advisor is chosen by the student during the first semester in residence. Fellowship awardees will be expected to participate in research or teaching during the term of the fellowship.

Funds for graduate students who are not on fellowships are primarily from ongoing research projects. The principal investigator [faculty member responsible] for each project selects graduate research assistants best suited for the specific project.

## Research facilities and opportunities

### Laboratory facilities

The Department of Foods and Nutrition has approximately 20,000 square feet for office, instruction, and research. Research laboratories and service areas comprise approximately 8,000 square feet. The department has a 1,500-square-feet animal laboratory that is fully accredited by the American Association for Accreditation of Laboratory Animal Care. In cooperation with the College of Veterinary Medicine, animals housed and maintained in our laboratory receive veterinary care to comply with the current NIH guidelines. A nutritional status assessment laboratory is used for both teaching and research activities and includes facilities for physical and dietary assessments.

### Sensory Analysis Center

The Sensory Analysis Center was established in 1982 to provide professional sensory panel services to researchers at K-State, industry, and government. Students are encouraged to become involved in projects of the Sensory Analysis Center to gain practical knowledge for conducting sensory tests. The center uses both highly trained/experienced panelists and consumers, depending on the test objectives. Graduate students research projects conducted through the center include meat products, grain products, school lunches, and the effects of packaging on food products. Examples of other projects include: carbonated beverages, essential oils, fruits, vegetables, sauces, cookies, tea, fabrics, automotive paint, and paper.

### Career opportunities

Graduate study in the foods and nutrition program prepares students for various academic positions. Graduates from our program are employed in the industry as directors of food product development and sensory evaluation divisions, senior food scientists, managers of quality assurance and test kitchens, directors of consumer services, and technical representatives; by hospitals and community organizations as dietitians or nutrition consultants; by universities and colleges as teachers and researchers; and by government agencies as extension specialists, nutritionists, and nutrition education coordinators.

### AIB/USDA

Adjunct professors of the department are associated with the American Institute of Baking in Manhattan. Cooperative research may be arranged for selected students.

### ADA qualification

The department has an approved Plan V program to meet minimum academic requirements of the American Dietetic Association. After completing academic requirements, students may apply for a qualifying work experience, which is an approved internship or preprofessional program, at one of over 150 sites around the United States.

## Foods and nutrition courses

## Undergraduate and graduate credit in minor field

**FN 501. Food Science.** (3) I, II. Basic scientific principles of preparation of foods as related to their chemical and physical properties. Two hours rec. and three hours lab a week. Pr.: CHM 350 and 351, or 531 and 532; and FN 300.

**FN 502. Principles of Nutrition.** (3) I, II. Functions and interrelationships of various nutrients in the body. Two hours rec. and three hours lab a week. Pr.: CHM 350 and 351, or 531 and 532; and BIOL 198.

**FN 503. Maternal and Child Nutrition.** (2–3) II. A study of the principles of prenatal, infant, and child nutrition emphasizing the practical application to life situations. Pr.: FN 132 and BIOL 198.

**FN 520. Topics in Foods and Nutrition.** (1–3) On sufficient demand. May be taken more than once for a maximum of 6 hours. Pr.: Junior standing and consent of instructor.

## Undergraduate and graduate credit

**FN 600. Practicum in Foods and Nutrition.** (3–5) I, II, S. Supervised professional field experience in foods and nutrition. Graduate students may enroll for a maximum of 3 credits. Pr.: FN 501, 502, and consent of instructor.

**FN 610. Nutrition Throughout the Life Cycle.** (3) I. Food patterns, dietary intakes, and nutritional requirements of infants, children, adolescents, and adults. Pr.: BIOCH 201 or 521; BIOL 240 or 526 or AP 530; and FN 502.

**FN 612. Principles of Food Product Development and Control.** (3) I, in even years. Food product concept, feasibility, and evaluation. Pr.: FN 501.

**FN 630. Clinical Nutrition.** (4) II. Nutrition in disease including physiological and biochemical basis of nutrition care, effects of disease on nutrient metabolism, diet therapy, nutrition assessment and nutrition counseling. Pr.: FN 502; BIOCH 201 or 521; and BIOL 240 or AP 530 or BIOL 526.

**FN 635. Nutrition and Exercise.** (3) II. The interrelationships among diet, nutrition, and exercise. Topics covered include physical fitness, weight control, nutrient metabolism during exercise, and athletic performance. Pr.: FN 132 or 502; and KIN 335. Cross-listed with College of Arts and Sciences; see KIN 635.

**FN 655. Community Health Programs.** (3) II. Analysis of local, state, and national health problems including infectious diseases, accidents, chronic illnesses, and occupational/environmental hazards, with emphasis on the programs designed to address these concerns. Pr.: FN 352 and BIOL 198.

**FN 660. Nutrition and Food Behavior.** (3) I, in even years. Focus on the physiological, environmental, cultural, and economic factors that influence the use of food. Identification of appropriate methodology to study these factors as well as programs to modify food behavior. Pr.: PSYCH 110 or SOCIO 211 or ANTH 200; and FN 502.

**FN 680. Seminar in Foods and Nutrition.** (2) I. Individual reports and discussion of current topics in foods and nutrition. Pr.: FN 501 and 502.

**FN 700. Community Nutrition.** (3) I. Factors in the community influencing nutritional status, techniques to assess community nutritional needs, methodology for implementing and evaluating community nutrition programs. Pr.: FN 503 or 610.

**FN 702. Nutrition in Developing Countries.** (3) I, in odd years. Nutritional problems in developing countries, including an analysis of factors which contribute to malnutrition, effects of undernutrition, methods for assessing nutritional status, and interventions to combat nutrition problems. Pr.: FN 503 or 610.

**FN 706. Practicum in Community Nutrition.** (3) I, II, S. Supervised experience in community nutrition agencies. Pr.: FN 700 and consent of instructor.

**FN 710. Bionutrition.** (3) II. Nutrient interrelationships based on knowledge of biochemical and physiological processes, functions of specific nutrients, and evaluation of nutritional status. Pr.: BIOCH 521, BIOL 526, and FN 502.

**FN 718. Physical Health and Aging.** (3) I, in alternate odd years. Focus is on the physiological theories of aging, the relationship between normal aging processes, and the major chronic and acute diseases of the elderly, and community health promotion/ maintenance programs for older adults. Pr.: BIOL 198 or 310; HDFS 510.

**FN 720. Food Systems.** (3) II. Chemical and physical principles of food components; emulsions and colloidal food systems. Two hours lec. and three hours lab a week. Pr.: BIOCH 521 and FN 501.

**FN 721. Sensory Analysis of Foods.** (3) II. Sensory analysis of food appearance, texture, aroma, flavor; physiology of sensory receptors; application of laboratory and consumer panels; and interpretation of data. Two hours rec. and two hours lab a week. Pr.: FN 501.

**FN 731. Descriptive Sensory Analysis.** (3) II. Even years. Flavor and texture profiling and other descriptive techniques for use in product development, research, and quality control. Practical experiences in conducting tests and leading panels. Two hours lecture and 2 hours lab a week. Pr.: FN 721.

**FN 741. Consumer Response Evaluation.** (3) II. Odd years. Evaluation of consumer attitudes and perceptions of products to provide quantitative and qualitative information for research guidance. Design and implementation of consumer questionnaires and development of guides for focus groups and interviews. Two hours lecture and four hours lab a week. Pr.: FN 501 or 502 and STAT 320 or 330.

**FN 750. Nutritional Aspects of Food Processing and Preparation.** (2–3) I. In alternate years. Stability of nutrients during processing, storage, and preparation of foods from raw food to products for human consumption. Pr.: FN 501; FN 502; and BIOCH 200 or 521.

**FN 780. Problems in Foods and Nutrition.** (Var.) 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.: FN 501 or 502.

**FN 782. Topics in Foods and Nutrition.** (1–3) On sufficient demand. May be taken more than once for a maximum of 6 hours. Pr.: Senior standing and consent of instructor.

**FN 790. Food Research Techniques.** (3) I. Fundamental principles of food quality evaluation and development of an independent research problem. Pr.: FN 501.

## Graduate credit

**FN 821. Practicum in Sensory Analysis.** (2–3) I, II, S. Individual experiences applying sensory testing. Four hours of lab per week for each hour of credit. Pr.: FN 731 or FN 741 and consent of instructor.

**FN 844. Nutritional Epidemiology.** (3) I. Methods and issues involved in understanding and conducting studies on the relationship between human diet and disease. Pr.: FN 502 and STAT 330 or STAT 702.

**FN 880. Graduate Seminar in Foods and Nutrition.** (1) II. Discussion of investigations in foods and nutrition. May be taken four semesters for credit. Pr.: FN 790 and 610.

**FN 898. Master's Report.** (Var.) I, II, S. Survey in depth of the literature.

**FN 899. Master's Thesis.** (Var.) I, II, S. Research in area of specialization.

**FN 905. Lipids in Food Systems.** (2) S. In alternate years. Physical and chemical characteristics of lipids with emphasis on their behavior and function in food systems. Pr.: BIOCH 521 and FN 720.

**FN 906. Proteins in Food Systems.** (2) S. In alternate years. Behavior and function of plant, animal, and nonconventional proteins in food systems. Pr.: BIOCH 521 and FN 720.

**FN 907. Food Dispersions.** (2) I. In alternate years. Properties of food dispersions; food sols, food gels, emulsions, and foams including batters and doughs. Pr.: FN 720.

**FN 908. Carbohydrates in Food Systems.** (2) I. In alternate years. Properties and functions of sugars and starches, and characteristics of edible plant tissues and pigments. Pr.: FN 720.

**FN 910. Advanced Nutrition: Carbohydrates and Lipids.** (2) II. In alternate years. Nutritional roles and metabolism of carbohydrates and lipids in normal and abnormal physiological states. Pr.: BIOCH 521, BIOL 526, and FN 710.

**FN 911. Advanced Nutrition: Proteins and Amino Acids.** (2), I, In alternate years. Nutritional roles and metabolism of proteins and amino acids. Functions, protein quality assessment, digestion and absorption, hormonal regulation, requirements, and interrelationships with other nutrients. Pr.: BIOCH 521, BIOL 526, and FN 710.

**FN 912. Advanced Nutrition: Minerals.** (2) I. In alternate years. Nutritional roles and metabolism of minerals. Functions, biological availability, hormonal regulation, requirements, deficiency and toxicity signs, and interrelations with other nutrients. Pr.: BIOCH 521, BIOL 526, and FN 710.

**FN 913. Advanced Nutrition: Vitamins.** (2) II. In alternate years. Nutritional roles and metabolism of vitamins. Functions, requirements, antivitamins, and deficiency and toxicity signs. Pr.: BIOCH 521, BIOL 526, and FN 710.

**FN 981. Food Science Colloquium.** (1) I. Discussion of investigations in food science. Attendance required of all graduate students in food science. Maximum of 2 hours may be applied toward an M.S. degree or 4 hours toward a Ph.D. degree.

**FN 999. Research in Foods and Nutrition.** (Var.) I, II, S. Three hours a week for each hour of credit. Pr.: Consent of instructor.

# Hotel, Restaurant, Institution Management and Dietetics

**Chair and professor**
**Judith Miller,** Ph.D., Texas Woman's U. (Forecasting for commercial and institutional foodservice, financial and quantitative analysis in restaurants, hotels and institutional foodservices)

**Professor**
**Carol W. Shanklin,** Ph.D., U. of Tennessee. (Solid waste management and other environmental issues affecting foodservice and hospitality operations, human resource management in foodservice and hospitality, and dietetic education)

**Associate professor**
**Deborah Canter,** Ph.D., U. of Tennessee. (Education and training of foodservice employees/dietetic professionals, consultation and private practice/marketing professional services, and personnel management in foodservice operations.)

**Rebecca A. Gould,** Ph.D., Texas Woman's University. (Professional development of school food service personnel, nutritional integrity of meals consumed away from home, productivity in foodservice and hospitality operations, dietetic education and tourism.)

## Programs

Graduate study in the Department of Hotel, Restaurant, Institution Management and Dietetics prepares graduates for management and academic careers in the foodservice and hospitality industries. Graduate students come from diverse academic and experience backgrounds, including foodservice management, dietetics, hotel and restaurant management, business, and social sciences. Graduate faculty and students collaborate to conduct applied research and disseminate findings through scholarly publications and presentations. Flexibility in planning the program of study allows students to meet personal and professional objectives while enhancing departmental research. Supportive faculty and peer relationships foster an environment where students may gain the knowledge, skills, and confidence for leadership positions in their chosen field.

### Objectives

The department offers the master of science degree and students may focus their study on issues related to foodservice, hospitality management, and dietetics. Graduates of the M.S. program will demonstrate:

Efficient management of human, material and financial resources;

- Analytical decision making;
- Application of research methods and findings;
- Leadership and administration of foodservice and hospitality management;
- Commitment to ethical business practices and assumption for self-direction, self-evaluation, and professional development; and
- Effective skills in communication and presentation.

The department participates in the Ph.D. program in human ecology offering a specialization in foodservice and hospitality management. Graduates of the Ph.D. program will demonstrate the above competencies and the following:

- Skills in grant proposal preparation;
- Leadership in administration of dietetics or hospitality education programs;
- Leadership in design and implementation of theoretical or applied research;
- Publication and application of research findings;
- Appreciation of the importance of internal and external environment and their impact on educational or operational effectiveness; and
- Effective skills in communication, presentation, and instruction.

## Facilities

The department has a well-equipped quantity foods laboratory in Justin Hall and access to the foodservice facilities in K-State residence halls and student union. Research opportunities are available in area hospitals, school foodservices, restaurants, and hotels. Graduate students are provided with work space and have access to personal computers and the university main frame computer.

## Admission

Admission to a graduate program in the Department of Hotel, Restaurant, institution Management and Dietetics requires a bachelor's degree from an accredited institution. Regular admission requires a grade point average of 3.0 on a 4.0 scale. Prerequisite requirements include: management concepts, financial accounting, marketing, quantity food production, and industry experience. Students interested in hospitality management also will need prerequisite knowledge of hotel operations. All applicants are required to take the Graduate Record Examination or the Graduate Management Admission Test. International applicants are required to submit results from the Test of English as a Foreign Language. A TOEFL score of 570 is required for admission.

### M.S. program

Application materials required include: application form; official transcript of all completed academic work; GRE or GMAT scores and TOEFL scores, if applicable; statement of objectives; resume; and three letters of recommendations. Application materials are reviewed by graduate faculty and recommendations forwarded to Graduate School.

### Ph.D. program

Students desiring to apply for the Ph.D. submit the above material to the College of Human Ecology Ph.D. Coordinator, Dean's Office, Kansas State University, Justin Hall, Manhattan, Kansas 66506. Deadlines for admission are February 1 for fall semester and August 1 for spring semester.

## Program requirements

### Master of science

Individual programs of study for the master of science degree are planned according to the background and interests of students. Students may choose one of the following plans:

30 hours of graduate credit consisting of 24 hours of graduate course work and 6 hours of research for a thesis, or 36 hours of graduate course work and a comprehensive examination.

**Required course work for master of science**

| | |
|---|---|
| HRIMD 810 | Research Techniques for Foodservice and Hospitality |
| HRIMD 885 | Seminar in Foodservice and Hospitality Management |
| HRIMD 890 | Administration of Foodservice and Hospitality Organizations |
| HRIMD 895 | Cost Control for Foodservice and Hospitality Management |

Graduate statistics course
Minimum 6 additional hours in HRIMD

### Doctor of philosophy

The Ph.D. requires a minimum of 90 semester hours of credit beyond the bachelor's degree, including dissertation research for at least 30 hours. The number of hours from a previously completed master's degree which may be counted toward the 90 hour requirement is decided upon by the student's supervisory committee and reviewed by the College of Human Ecology Coordinating Committee and the Graduate School. A maximum of 30 hours may be transferred from a completed master's degree and a maximum of 9 credit hours can be transferred from graduate work completed after the master's degree at another university. Doctoral students are required to take written and oral preliminary examinations prior to admission to candidacy.

**Required course work for Ph.D.**
All required courses for M.S.

| | |
|---|---|
| HRIMD 980 | Administration of Dietetics and Hospitality Programs |
| HRIMD 985 | Advances in Foodservice and Hospitality Management |
| HRIMD 990 | Dissertation Seminar |
| HRIMD 999 | Research in Foodservice and Hospitality Management (30 minimum) |
| EDCEP 927 | Higher Education Administration |

Statistics course(s) including analysis of variance, regression, and correlation
Experimental design course

## Graduate assistantships

The department offers several graduate teaching and research assistantships. The Department of Housing and Dining Services cooperates with the HRIMD department and offers several graduate assistantships for students to work as managers in residence hall foodservice.

Students are selected based on academic standing and prerequisite skills required for the assignment. Students on assistantship are required to take a minimum of 6 and no more than 12 credit hours per semester and must maintain a 3.0 GPA on all undergraduate and graduate course work. Reappointment is based on maintaining a 3.0 or higher GPA and performance in the position during the previous semester. The level of support for students ranges from $700 to $900 per month. Students on four-tenths or higher assistantship are assessed fees at the in-state rate in accordance with Graduate School policy.

## Hotel, restaurant, institution management and dietetics courses

### Undergraduate and graduate credit

**HRIMD 510. Introduction to Clinical Dietetics.** (1) Offered on demand. Application of concepts and skills in clinical dietetics in a simulated practice environment. One hour rec. per week. Pr.: FN 502; BIOCH 365; and BIOL 240; and conc. enrollment in FN 630.

**HRIMD 520. Applied Clinical Dietetics.** (7) I, II. Professional role of dietitians in the nutritional care and education of persons throughout the life cycle. Four credits recitation. 3 credits supervised practice. Pr.: HRIMD 510; FN 610, 630; and admission to coordinated program in dietetics.

**HRIMD 521. Clinical Dietetic Practicum.** (8) I, II. Supervised clinical/community experience in the nutritional care of patients/clients and the promotion of dietetic services. Two credits recitation, 6 credits supervised practice. Pr.: HRIMD 510; FN 610, 630; and admission to coordinated program in dietetics.

**HRIMD 560. Management in Dietetics.** (9) I, II. Functions of management in foodservice: financial control policy making, interdepartmental relationships, and foodservice planning; independent study and management experience in campus and other foodservices. Three credits rec., 6 credits practicum. Pr.: HRIMD 455, 456, 482; ACCTG 231, and admission to the coordinated program in dietetics.

**HRIMD 635. Foodservice Equipment and Layout.** (2) I, II. Factors affecting the selection and arrangement of equipment in foodservice systems. Field trip required. Pr.: HRIMD 440.

**HRIMD 650. Fundamentals of Public Health and Food Safety.** (3) I. Organization and function of food inspection services; principles of disease transmission; diseases transmitted to man through the food chain. (Jointly with LM 650.) Pr.: BIOL 198 and consent of staff.

**HRIMD 670. Seminar in Hotel, Restaurant Management and Dietetics.** (1) I, II. Current trends, research, and developments in hotel and restaurant management and dietetics. Pr.: Senior standing in hotel/restaurant management or dietetics programs. May be taken more than once.

**HRIMD 705. Computer Implementation in Foodservice and Hospitality Operations.** (3). S. In alternate years. Review of computer development in foodservice and hospitality operations; development of criteria for implementation of a computer system; analysis of foodservice and hospitality hardware and software. Pr.: CMPSC 110; and HRIMD 480 or 560 or MANGT 420.

**HRIMD 710. Readings in Foodservice and Hospitality Management.** (1–3) I. II. S. Directed study of current literature in foodservice and hospitality management and related areas. Pr.: HRIMD 480 or 560 or MANGT 420.

**HRIMD 720. Current Issues in Hotel, Restaurant, Institution Management and Dietetics.** (1–3) Recent developments and concerns related to management of foodservice and hospitality operations. Pr.: HRIMD 440, 480 or 560 or MANGT 420.

**HRIMD 755. Consultation in Dietetics.** (2–3) II. On sufficient demand. Dietetic consultation for foodservice in small hospitals, nursing homes, and schools. Pr.: HRIMD 440.

**HRIMD 780. Problems in Hotel, Restaurant, Institution Management and Dietetics.** (Var.) I, II, S. Individual investigation of problems in foodservice and hospitality management. Conferences and reports at appointed hours. Pr.: HRIMD 440; and HRIMD 480 or 560 or MANGT 420.

**HRIMD 785. Practicum in Foodservice Systems Management.** (1–6) I, II, S. Professional experiences in approved foodservice organization as a member of the management team under faculty supervision. Pr. or conc.; HRIMD 440; and HRIMD 480 or 560 or MANGT 420.

## Graduate credit

**HRIMD 805. Food Production Management.** (3) II. In alternate years. Production planning and controls in foodservice systems analysis in foodservice systems. Decision optimization and systems analysis in foodservice organizations. Consideration of various types of foodservice systems. Pr.: HRIMD 440; and HRIMD 480 or 560 or MANGT 420.

**HRIMD 810. Research Techniques for Foodservice and Hospitality Management.** (3) II. Survey and application of research methodology in foodservice and hospitality management. Pr.: STAT 702 or STAT 703.

**HRIMD 880. Procurement for Foodservice and Hospitality Operations.** (3) II. Principles of materials management and procurement of material resources for foodservice and hospitality operations. Pr.: HRIMD 480 or 560 or MANGT 420.

**HRIMD 885. Seminar in Foodservice and Hospitality Management.** (1) I, II, S. Discussions of research related to foodservice and hospitality management. Pr.: consent of instructor.

**HRIMD 890. Administration of Foodservice and Hospitality Organizations.** (3) I. Advanced study of management applied to foodservice and hospitality organizations. Pr.: HRIMD 480 or 560 or MANGT 420.

**HRIMD 895. Cost Controls in Foodservice Systems.** (3) I. Review of the components of cost control systems; analysis of financial data for foodservice operations; techniques for budget planning and control. Pr.: ACCTG 260; HRIMD 440; and HRIMD 480 or 560 or MANGT 420.

**HRIMD 899. Research in Foodservice or Hospitality Management.** (Var.) I, II, S. Individual research which may form the basis for master's report or thesis. Pr.: Consent of instructor.

**HRIMD 980. Administration of Dietetics and Hospitality Programs.** (3) II. In alternate years. An in-depth study of the development of dietetic and hospitality education and influence of the professional associations. Assigned observations and limited participation in administration of coordinated dietetics and hospitality management programs. Pr.: EDCEP 927 and consent of instructor.

**HRIMD 985. Advances in Foodservice and Hospitality Management.** (3) I. In alternate years. Analysis of selected topics and research in foodservice and hospitality management. Pr.: HRIMD 810 and consent of instructor.

**HRIMD 990. Dissertation Proposal Seminar.** (1) I. II, S. Presentation and discussion of proposals for dissertation research. Pr.: Six hours of statistics, 3 hours of research design or methods, and consent of major professor.

**HRIMD 999. Research in Foodservice or Hospitality Management.** (Var.) I, II, S. Research in foodservice or hospitality management for the doctoral dissertation. Pr.: consent of major professor.

# Human Development and Family Studies

**Head**

**John P. Murray,** Professor, Ph.D. 1970, The Catholic University of America: Impact of television on children; youth and popular music; child development and social policy.

**Professors**

**Stephan R. Bollman,** Ph.D. 1966, Iowa State University: Family theory; delivery of human service programs; research methodology.

**Anthony P. Jurich,** Ph.D. 1972, Pennsylvania State University: Adolescence; family; marriage and family therapy; family crisis; rural families in crisis.

**Virginia M. Moxley,** Ph.D. 1977, Kansas State University: Rural families; work-family interactions.

**Candyce S. Russell,** Vera Mowery McAninch Professor of Human Development and Family Studies, Ph.D. 1975, University of Minnesota: Family studies; marriage and family therapy; therapy outcome.

**Walter R. Schumm,** Ph.D. 1979, Purdue University: Family theory; military families; measurement and evaluation; family studies; and premarital counseling.

**Associate professors**

**David E. Balk,** Ph.D. 1981, University of Illinois at Urbana–Champaign: Program evaluation; adult development; adolescence; bereavement; coping and life crises; qualitative research.

**M. Betsy Bergen,** Ph.D. 1972, Kansas State University: Family relationships; courtship and marital interaction; human sexuality; stepfamilies; AIDS education.

**Ann D. Murray,** Ph.D. 1978, Macquarie University, Australia: Infant development; neonatal behavior; child development and social policy.

**Robert H. Poresky,** Ph.D. 1969, Cornell University: Child development research and theory; infancy; child and home assessment; child rearing environments; early childhood education; companion animal effects.

**Rick J. Scheidt,** Ph.D. 1973, University of Nebraska: Adult development and aging; environment-behavior interactions.

**Susan K. Wanska,** Ph.D. 1977, University of Wisconsin: Early childhood/handicapped; communication skills; cognitive development.

**David W. Wright,** Ph.D. 1985, University of Georgia: Marriage and family therapy; adolescent sexuality; post-divorce family use; use of computers in marriage and family therapy.

**Assistant professors**

**Mary F. De Luccie,** Director of Early Childhood Education, Ph.D. 1987, Kansas State University: Early childhood development; child care administration; parent–child interaction; parent education.

**Richard B. Miller,** Ph.D. 1989, University of Southern California: Marriage and family therapy; gerontology; family studies.

## Programs

The Department of Human Development and Family Studies is a multidisciplinary department that provides graduate training for M.S. and Ph.D. students. The professional specializations are addressed to broad issues concerning individuals and families and the courses are taught by a faculty of sociologists and psychologists, educators and economists, health specialists and gerontologists, social workers and marriage and family therapists.

The department offers graduate work towards M.S. and Ph.D. degrees in a broad range of the human sciences and human services. The M.S. degree in human development and family studies includes specializations in adolescence and youth, early childhood education administration, early childhood education/handicapped, family life education and consultation, life span human development, and marriage and family therapy. Also, the department offers the following specializations leading to the Ph.D. degree in human ecology: family life education and consultation, life span human development, and marriage and family therapy.

## Graduate program specializations

### Adolescence and youth

M.S. students in this program study adolescence from a developmental perspective in a family context. Graduates are prepared to be administrators for group care adolescent facilities, counselors of adolescents, and educators who consult or provide programs for organizations concerned with youth and families.

### Early childhood education

The M.S. program in early childhood education administration prepares individuals to be directors of early childhood programs and leaders in the development of child care policy. The M.S. program in early childhood/handicapped leads to a teaching certificate endorsement by the Kansas Department of Education in this area of specialization and career opportunities in teaching and administration.

### Family life education and consultation

The M.S. and Ph.D. specializations in family life education prepare students to develop and implement educational programs designed to strengthen family life. Course work and practica are tailored to the backgrounds and professional goals of each student, with emphasis on human development and family studies, and on program development and evaluation.

### Gerontology

The department participates in the university's interdisciplinary graduate emphasis program in gerontology at both the M.S. and Ph.D. levels. This program prepares graduates to establish careers in academic work, research, program development, or professional services related to aged individuals and their families.

### Life span human development

The life span human development M.S. and Ph.D. specializations are concerned with the growth and development of the individual, the varying contexts of human development, and the processes underlying development throughout the life cycle. Emphasis is placed on understanding the continuous and systematic changes in individual behavior.

### Marriage and family therapy

The marriage and family therapy M.S. and Ph.D. specializations prepare professionals to conduct and evaluate therapy with marital and family groups. Students pursue programs of study that include course work in human development, family studies, marital and family therapy, statistics, and research methods. Both the M.S. and Ph.D. specializations in marriage and family therapy are accredited by the Com-

mission on Accreditation for Marriage and Family Therapy Education.

**Application**
For additional information, please contact:
Graduate Admissions
Department of Human Development and Family Studies
College of Human Ecology
303 Justin Hall
Kansas State University
Manhattan, KS 66506–1403
(913) 532-5510
Fax: 913-532-5505
E-Mail: HDFS@KSUVM (bitnet)

## Human development and family studies courses

### Undergraduate and graduate credit in minor field

**HDFS 505. Families, Employment Benefits and Retirement Planning.** (3) I. Study of micro and macro considerations for retirement planning. Survey of various types of retirement plans, ethical considerations in providing retirement planning services, assessing and forecasting financial needs in retirement, and integration of retirement plans with government benefits. Pr.: HDFS 405.

**HDFS 506. Middle Childhood and Adolescence.** (3) I. Principles of growth and development during middle childhood and adolescence, including familial, societal, and other ecological factors affecting development of youth. Pr.: HDFS 110 or PSYCH 110.

**HDFS 507. Middle Childhood Lab.** (1) I. Analysis of situations facing children age six to twelve and design of interventions to enable these children to cope with these situations. Prior or conc. enrollment in HDFS 506.

**HDFS 508. Adolescent Lab.** (1) I. Analysis of situations facing adolescents and design of interventions to enable adolescents to cope with these situations. Prior or conc. enrollment in HDFS 506.

**HDFS 510. Human Development and Aging.** (3) I. Survey of issues, research, and problems in aging and human development throughout adulthood, with particular emphasis upon the later years. Pr.: HDFS 110 or PSYCH 280.

**HDFS 515. Family Law.** (3) I. Survey of legal issues concerning children and families. Topics include: human rights and responsibilities; marriage, divorce, paternity, child custody; estate and integenerational transfer; and juvenile codes and school law. Pr.: HDFS 110 or PSYCH 110.

**HDFS 524. Professional Seminar in Early Childhood Education.** (3) II. Examination of programs for young children, including philosophical and theoretical foundations. Implementation and evaluation of program models and related issues and research. Pr.: HDFS 310 or PSYCH 280.

**HDFS 525. Estate Planning for Families.** (3) II. Introduction to fundamentals of the estate planning process. Includes property transfer, tax consequences, probate avoidance, powers of appointment, and various tools/techniques used in implementing an effective estate plan. Pr.: HDFS 405.

**HDFS 528. Exceptional Development in Early Childhood.** (3) II. Exceptional development in early childhood (birth to five years), including sensory impairments, physical impairments, communication disorders, mental retardation, behavioral problems, and gifted performance; formal and informal assessment in all developmental areas; the family's role in the assessment/referral/intervention process. Pr.: HDFS 310.

**HDFS 540. Curriculum for Cognitive and Language Development of Young Children.** (3) I. Planning for the enhancement of cognitive and language development. The application of child development theory to the planning of programs for young children within the major curriculum areas. Conc. with HDFS 545 or 546. Prior or conc. with SPPAT 555. Pr.: HDFS 310 and 313 and admission into teacher education.

**HDFS 541. Curriculum for Emotional, Social, and Physical Development of Young Children.** (3) II. Planning for the enhancement of physical, social, and emotional development. The application of child development theory to the planning of programs for young children within the major curriculum areas. Conc. with HDFS 545 or 546. Pr.: HDFS 310 and 313 and admission into teacher education.

**HDFS 545. Early Childhood Program Lab I.** (1) I, II. Application of principles and techniques to planning, implementing, and evaluating developmentally appropriate activities for young children in a supervised lab setting and in recitation sessions. Conc. with HDFS 540 or 541. Pr.: HDFS 310 and 313 and admission into teacher education.

**HDFS 546. Early Childhood Program Lab II.** (2) I, II. Advanced application of principles and techniques for developmentally appropriate programs for young children. Planning, implementing, and evaluating activities in a supervised lab setting. Conc. with HDFS 540 or 541. Pr.: HDFS 545 and admission into teacher education.

**HDFS 550. The Family.** (3) I, S. Consideration of the family throughout the family life cycle; developmental tasks at each stage. Use and impact of family support services. Pr.: Nine hours in HDFS or other social science and junior standing.

**HDFS 580. Directed Field Experience.** (8) I, II. A block field placement in local agencies. Faculty-supervised experience in direct service to clients: individuals, groups, and communities. Weekly seminar during placement emphasizes theory underlying the practice. Pr.: HDFS 301 or SOCWK 260; HDFS 550; and consent of instructor.

**HDFS 585. Professional Seminar in Family Life Education.** (4) I, II. Consideration of professional philosophy, identity, ethics, career development, and characteristics of client populations. Development of skills for family life educators working in agencies with various socioeconomic, age, and ethnic groups. Pr.: Conc. enrollment in HDFS 580.

**HDFS 590. Proseminar in Human Development and Family Studies.** (1–3) On sufficient demand. Review of specific issues or professional practices affecting children and/or families. Pr.: Junior standing and consent of instructor.

**HDFS 595. Professional Seminar in Family Financial Planning.** (3) II. Examination of professional issues in family financial planning, including ethical considerations, regulation and certification requirements, communication skills, and professional responsibility. Development of skills needed for family financial planners working with families in meeting their financial needs. Pr.: Senior standing and HDFS 405.

### Undergraduate and graduate credit

**HDFS 589. Administration of Early Childhood Programs.** (3) I. Rationale for and techniques of administering programs for preschool children, including health, education, social services, parent involvement. Pr.: Nine hours in HDFS or other social science and junior standing.

**HDFS 598. Directed Experiences in Early Childhood Education.** (8) I, II, S. Participation in a preschool program; planning, instruction, evaluation. Prearrangement and consent of instructor required. Pr.: HDFS 420, 540, 541, 545, 546, and admission into teacher education.

**HDFS 600. Economic Status of Women.** (3) II, in alternate years. Socioeconomic factors affecting the economic roles of women. Income, wealth, discrimination, employment, household production, and attitudes as they pertain to the economic position of women in society. Pr.: Junior standing and ECON 110.

**HDFS 603. Coping with Life Crises.** (3) I. Examination of the effects of human competencies and coping strategies on successful adaptation to anticipated life crises, developmental transitions, and sudden, unexpected life events. Pr.: HDFS 110 or PSYCH 110 and 6 hours of social science.

**HDFS 605. Consumers and the Market.** (3) I, in alternate years. Consumption behavior studied with a focus on social and economic variables. Pr.: ECON 110.

**HDFS 609. Families in the American Economy.** (3) II, in alternate years. Impact of socio-economic and public policy factors on family economic well-being. The special issues faced by financially disadvantaged and non-traditional households will be addressed. Pr.: Nine hours in HDFS or other social sciences.

**HDFS 652. Black Families.** (2–3) Selected topics for understanding life styles of black families. Implications for professionals working with black children and families. Pr.: Nine hours in HDFS or other social science and junior standing.

**HDFS 654. Death and the Family.** (2–3) I. Exploration of contemporary attitudes toward death and dying; related influences on individual development and family life. Pr.: HDFS 550 or SOCIO 640.

**HDFS 670. Parent Education.** (3) II. Principles in child development and family relationships applied to professional group and individual work with parents. Pr.: HDFS 370 and 550.

**HDFS 675. Field Study in Family Economics.** (1–3) I, II. Supervised experiences in financial counseling, community action, or consumer services. Pr.: Consent of instructor.

**HDFS 700. Problems in Human Development and Family Studies.** (Var.) I, II, S. Independent study on aspects of human development and family studies. Pr.: Consent of instructor.

**HDFS 704. Seminar in Human Development and Family Studies.** (Var.) I, II, S. Interpretation and evaluation of information on varied topics relating to family members. May be taken for a maximum of nine hours. Pr.: Nine hours of HDFS or other social science.

**HDFS 705. Financial Problems of Families.** (3) I, in alternate years. Analysis of financial problems confronting families. Application of family economic theory to major financial decisions made by families. Pr.: HDFS 405.

**HDFS 708. Topics in Human Development and Family Studies.** (2–3) I, II, S. Review of recent research and theory related to exploration of methods and family and interpersonal processes. Pr.: Consent of instructor. May be taken more than one semester.

**HDFS 710. Child Care: Components and Issues.** (2–3) On sufficient demand. Resources and facilities of quality child care; exploration of methods and philosophies of such programs; designed for those working with paraprofessional child care personnel. Pr.: Fifteen hours of either social science and/or HDFS.

**HDFS 728. Assessment of Young Children.** (3) I. Theory and practice of individual assessment of handicapped and normal children, infancy to age eight, including cognitive, language, fine and gross motor, social, and self-help skills. Focus on selection, administration, interpretation, and evaluation of screening and comprehensive evaluation instruments for assessment and individual program planning. Pr.: HDFS 310.

**HDFS 760. Family Decision Making.** (3) II, in alternate years. Analysis of conceptual frameworks of processes by which families and individuals allocate resources. Pr.: HDFS 460 and 550.

**HDFS 770. Economics of Aging.** (3) II, in alternate years. Analysis of economic factors associated with aging; implications for individuals, society, and the economy. Pr.: Nine hours of HDFS or other social sciences.

### Graduate credit

**HDFS 810. Child Development.** (3) I, II. Behavioral characteristics and developmental processes in childhood and adolescence. Analysis of developmental trends and issues in terms of research evidence and theoretical expectations. Pr.: HDFS 310; and 3 additional hours in HDFS or child psychology.

**HDFS 815. Infant Behavior and Development.** (3) II. In alternate years. 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.: HDFS 310, 810; and BIOL 198.

**HDFS 820. Theories of Child Development.** (3) I. Theories of development relating to physical, social, and psychological patterns of children's growth and interaction with the family and the community. Pr.: HDFS 310; and three additional hours in HDFS or child psychology.

**HDFS 822. Transition to Adulthood.** (3) S. In alternate years. Advanced study of theory and research of the transition period from adolescence through youth to adulthood. Pr.: HDFS 506 and 810.

**HDFS 824. Parent–Child Interaction: Theory and Research.** (3) II. Developmental theories and empirical research concerning the reciprocal interactions between parents and their children focusing on the socialization of the child within the family. Pr.: HDFS 810.

**HDFS 830. Advanced Program Development.** (2–3) Alternate II. Analysis of the process and application of child development theory to early childhood program planning. Pr.: HDFS 820.

**HDFS 845. Adult Development and Aging.** (3) II. Developmental aging research as related to individual, social, and family functioning throughout adulthood. Pr.: Twelve hours social science.

**HDFS 850. Family Studies.** (3) II. Survey of family research literature to illustrate various approaches to the study of the family and to understand family changes within the life cycle. Pr.: HDFS 550; and STAT 330 or 702.

**HDFS 852. Contemporary Family Theories.** (3) I. Survey of contemporary family conceptual frameworks and theoretical perspectives, with emphasis on the application of family theory in basic and applied family research. Pr.: HDFS 550; and STAT 330 or 702.

**HDFS 855. Family Crisis.** (3) I. The nature of stress in the family from a theoretical and research base, focusing on the genesis of family crisis and the family's response to stress and crisis. Pr.: HDFS 550.

**HDFS 862. Marital Interaction.** (3) I. A study of the dynamics of marital interaction with emphasis upon the interpersonal relationships and processes of adjustment. Pr.: HDFS 350 and 550 and consent of instructor.

**HDFS 863. Single-Parent and Reconstituted Families.** (3) I, II. Survey of research literature regarding single-parent and reconstituted families. Demography, complexity, problems, strengths, and processes of adjustment of family units and their members. Implications for professionals working with these families. Pr.: HDFS 550.

**HDFS 864. Clinical Theory and Practice.** (3) I. Frameworks and skills for helping individuals within the family context. Study and observation of operations in family clinical programs and family therapy. Pr.: HDFS 301; HDFS 550 and consent of instructor.

**HDFS 865. Human Sexuality.** (3) II, alternate S. Focus on implications of personal and familial aspects of human sexuality throughout the life cycle. Pr.: HDFS 350 and six hours social science.

**HDFS 870. Principles of Marriage and Family Therapy.** (3) II, S. Examination of processes in marriage and family therapy; study of interactions within the therapeutic setting; and application of knowledge of the family and of marriage to the helping relationship. Pr.: HDFS 852 and 864 or EDAF 823 and permission of instructor.

**HDFS 871. Family Life Education and Consultation.** (3) I, II. Theory and procedures for family life education and consultation with professional and volunteer staff in a variety of settings. Pr.: HDFS 550.

**HDFS 875. Delivery of Human Services.** (3) I, II, alternate S. Cognitive and experiential understanding of professional responsibilities in working effectively with families in an educational outreach or consultative setting. Pr.: HDFS 871.

**HDFS 877. Individual and Family Assessment.** (3) I. Assessment of individual and family functioning within developmental, ethnic, community and gender-sensitive contexts; including indicators for further evaluation and referral. Pr.: HDFS 870.

**HDFS 878. Professional Studies in Family Therapy.** (3) I. Analysis of professional issues, techniques, and responsibilities associated with working effectively with families in a family therapy setting. Pr.: HDFS 864 or conc. enrollment and consent of instructor.

**HDFS 880–885. Practica in Human Development and Family Studies.** (Var.) I, II, S. Supervised experience in providing help and/or instruction in the several areas of human development and family studies presented in terms of the special interests of the students. Consent of practicum supervisor is required for each.

**HDFS 880. Practicum in Counseling.** Same as PSYCH 860 and EDAF 863. Pr.: HDFS 870 and EDAF 823.

**HDFS 881. Practicum in Family and Community Services.** Pr.: HDFS 875 and 871.

**HDFS 882. Practicum in Study of Student Development.**

**HDFS 883. Practicum in Early Childhood Education.** Pr.: HDFS 540.

**HDFS 884. Practicum in Parent Education.** Pr.: HDFS 670.

**HDFS 885. Practicum in Marriage and Family Therapy.** (3) Supervised experience in marriage and family therapy. Designed for master's level students. Pr.: HDFS 870; HDFS 878 and admission to marriage and family therapy program.

**HDFS 890. Research Methods in Human Development and Family Studies.** (3) I, II. Study and application of family and human developmental methodology for research in graduate programs and professional careers. Pr.: STAT 330 or 702.

**HDFS 891. Family Survey Research.** (3) II. Principles and techniques for collection, coding, analysis, and interpretation of survey data from several family members. Computer-oriented. Pr.: STAT 330, HDFS 550 and 890.

**HDFS 892. Practicum in Human Development Research.** (Var.) I, II, S. Observation, modification, and reporting of behavior. Pr.: HDFS 890; course in methods of research; 9 other graduate hours in human development and family studies; consent of instructor.

**HDFS 893. Program Evaluation in Human Services.** (3) II. Study and application of program evaluation approaches and methodology pertinent to evaluating programs in human service and education settings. Pr.: HDFS 890 or another graduate level social sciences research course.

**HDFS 894. Readings in Human Development and Family Studies.** (Var.) I, II, S. Implications of research findings in preparation for professional work in counseling, teaching, and research in human development and family studies. Pr.: Twelve hours in social-behavioral science; and consent of instructor. May be taken for a maximum of 9 hours.

**HDFS 895. Principles and Techniques of Family Measurement.** (3) II. The comparative reliability and validity of current measures of family interaction and analysis of their suitability for use in program evaluation of family life education and family therapy. Pr.: HDFS 850 and a graduate-level research methods course.

**HDFS 896. Advanced Family Therapy.** (3) II. Analysis of care management issues and literature related to the application of advanced techniques in family therapy. To be taken concurrently with HDFS 885. Pr.: HDFS 870 and consent of instructor.

**HDFS 899. Research in Human Development and Family Studies.** (Var.) I, II, S. Individual research problems which may form the basis for the master's thesis or report. Pr.: Consent of major professor.

**HDFS 908. Topics in Family Life Education and Consultation.** (3) On sufficient demand. Recent research, theory construction, and program development; focusing on selected relevant topics. Designed for doctoral students in family life education and consultation. Pr.: HDFS 871.

**HDFS 910. Topics in Marriage and Family Therapy.** (1–3) I, II. Examination of recent research, theory, and clinical practice related to marriage and family therapy. Pr.: HDFS 870 and consent of instructor. May be taken up to 9 hours.

**HDFS 930. Human Development Seminar.** (3) Analysis of the continuous and systematic changes in the development of individuals as they interact with their physical and social environments. Pr.: HDFS 810, 820, and 845. May be taken for a maximum of 12 hours.

**HDFS 950. Advanced Family Theory.** (3) I. In alternate years. Examination of theoretical approaches to the study of the family unit from the perspective of interpersonal relationships. Emphasis on axiomatic theory construction in contemporary family studies literature. Pr.: HDFS 850, 852, and 890.

**HDFS 979. Advanced Family Life Education and Consultation.** (3) II. In alternate years. Theory and practices of family life education and consultation, including issues of development of the family life profession and national family policy. Pr.: HDFS 871.

**HDFS 981. Advanced Practicum in Family and Community Services.** (1–3) Supervised experience in family life education and consultation. Pr.: HDFS 871, 875, 881, and consent of instructor; may be taken for a maximum of 6 hours.

**HDFS 984. Supervision of Marriage and Family Therapy.** (3) I. Preparation of experienced marriage and family therapists for supervision roles within educational, medical and agency settings. Must be concurrently enrolled in HDFS 986 (Practicum in Supervision). Pr.: HDFS 896 and HDFS 985.

**HDFS 985. Ph.D. Practicum in Marriage and Family.** (1–3) I, II, S. Supervised experience in family therapy. Consent of instructor is required. Pr.: HDFS 880. May be taken for up to 9 hours.

**HDFS 986. Practicum in Supervision of Marriage and Family Therapy.** (1–3) I, II, S. Supervised experience in supervision of marital and family therapy. Consent of instructor required. Pr.: HDFS 985. May be taken for up to 9 hours.

**HDFS 988. Conjoint and Group Techniques in Family Counseling.** (3) II, S. Advanced theory in marriage and family counseling with emphasis on group techniques. Pr.: HDFS 885 and consent of instructor.

**HDFS 990. Dissertation Proposal Seminar.** (1) I, II. Presentation and discussion of proposals for dissertation research. Pr.: Six hours of statistics, 3 hours of research design or methods, and consent of major professor.

**HDFS 999. Research in Human Development and Family Studies.** (Var.) I, II, S. Pr.: Consent of major professor.

# Veterinary Medicine

Michael D. Lorenz, Dean
Ronnie G. Elmore, Associate Dean
Carolyn V. Roberts, Assistant Dean

101 Trotter Hall
532-5660

## Doctor of Veterinary Medicine Degree

### Admission

Enrollment in the College of Veterinary Medicine is limited to well-qualified students who have completed the minimum 70 required hours of pre-professional courses (see pre-professional requirements). A student must have at least a 2.80 grade point average over the pre-professional requirements and over the last 45 hours of undergraduate college work in order to be eligible for an interview. A grade below a C in a pre-professional requirement is not acceptable. Nonresidents must meet the same scholastic requirements to receive an application for the professional curriculum and consideration for selection. All applicants must take the general test of the Graduate Record Examination.

Personal interviews are required of all students under consideration. Selection is based upon academic achievement and professional potential as determined by the interview with the Admissions Committee. Applicants are evaluated on such items as motivation, maturity, communication skills, experience with and knowledge of animals, and experience with and knowledge of veterinary medicine. Therefore, all students interested in applying to the College of Veterinary Medicine are encouraged to have adequate animal exposure and to have work experience related to veterinary medicine to demonstrate to the admissions committee an understanding of the profession.

Selection for admission to the curriculum in veterinary medicine is based on individual merit of qualified applicants who are graduates of Kansas high schools and/or who have been residents for at least three years immediately prior to first semester enrollment of the year for which they are applying.

After Kansans are selected, nonresidents from states with which K-State has a contract to provide veterinary medical education and who are certified by their state will be selected. Since the contract status may change yearly, interested applicants should contact the associate dean, College of Veterinary Medicine, for current information regarding contract states. There is also a limited number of at-large positions available. Applicants for these positions may be considered after highly qualified Kansas residents and certified residents of contract states are selected. In the selection of the at-large positions, priority will be given to residents/citizens of the United States.

On September 1, applications for admission to the professional curriculum may be obtained from the Office of the Assistant Dean of the College of Veterinary Medicine for consideration in the next class.

No applications are accepted after January 15.

### Pre-professional requirements

The pre-professional work may be pursued at Kansas State University in the College of Arts and Sciences or the College of Agriculture or in other academically accredited institutions.

Listed below are required courses, with K-State course numbers listed at left.

#### Requirements

| | | |
|---|---|---|
| ENGL 100 | Expository Writing I | 3 |
| ENGL 120 | Expository Writing II | 3 |
| SPCH 105 | Public Speaking | 2 |
| | **or** | |
| SPCH 106 | | |
| CHM 210 | Chemistry I | 4 |
| CHM 230 | Chemistry II | 4 |
| CHM 350 | General Organic Chemistry | 3 |
| CHM 351 | General Organic Chemistry Laboratory | 2 |
| BIOCH 521 | General Biochemistry | 3 |
| BIOCH 522 | General Biochemistry Laboratory | 2 |
| PHYS 113 | General Physics I | 4 |
| PHYS 114 | General Physics II | 4 |
| BIOL 198 | Principles of Biology | 4 |
| BIOL 510 | Embryology** | 4 |
| BIOL 511 | Embryology Laboratory** | 1 |
| BIOL 455 | Microbiology (with lab) | 4 |
| ASI 500 | Genetics | 3 |
| Social Sciences and/or humanities | | 12 |
| Electives | | 9 |
| | | 70 |

**If a course in embryology is not offered at the school you are attending, developmental biology, comparative anatomy, reproductive physiology, or an advanced animal biology course may be substituted.

All science courses (chemistry, physics, biology, and genetics) must have been taken within six years of the date of application. All pre-professional requirements must be graded.

A bachelor of science degree may be granted by the College of Agriculture or the College of Arts and Sciences upon completion of residency and academic requirements. Detailed information should be obtained from the dean's office of the appropriate college.

### Fees for veterinary medical students

College of Veterinary Medicine fees are higher than undergraduate fees. Since these are determined annually, contact the Office of the Associate Dean for current fees.

### Doctor of veterinary medicine curriculum

The curriculum in veterinary medicine at Kansas State University was established to give Kansas residents preparation for entry into a variety of veterinary medical careers. While the professional curriculum in veterinary medicine is balanced and comprehensive with consideration given to all species, emphasis is placed on food animal diseases.

The academic standards of the College of Veterinary Medicine govern honors, progression, probation, and dismissal. Students will be informed of their academic status by the dean's office based on information supplied by the university registrar. The scholastic record of each student will be reviewed following each period of required registration in the veterinary curriculum.

Studies must be taken as prescribed. Elective courses may be taken with permission only.

For admission to the curriculum in veterinary medicine, consult the previously listed pre-professional requirements.

Completion of the professional curriculum leads to the degree of doctor of veterinary medicine. (Hours required for graduation: pre-professional 70; professional 165; total 235.)

#### First professional year

**Fall semester**

| | | |
|---|---|---|
| AP 700 | Gross Anatomy | 6 |
| AP 710 | Microanatomy | 5 |
| AP 737 | Veterinary Physiology I | 5 |
| AP 740 | Veterinary Orientation | 1 |
| AP 702 | Nutritional Physiology and Metabolism | 3 |
| | | 20 |

**Spring semester**

| | | |
|---|---|---|
| AP 705 | Gross Anatomy II | 6 |
| AP 720 | Veterinary Neuroscience | 2 |
| AP 747 | Veterinary Physiology II | 6 |
| AP 801 | Clinical Skills I | 1 |
| LM 705 | Veterinary Immunology | 2 |
| LM 755 | Principles of Epidemiology | 2 |
| CS 741 | Ethics and Jurisprudence | 1 |
| | | 20 |

#### Second professional year

**Fall semester**

| | | |
|---|---|---|
| AP 770 | Pharmacology | 5 |
| LM 712 | Veterinary Bacteriology and Mycology | 5 |
| LM 793 | Veterinary Parasitology | 5 |
| PA 703 | General Pathology | 5 |
| | | 20 |

**Spring semester**

| | | |
|---|---|---|
| LM 722 | Veterinary Virology | 3 |
| LM 775 | Clinical Pathology | 3 |
| PA 710 | Systemic Pathology | 5 |
| PA 859 | Laboratory Animal Science | 2 |
| CS 805 | Surgery I | 3 |
| CS 830 | Medicine I | 4 |
| CS 802 | Clinical Skills II | 1 |
| | | 21 |

#### Third professional year

**Fall semester**

| | | |
|---|---|---|
| LM 777 | Laboratory Diagnosis | 1 |
| VD 847 | Avian Diseases | 3 |
| CS 814 | Small Animal Surgery | 4 |

| | | |
|---|---|---|
| CS 820 | Theriogenology | 3 |
| CS 824 | Food Animal Medicine | 4 |
| CS 850 | Medicine II | 4 |
| CS 895 | Toxicology | 3 |
| | | 22 |

**Spring semester**

| | | |
|---|---|---|
| LM 753 | Zoonosis and Preventative Medicine | 3 |
| CS 875 | Production Medicine | 2 |
| CS 803 | Clinical Skills III | I |
| CS 811 | Large Animal Surgery | 4 |
| CS 821 | Companion Animal Medicine | 4 |
| CS 840 | Radiology | 3 |
| AP 886 | Clinical Nutrition | 3 |
| | | 20 |

### Fourth professional year

**Summer, fall, and spring semesters**

33 hours required core rotations:

| | | |
|---|---|---|
| CS 817 | Small Animal Medicine | 6 |
| CS 809 | Clinical Small Animal Surgery | 6 |
| CS 810 | Equine Medicine and Surgery | 6 |
| CS 813 | Agricultural Clinical Practices | 6 |
| CS 815 | Veterinary Diagnostic Imaging I | 3 |
| CS 816 | Clinical Anesthesia | 3 |
| VD 851 | Necropsy-Toxicology-Public Health | 2 |
| CS 860 | UNL-KSU Food Animal Production Medicine | I |
| | | 33 |

Plus minimum 9 hours of mini-electives and/or rotational electives for a total of a minimum of 42 hours.

### Veterinary medical library

The College of Veterinary Medicine has a well-equipped library that is a part of the Kansas State University libraries system and consists of approximately 35,000 volumes that deal with all phases of veterinary medical literature and many allied fields. It subscribes to 900 journals and has medical/veterinary CD-ROM data bases.

### Anatomy and physiology

The Department of Anatomy and Physiology presents courses in cell and systemic physiology, gross anatomy and microscopic anatomy, nutrition and metabolism, and pharmacology at both the undergraduate and graduate levels. For information on graduate work, courses, and faculty, see the Anatomy and Physiology.

Biophysical electronic instrumentation, an electron microscope, environmental chambers, scintillation counter, respiratory mass spectrometer, treadmills, and other instruments are available for physiological and anatomical studies.

### Professional veterinary medicine courses

For complete course lisings, see the Department of Anatomy and Physiology.

**AP 700. Gross annatomy I.** (6)

**AP 702. Nutrition Physiology and Metabolism.** (3) I. The physiological and metabolic aspects of nutrition presented to form a basis for the applicaton of clinical nutrition in medicine. Major nutrient groups and nutrients will be approached from digestive, physiological, and metabolic points of view. Pr.: First year standing in College of Veterinary Medicine.

**AP 705. Gross Anatomy II.** (6)

**AP 710. Microscopic Anatomy I.** (3)

**AP 720. Veterinary Neuroscience.** (2)

**AP 737. Veterinary Physiology I.** (6)

**AP 740. Veterinary Orientation.** (I)

**AP 747. Veterinary Physiology II.** (6)

**AP 770. Pharmacology.** (5)

**AP 801. Clinical Skills I.** (1)

**AP 886. Clinical Nutrition.** (3)

**AP 891. Beef Nutritional Health and Feeding Management.** (I)

**AP 892. Dairy Nutritional Health and Feeding Management.** (I)

**AP 893. Equine Nutritional Health and Feeding Management.** (1)

### Clinical sciences

The KSU-Veterinary Medical Teaching Hospital (KSU–VMTH) is equipped for diagnosis and treatment of animal disease and for instruction of veterinary students, house officers, and postgraduate veterinarians.

The hospital has a capacity of 82 large animal patients and 150 small animal patients. Clinical faculty accompanied by students provide clinical veterinary service to clients in the local community, for clients of referring veterinarians from a six-state region, and on local and regional livestock farms. In addition to caring for sick animals, they provide preventative medical services and consultation on production medicine and management. KSU–VMTH provides full veterinary service for clients and referring veterinarians from Kansas and Nebraska, and the educational programs are conducted in conjunction with the University of Nebraska Veterinary Educational Center at Clay Center, Nebraska.

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 on the clinical and pathology staffs.

The department presents courses in medicine, surgery, toxicology, obstetrics, theriogenology, and other clinical specialties to veterinary students and post-DVM trainees. For more information on graduate work, courses, and faculty, see entry the clinical section.

### Professional veterinary medicine courses

For complete course descriptions, see the Department of Clinical Sciences.

**CS 702. Animal Nutrition and Diet Formulation.** (2) I. Application of basic nutrition principles, diet formulation, and diet adequacy for livestock, poultry, pets, and exotic animals. Includes practical feeding problems encountered by producer and veterinarians. Same as AP 702 and ASI 702. Pr.: First-year standing in College of Veterinary Medicine.

**CS 741. Ethics and Jurisprudence.** (1) II. Socratic ethics are discussed along with the American Veterinary Medical Association's Code of Ethics and practical situations with a fundamental ethical basis. The Kansas Practice Act is explored as an example of governance in veterinary medicine. The role of animals in humans' well being is addressed along with the philosophy of animal welfare. The law and the practicing veterinarian are discussed with emphasis upon professional liability. Pr.: First-year standing of College of Veterinary Medicine.

**CS 801. Clinical Skills I.** (1) II. Introduction to terminology and thought/organization for clinical veterinary medicine. Emphasis on problem identification from a clinical data base, and basic veterinary skills with animals. Same as AP 801. Pr.: First-year standing in the College of Veterinary Medicine. Three hours lab a week.

**CS 802 Clinical Skills II.** (1) II. Continuation of Clinical Skills I. Introduction to clinical cases, data base accumulation, problem identification, problem solving, and basic veterinary skills with animals. Pr.: Second-year standing in the College of Veterinary Medicine. Three hours lab week.

**CS 803. Clinical Skills III.** (1) II. Laboratory instruction and experience in hand skills for physical examination and for veterinary therapy. Pr.: Third-year standing in the College of Veterinary Medicine. Three hours lab a week.

**CS 805. Surgery I.** (3) II. Principles of surgery and consideration of instrumentation. the surgical suite, preparation and monitoring of the patient. Three hours lec. a week. Pr.: Secondyear standing in College of Veterinary Medicine.

**CS 809. Clinical Small Animal Surgery.** (6) I, II, S. This course is designed to train veterinary students in the diagnosis and treatment of small animal surgical diseases through participation in clinical service in the Veterinary Teaching Hospital. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 810. Basic Equine Medicine and Surgery Clinics.** (6) I, II, S. This course will offer the veterinary student a general exposure to clinical problems and problem-solving of medical and surgical diseases of horses. The student will be responsible for and involved in the diagnosis, treatment and nursing care of equine patients affected by a variety of conditions. Pr.: Fourthyear standing in the College of Veterinary Medicine.

**CS 811. Large Animal Surgery.** (4) II. Lectures and demonstrations of food animal and equine surgical patients, including participation in surgical laboratories. Three hours lec. and three hours lab a week. Pr.: Third-year standing in the College of Veterinary Medicine.

**CS 813. Agricultural Clinical Practices.** (6) I, II, S. A study of the role of the veterinarian in the practice of clinical medicine in livestock production units. Students will work under faculty supervision in local practice and in-hospital situations. Pr.: Fourth-year standing in the College of Veterinary Medicine or consent of the instructor.

**CS 814. Small Animal Surgery.** (3) I. Lectures and demonstrations of small animal surgical patients, including participation in surgical laboratories. Two hours lec. and three hours lab a week Pr.: Third-year standing in College of Veterinary Medicine.

**CS 815. Veterinary Diagnostic Imaging I.** (3) I, II, S. Radiographic, ultrasonographic, and nuclear imaging in the clinical setting, with emphasis on making/identifying images of diagnostic quality, interpretation, indications for imaging, and radiation safety. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 816. Clinical Anesthesia.** (3) I, II, S. Practical instruction in the skills and techniques used in the practice of clinical veterinary anesthesia of both large and small animals. May be repeated once. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 817. Small Animal Medicine.** (6) I, II, S. The study of preventive medicine, internal medicine, and special medicine in the setting of the veterinary medical center. Problem solving, differential diagnosis, diagnostic procedures, and medical treatment of small animal disease will be emphasized using veterinary patients. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 818. Clinical Externship and\or Programmed Study.** (3–9) I, II, S. Practical experience with the daily operation of veterinary practice, insights into the role of veterinarians in private industry, and/or opportunity to become involved in specialty areas relating to veterinary medicine in other academic institutions. Pr.: Fourth- year standing in the College of Veterinary Medicine.

**CS 819. Ophthalmology.** (3) I, II, S. The study of the surgery and medical diagnosis and treatment of ocular disease in animals in the setting of the veterinary medical center. Problem solving, differential diagnosis, diagnostic procedures, and medical and surgical therapy will be emphasized using veterinary patients. Pr.: Fourth-year standing in the College of Veterinary medicine.

**CS 820. Theriogenology.** (3) I. Consideration of prevention, diagnosis, and treatment of disease, and maintenance of health and productivity of the genital tract of domestic animals. Three hours lec. a week. Pr.: Third-year standing in College of Veterinary Medicine

**CS 821. Companion Animal Medicine.** (4) II. A study of the etiology, clinical signs, diagnosis, treatment, and control of infectious or contagious diseases which affect horses, dogs, and cats. Four hours lec. a week. Pr.: Third-year standing in College of Veterinary Medicine.

**CS 823. Advanced Small Animal Surgery.** (3 or 6).

**CS 824. Food Animal Medicine.**(4) I. A study of the etiology, clinical signs diagnosis, treatment, and control of infectious or contagious disease conditions which affect cattle, swine, and sheep. Four hours lec. a week. Pr.: Third-year standing in the College of Veterinary Medicine.

**CS 825. Advanced Equine Medicine and Surgery.** (3 or 6).

**CS 828. Advanced Small Animal Medicine.** (3–6).

**CS 829. Veterinary Diagnostic Imaging II.** (3).

**CS 830. Medicine I.** (4) II. Consideration of medical and pathophysiologic aspects of diseases affecting the musculoskeletal, respiratory, cardiovascular special senses, and nervous systems. Four hours lec. a week. Pr.: Second-year standing in the College of Veterinary Medicine.

**CS 831. Topics in Anesthesia.** (1).

**CS 833. Topics in Equine Internal Medicine.** (1).

**CS 834. Advanced Topics in Equine Surgery.** (1).

**CS 835. Emergency Medicine.** (1).

**CS 836. Advanced Ophthalmology.** (1).

**CS 838. Advanced Toxicology.** (3–6).

**CS 839. Small Animal Clinical and Critical Care Nutrition.** (1).

**CS 840. Radiology.** (3) II. 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. Three hours lec. a week. Pr.: Third-year standing in the College of Veterinary Medicine.

**CS 841. Advanced Systemic Bovine Medicine.** (1).

**CS 843. Advanced Agricultural Clinical Practices.** (3–6) I, II, S. Advanced studies in the practice of veterinary medicine and surgery emphasizing the application of problem-solving methodology in livestock health and production programs. Pr.: CS 813 or consent of the instructor.

**CS 844. Commercial Pet Production.** (1) I, II, S. A comprehensive overview of the commercial pet industry emphasizing herd-health management. The interrelationships of housing, nutrition, and preventative medicine in small animal production medicine will be discussed and observed on field trips. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 845. Swine Production Medicine.** (2).

**CS 846. Advanced Small Animal Orthopedics.** (1).

**CS 847. Chemical and Food Safety/Environmental Health.** (1).

**CS 848. Research in Toxicology.** (2–3).

**CS 849. Production Medicine of Small Ruminants.** (1).

**CS 850. Medicine II.** (4) I. Consideration of the medical and pathophysiological aspects of diseases affecting the gastrointestinal, endocrine, urinary, integumentary, and hemic and lymphatic systems. Four hours lec. a week. Pr.: Third-year standing in the College of Veterinary Medicine.

**CS 851. Necropsy and Diagnostic Investigations.** (2) I, II, S. Practical experiences in necropsy procedures, (identification of gross pathologic changes and utilization of ancillary laboratory findings), public health and toxicology. Same as LM 851 and VD 851. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 853. Advanced Equine Theriogenology.** (1) I, II, S. An in-depth exposure to methods of maximizing reproductive efficiency in the mare and the stallion. Advanced equine reproductive physiology, diagnostics, and therapeutics are emphasized. Pr.: Fourth-year standing in the College of Veterinary

**CS 859. Beef Production Medicine.** (13).

**CS 860. UNL–KSU Food Animal Production Medicine.** (1) I, II, S. A study of the role and responsibility of the veterinarian in the practice of clinical veterinary medicine in livestock production units. Students will work under University of Nebraska-Lincoln and KSU faculty supervision at the USDA Meat Animal Research Center with swine, sheep, and beef cattle. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 875. Production Medicine.** (2) II. The role of the veterinarian in livestock production units, including interactions with producers, nutritionists, investors, and others in decision analysis. Emphasis is on the professional service that veterinarians provide to beef feedlot, cow/calf, swine, dairy, and dog kennel segments of animal production. Pr.: Third-year standing in the College of Veterinary Medicine.

**CS 886. Clinical Nutrition.** (3) II. The clinical aspects of nutrition as it relates to (a) medical and surgical management of diseased and convalescent animals (therapeutic nutrition), and (b) programs of disease prevention of the common domestic species of food- producing, companion animals, pet birds, and exotic animals (nutritional preventative medicine). Same as ASI 886 and AP 886. Pr.: Third-year standing in the College of Veterinary Medicine.

**CS 888. Exotic Animal and Wildlife Medicine.** (3) I, II, S. Study of exotic, wildlife, and zoo animal medicine through participation in the clinical service in the Veterinary Medical Teaching Hospital. Problem solving, differential diagnosis, diagnostic procedures, and medical and surgical therapy of nondomestic animals will be emphasized. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 895. Toxicology.** (3).

## Pathology/microbiology

Basic courses in pathology/microbiology, parasitology, virology, public health, and clinical pathology are offered for students enrolled in the veterinary medicine curriculum. Practical necropsy experience is provided for students as an adjunct to their pathology education and as an aid to disease diagnosis.

### Professional veterinary medicine courses

**PA 703. General Pathology.** (5) I. Study of the mechanisms of disease including degeneration/necrosis, inflammation, circulatory disturbances, and neoplasia. Introduction to gross and microscopic anatomy. Three hours lec. and six hours lab a week. Pr.: Second-year standing in College of Veterinary Medicine.

**PA 710. 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.: PA 703.

**PA 859. Laboratory Animal Science.** (2) II. Consideration of the management and health of common species of laboratory animals. Two hours lec. a week. Pr.: Second-year standing in College of Veterinary Medicine.

**LM 705. Principles of Veterinary Immunology.** (2)

**LM 712. Veterinary Bacteriology and Mycology.** (5).

**LM 722. Veterinary Virology.** (3) .

**LM 753. Zoonoses and Preventive Medicine.** (3) .

**LM 755. Principles and Methods of Epidemiology.** (2).

**LM 775. Clinical Pathology.** (3).

**LM 777. Laboratory Diagnosis.** (1).

**LM 793. Veterinary Parasitology.** (5).

## Veterinary diagnosis

M. W. Vorhies, Head

Professors Kennedy, Phillips, Strafuss, and Vorhies; Assistant Professors Briggs, Frank, and Veatch; Emeriti: Professor Anthony; Associate Professors Gray and Milleret.

The department's academic responsibilities include teaching diagnostic necropsy and laboratory procedures to fourth-year professional students and graduate students. The department serves the livestock and companion animal industry by conducting investigational procedures to identify animal disease problems, by developing research projects related to disease pathogenesis and diagnosis.

The department's diagnostic laboratory is nationally recognized as fully accredited with capabilities in all areas of diagnostic medicine by A.A.V.L.D.

### Professional veterinary medicine courses

**VD 847. Avian Diseases.** (3) I. The prevention, diagnosis, and treatment of avian diseases. Three hours lec. a week. Pr.: Third-year standing in the College of Veterinary Medicine.

**VD 851. Necropsy and Diagnostic Investigations.** (2) I, II, S. Practical experience in necropsy procedures and laboratory findings. Same as CS 851, LM 851. Pr.: Fourth-year standing in the College of Veterinary Medicine.

# Anatomy and Physiology

**Chairman**
**Professor Jon D. Dunn,** Ph.D., University of Kansas (Comparative Neuroanatomy and Neuroendocrinology).

**Professors**
**Frank Blecha,** Ph.D., Washington State University (Coordinator of the Graduate Studies, Immunophysiology).

**Howard Erickson,** DVM, Kansas State University, Ph.D., Iowa State University (Equine Exercise Physiology).

**Roger Fedde,** Ph.D., University of Minnesota (Respiratory Physiology).

**Russell Frey,** DVM, Ph.D., Kansas State University (Nutrition).

**Kaleem Quadri,** B.V.Sc., Osmania University, Ph.D., Michigan State University (Neuroendocrinology).

**Dan Upson,** DVM, Ph.D., Kansas State University (Clinical Pharmacology).

**Jane A. Westfall,** Ph.D., University of California (Neuroscience and Respiratory Disease).

**Associate Professors**
**Walter Cash,** DVM, Ph.D., Kansas State University (Clinical Neuroanatomy and Neurophysiology).

**Glenn Hartke,** DVM, Ph.D., Kansas State University (Ultrasonic Anatomy).

**Deryl Troyer,** DVM, Ph.D., Kansas State University (Molecular Genetics and Neurodegenerative Diseases).

**Assistant Professors**
**Michael J. Kennedy,** Ph.D., University of Iowa (Neuroscience).

**Chris Ross,** DVM, Ph.D., University of Missouri (Cardiovascular Cell Biology).

**James Sharp,** DVM, Ph.D., University of California–Davis (Neuroscience).

**Mark Weiss,** Ph.D., University of Pennsylvania–Philadelphia (Neuroscience).

**Ancillary Faculty**
**Stanley Dennis,** Professor, Department. of Pathology and Microbiology, Ph.D., University of Sydney (Reproductive Pathology).

**Jerry Gillespie,** Professor, Dept. of Clinical Sciences, DVM, Oklahoma State University; Ph.D. University of California–Davis (Exercise Physiology).

**Sung Koo,** Professor, Dept. of Foods and Nutrition, Ph.D. Clemson University (Nutrition).

**Charles Layne,** Assistant Professor, Dept. of Kinesiology, Ph.D. University of Texas-Austin (Exercise Physiology).

**Horst Leipold,** Professor, Dept. of Pathology/Microbiology, DVM University of Giessen, Ph.D. Kansas State University (Molecular and Applied Genetics).

**Frederick Oehme,** Professor, Dept. of Clinical Sciences, DVM Cornell University, Dr med vet Justus Liebig University, Ph.D. University of Missouri (Toxicology).

**Dolores Takemoto,** Associate Professor, Dept. of Biochemistry, Ph.D. University of Southern California (Virology and Oncology).

## Program of study

The Department of Anatomy and Physiology offers diverse opportunities for graduate studies leading to both M.S. and Ph.D. degrees. Faculty sponsor research in the following disciplines: molecular genetics, exercise physiology, cardiovascular cell biology and physiology, immunophysiology, neuroscience, neuroendocrinology, and pharmacology. Faculty from other departments comprise a strong ancillary support group. Career options available with an advanced degree in anatomy or physiology include academic positions in various animal and human health science-related institutions such as Colleges of Veterinary Medicine and Schools of Medicine and Dentistry, as well as positions in industry and agribusiness.

## Admissions

To be admitted with full standing, the applicant must have an average of B or better in the junior and senior years, a bachelor's or veterinary medical degree from an approved institution, and adequate undergraduate preparation in the proposed field.

For the master of science degree, applicants must complete a minimum of 30 hours of credit, which includes 6 to 8 hours of research credit. Applicants with a bachelor's degree who are concurrently pursuing a DVM degree may apply 12 hours from relevant courses toward both the master's and DVM degrees if the grades in these courses are adequate. Applicants already possessing the DVM degree can likewise select 12 hours from the professional curriculum to be applied toward the M.S. degree.

For the Ph.D. degree, 90 semester hours of graduate study beyond the bachelor's degree are required, including at least 30 hours of research. For DVM candidates, if 12 hours of dual credit has not been applied to the master of science degree, it may be applied toward the Ph.D.

## Application procedure

To apply, submit an initial letter of interest to: Coordinator of Graduate Studies, 228 VMS Building, Kansas State University, Manhattan, KS 66506–5602.

Applications are considered on a rolling basis and are due May 1. However, students applying for financial support and international students are encouraged to apply by February 1. Teaching and research assistantships are awarded on the basis of merit, using many of the same criteria used for admission decisions. All students offered admission are considered for financial support.

## Anatomy and physiology courses

**AP 700. Gross Anatomy I.** (6) I. Gross dissection of the dog with comparative aspects of the cat. Three hours lec. and nine hours lab a week. Pr.: First-year standing in College of Veterinary Medicine.

**AP 705. Gross Anatomy II.** (6) II. Gross dissection of the horse and ruminant with comparative aspects of the pig, laboratory animals, and the chicken. Three hours lec. and nine hours lab a week. Pr.: AP 700.

**AP 710. 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 College of Veterinary Medicine.

**AP 720. Veterinary Neuroscience.** (2) II. Study of the normal neuroanatomy, neurophysiology and introductory neuropharmacology of the central nervous system of common domestic mammals. Pr.: First-year standing in the College of Veterinary Medicine or BIOL 505 or equivalent.

**AP 737. Veterinary Physiology I.** (5) Function of the animal body at the cellular level, including nerve and muscle function. Basic pathophysiological mechanisms will be emphasized and correlated with clinical topics. Four hours lecture, three hours lab per week. Pr.: First-year standing in College of Veterinary Medicine or concent of insructor.

**AP 740. Veterinary Orientation.** (1) I. Lectures on introduction to veterinary medicine. One hour lec. a week. Pr.: First-year standing in College of Veterinary Medicine.

**AP 747. Veterinary Physiology II.** (6) II. Functioning of the nervous, muscular, endocrine, cardiovascular, respiratory, and reproductive systems of animals with emphasis on physiologic control mechanisms, interrelationships of body systems, and criteria for evaluating animal health. Four hours lec. and six hours lab a week. Pr.: AP 737 or equiv.

**AP 770. Pharmacology.** (5) I. The basic principles of pharmacology, the interaction of drugs and living systems which includes: the action of the drug upon the animal's systems, and the actions of the animal's body upon the drug. The application of these principles to the safe and efficacious use of drug regimens in veterinary medical and surgical patients. Four hours lec. and three hours lab a week. Pr.: AP 737 and 747 or equiv.

**AP 773. Bioinstrumentation Laboratory.** (1) I. in even years. Practical experience with and evaluation of laboratory and clinical techniques related to electrodes, transducers, and monitoring equipment. Emphasis is on instrumentation for the respiratory, cardiovascular, and nervous systems. Three hours lab a week. Pr.: AP 747 or equiv., or conc. enrollment in EECE 773.

**AP 778. Respiratory Function in Health and Disease.** (3) II, in even years. A comprehensive overview of normal respiratory physiology in mammals with clinical application to the recognition of obstructive, restrictive, infectious, and allergic diseases, and the management of mechanical ventilation and oxygen therapy. Pr.: AP 747 or equiv.

**AP 801. Clinical Skills I.** (1) II. Introduction to terminology and thought/organization for clinical veterinary medicine. Emphasis on problem identification from a clinical data base, and basic veterinary skills with animals. Same as CS 801. Pr.: First-year standing in College of Veterinary Medicine. Three hours of lab a week.

**AP 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 evaluation of data. One hour a week. Pr.: Consent of staff.

**AP 825. Special Anatomy.** (Var.) I. II. S. The gross and/or microscopic study of any system (or systems) of any domestic animal. Pr.: AP 700 or 710 or equiv. and consent of staff.

**AP 850. Anatomical Techniques.** (1–2) I, in odd years, S. Pr.: Consent of staff.

**AP 860. Neuroscience.** (2) I. An advanced multidisciplinary study of the central nervous system, including neurochemistry, neuropharmacology, neuroanatomy, neurophysiology, clinical neurology, and behavioral science. Pr.: Consent of staff.

**AP 861. Ultrastructural Interpretation of the Nervous System.** (3) II. Study of the fine structure of neurons, axons, synapses, neuroglia and choroid plexus, the interconnections among neurons, the location of specific tracers and antibodies which define synaptic terminals, and a survey of methodologies used with transmission electron microscopy. Pr.: Biol. 541 or AP 710 AP 861-0-1219

**AP 865. 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.: AP 747 and consent of staff.

**AP 870. Advanced Cardiovascular Physiology.** (2) I. in odd years. Comprehensive overview of cardiovascular physiology in domestic animals with special emphasis on the dog and horse, including current research. Pr.: AP 747 or equivalent.

**AP 880. Mechanisms of Drug Action.** (3) II. in even years. Discussion of pharmacologic mechanisms at the molecular and cellular level, including receptors, second messengers, and pharmacokinetics. Specialized areas of pharmacology such as neuropharmacology and drug design will be discussed. Areas of current research interest will be emphasized. Pr.: BIOCH 521.

**AP 885. Environmental Toxicology.** (2) II, in odd years. An advanced toxicology course concerned with the occurrence, biological effect, detection, and control of foreign chemicals in the environment. Pr.: Consent of staff.

**AP 886. Clinical Nutrition.** (3) II. The clinical aspects of nutrition as it relates to (a) medical and surgical management of diseased and convalescent animals (therapeutic nutrition), and (b) programs of disease prevention of the common domestic species of food producing, companion animals, pet birds, and exotic animals (nutritional preventive medicine). Same as ASI 886 and CS 886. Pr.: third-year standing in College of Veterinary Medicine.

**AP 888. Advanced Neuroendocrinology.** (2) II, in even years. A study of the chemical link between the brain and the endocrine system; the roles of brain peptides, neural pathways, and centrally acting drugs in the release of hormones, hormonal involvement in reproduction, aging, breast cancer, stress, etc.; a survey of the new and evolving concepts and techniques in neuroendocrinology. Two hours lec. a week. Pr.: AP 747 or BIOL 710 or equiv.

**AP 890. Problems in Pharmacology and Toxicology.** (Var.) I, II, S. Individual investigation into the interactions of chemical compounds and living systems. Pr.: AP 770 or CS 895 or equiv.

**AP 891. Beef Nutritional Health and Feeding Management.** (1) I, II. Veterinary medical aspects of nutrition and feeding management of beef cattle, with consideration of therapeutic nutrition related to clinical management of diseased and convalescent animals and nutritional programs of disease prevention in applied production. Pr.: AP 886 or equivalent.

**AP 892. Dairy Nutritional Health and Feeding Management.** (1), I, II. Veterinary medical aspects of nutrition and feeding management of dairy cattle, with consideration of therapeutic nutrition related to clinical management of diseased and convalescent animals and nutritional programs of disease prevention in applied production. Pr.: AP 886 or equivalent.

**AP 893. Equine Nutritional Health and Feeding Management.** (1) I, II. Veterinary medical aspects of nutrition and feeding management of horses, with consideration of therapeutic nutrition related to clinical management of diseased and convalescent animals and nutritional programs of

disease prevention in applied production and horse care. Pr.: AP 886 or equivalent.

**AP 895. Equine Exercise Physiology.** (2) I, in even years. Comprehensive overview of the physiology of exercise in the horse with comparison to other species. Emphasis will be on cardiovascular, respiratory, and musculoskeletal systems, including current research. Pr.: AP 747 or equivalent.

**AP 898. Master's Report.** (2) I, II, S. Pr.: Consent of staff.

**AP 899. Research.** (1–4) I, II, S. For graduate students in the field of anatomy or physiology working toward the M.S. degree. Pr.: Consent of staff.

**AP 901. Molecular Neurobiology.** (2) II, in odd years. Topics of neurobiology are covered from a molecular perspective, including neurotransmitters and neuromodulators, the synapse, G-coupled receptors, pumps, ligand-gated and voltage-gated channels, sensory transduction, the action potential and other relevant phenomena. Pr.: BIOCH 521.

**AP 915. 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.

**AP 925. Advanced Physiology.** (3–5) 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.: AP 747 and consent of staff.

**AP 935. Comparative Neuroanatomy.** (3) II, in odd years. Study of the structure and function of the nervous system of animals representing all phyla of the animal kingdom. Special emphasis is given to the study of vertebrates including man. Pr.: an introductory neurobiology course.

**AP 995. Problems in Physiology.** (Var.) I, II, S. Special problem-involving techniques utilized in studying the function of various organ systems of the body. Pr.: Consent of instructor.

**AP 999. Research in Physiology.** (1–6) I, II, S. For graduate students working toward the Ph.D. degree. Pr.: Consent of staff.

# Clinical Sciences

**Professor and Head**
**Jerry Gillespie** DVM, Oklahoma State; Ph.D., University of California–Davis; Diplomate, American College of Veterinary Anesthesiology.

**Professors**
**Neil Anderson** DVM, Ph.D., University of Minnesota; Diplomate, American College of Veterinary Internal Medicine.

**Alan Brightman** DVM, Kansas State University; MS, University of Illinois; Diplomate, American College of Veterinary Ophthalmology.

**Fred Oehme** DVM, Cornell University; Ph.D., University of Missouri; Diplomate, American Board of Veterinary Toxicology.

**Mark Spire** (Jones Chair in Food Animal Production Medicine) DVM, Texas A&M; MS, Kansas State University; Diplomate, American College of Theriogenologists.

**Jerome Vestweber** DVM, University of Minnesota; Ph.D., Kansas State University.

**David Schoneweis** DVM, MS, Kansas State University.

**Regents Distinguished Professor**
**David Leith** MD, Harvard Medical School; Diplomate, American Board of Anesthesiologists, Inc.

**Associate Professors**
**James Carpenter** DVM, MS, Oklahoma State University; Diplomate, American College of Zoological Medicine.

**Richard DeBowes** DVM, University of Illinois; MS, Washington State University; Diplomate, American College of Veterinary Surgeons.

**John Pickrell** DVM, Ph.D., University of Illinois; Diplomate, American Board of Toxicology.

**Assistant Professors**
**David Bruyette** DVM, University of Missouri; Diplomate, American College of Veterinary Internal Medicine.

**Roger Fingland** DVM, University of Missouri–Columbia; MS, The Ohio State University; Diplomate, American College of Veterinary Surgeons.

**Earl Gaughan** DVM, University of Georgia; Diplomate, American College of Veterinary Surgeons.

**Cynthia Godshalk** DVM, MS, University of Illinois; Diplomate, American College of Veterinary Radiology.

**James Hoskinson** DVM, Washington State University; Diplomate, American College of Veterinary Radiology.

**Ronald McLaughlin** DVM, University of Missouri; DVSc, University of Guelph; Diplomate, American College of Veterinary Surgeons.

**James Roush** DVM, Purdue University; MS, University of Washington; Diplomate, American College of Veterinary Surgeons.

**Guy Saint Jean** DVM, University of Montreal; MS, Ohio State University; Diplomate, American College of Veterinary Surgeons.

## The department

The Department of Clinical Sciences offers a graduate program leading to the master of science degree. Graduate work in clinical sciences may be pursued in several fields of specialization including agricultural practice, anesthesiology, equine medicine and surgery, exotic and wildlife medicine, ophthalmology, radiology, small animal medicine, small animal surgery, theriogenology, and toxicology. The department, with the Veterinary Medical Teaching Hospital, has modern facilities and equipment for studies of applied and basic aspects of diseases and other conditions of animals.

The primary goal of graduate study programs in clinical medicine is to prepare students for careers in teaching and research in a clinical specialty area. After completing graduate work, the student shall be able to conduct research both independently and as a team member. Adequate training in planning research projects and writing research proposals will give the student the ability to function with teams of scientists from the biomedical field. The students experience in clinical teaching and literature study will form the basis for development of future teaching programs within his/her discipline.

A residency program, designed to prepare and qualify a veterinarian for admission to one of a number of specialty boards recognized by the AVMA, is usually combined with the graduate program. While a graduate program can be accomplished in a shorter period of time, the duration of combined programs is usually three years. This reflects the minimum time required to satisfy the objectives of each program. Details of an individual residency program can be obtained from the head of the Department of Clinical Sciences.

## Requirements for admission

Admission requirements include holding a doctor of veterinary medicine degree or its equivalent. Applicants for graduate study must have a minimum grade average of B. A student who has less than a B average, based on individual merit, may be admitted on probationary status. Full standing is attained automatically upon completion of at least 9 hours of course work for graduate credit with grade of B or better and upon the removal of any deficiency which was specified at the time of admission. International students must have a health certificate and an acceptable score on the Test of English as a Foreign Language (TOEFL).

Additionally, international students must be able to demonstrate proficiency in written and oral English to the Departmental Graduate Committee. Qualifications of students must be approved, in writing, by the Departmental Graduate Committee prior to recommending acceptance in to graduate studies to the department head.

A graduate student may be denied continued enrollment in the university in case of:
a. Failure to satisfy conditions necessary for removal of probationary status.
b. The accumulation of 6 or more semester hours of work with grades less than B, or grade point average less than 3.0.
c. Demonstrable lack of diligence in meeting published degree requirements.
d. Failure to acquire mastery of the methodology and content of one's field sufficient to complete a successful thesis.

## Application for admission

Department-sponsored postgraduate residencies normally start each year in June and are advertised in the Directory of Intern Matching Program and Residencies. Three letters of recommendations, undergraduate and professional transcripts, and a completed Graduate School Application and Information Blank should be filed with the department head for consideration by the Graduate Committee.

## General requirements

Participation in teaching is considered to be part of graduate education, and the graduate student will participate in the teaching program. The extent of the participation will be to a level that is deemed of value for each particular student. A certain amount of advanced clinical training is required of graduate students. This will usually be conducted in the Veterinary Teaching Hospital.

The master's degree in clinical sciences usually requires a thesis. The credit requirements for a master's degree are in accordance with those for the Graduate School. A minimum of 30 semester hours of credit including 6 to 8 hours of thesis credit are required. Only two 500-level courses (6 hours total) may be used for an MS. A significant majority of course work (at least 60 percent) should be at the

700 level or higher. Only 3 hours of problems or individualized study may apply toward the MS. Successful completion of a final oral or comprehensive written examination, or both, are required of all master's degree candidates. The final examination is administered by the supervisory committee and may include defense of the thesis, or a testing of the student's understanding of the field of study.

## Clinical sciences courses

### Undergraduate and graduate credit

**CS 823. Advanced Small Animal Surgery.** (3 or 6) I, II, S. This course provides veterinary students an opportunity for advanced training in the diagnosis and treatment of small animal surgical diseases through participation in clinical service in the Veterinary Medical Teaching Hospital. Pr.: Fourth-year standing in the College of Veterinary Medicine and CS 809.

**CS 825. Advanced Equine Medicine and Surgery.** (3 or 6) I, II, S. This course provides an opportunity for students to pursue equine clinical studies in depth and assume substantial responsibility for care of hospitalized cases. Students will present a seminar on a medicine or surgical subspecialty and pursue a special problem. Pr.: CS 810.

**CS 828. Advanced Small Animal Medicine.** (3–6) I, II, S. Advanced topics in preventative medicine, kennel medicine, greyhound medicine, internal medicine, dermatology, neurology, and cardiology. The student will be required to participate in a special problem with a written report.

**CS 829. Veterinary Diagnostic Imaging II.** (3) I, II, S. Student will make presentations on topics relevant to diagnostic imaging, and receive advanced training on interpretation, techniques, and safety, and will have opportunity for advanced involvement in imaging procedures. Pr.: CS 815.

**CS 831. Topics in Anesthesia.** (1) II. Seminars and assigned reading which will emphasize the application of both the basic sciences (particularly physiology and pharmacology) and the results of recent veterinary and medical research to the practice of veterinary anesthesia. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 833. Topics in Equine Internal Medicine.** (1) I, II. Selected topics in equine internal medicine. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 834. Advanced Topics in Equine Surgery.** (1) I, II, S. This course will present an in depth experience in the pathophysiology, diagnosis, and surgical treatment of selected complex surgical diseases of horses.

**CS 835. Emergency Medicine.** (1) I, II, S. A study of the advanced medical/surgical therapy and diagnosis of the most commonly encountered emergencies affecting animals. The use of problem solving in cases of trauma, metabolic, gastrointestinal, reproductive, neurological, and ophthalmic emergencies will be emphasized. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 836. Advanced Ophthalmology.** (1) I, II, S. The advanced study of the pathophysiology, pharmacology and neuroscience of ophthalmology using a problem-solving approach to evaluate clinical cases. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 838. Advanced Toxicology.** (3–6) I, II, S. An advanced course in toxicology stressing independent problem-solving utilizing data bases and technical resources to identify toxicological concerns, to define the problem, to consider possible remedial alternatives, and to select and implement the most appropriate management and recommendations for correction and future prevention. May be repeated once per student. Pr.: Fourth-year standing in the College of Veterinary Medicine, or graduate students in toxicology.

**CS 839. Small Animal Clinical and Critical Care Nutrition.** (1) I, II, S. The principles of nutrition as it relates to specific diseases and in the management of critically ill small animal patients. Emphasis on case histories and laboratory experience in diet formulation and internal feeding techniques. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 841. Advanced Systemic Bovine Medicine.** (1) I. A problem-oriented study of the medial and pathophysiological aspects of diseases of the respiratory, nervous, digestive, musculoskeletal, cardiovascular, metabolic, integumentary, and urogenital systems of the bovine. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 845. Swine Production Medicine.** (2) I, II, S. A study of the interactions of infectious agents, nutrition, and environment in infectious and non-infectious swine problems in commercial swine production. Pr.: Fourth-year standing in the College of Veterinary Medicine or consent of instructor.

**CS 846. Advanced Small Animal Orthopedics.** (1) II. Seminars will be given in advanced problem-solving in small animal orthopedics. Problem identification and resolution derived from application of basic principles and reconstruction concepts will be emphasized. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 847. Chemical and Food Safety/Environmental Health.** (1) I, II, S. A case presentation/problem-oriented discussion of chemical use and circumstances that impact upon health hazards, risks to food safety, and the compromising of environmental health. Recognition of risks associated with chemical use, evaluating toxicity in given situations, and determination of appropriate management, control, and future prevention is stressed. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 848. Research in Toxicology.** (2–3) I, II, S. This course provides research opportunities in toxicology through formulation of a research proposal, performance of an investigation, and documentation of results in publishable format. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 849. Production Medicine of Small Ruminants.** (1) I. Lectures and field trips emphasizing production medicine of small ruminants. Pr.: Fourth-year standing in the College of Veterinary Medicine.

**CS 859. Beef Production Medicine.** (1) I. A study of the development, initiation, maintenance, and monitoring of production-oriented health management delivery systems in beef cattle operations. Pr.: Fourth-year standing in the College of Veterinary Medicine or consent of the instruction.

**CS 887. Orthopedic Surgery.** (4) II, in even years. Fundamentals, theory, and practice concerning genetic, metabolic, infectious, neoplastic, and traumatic diseases of bones and joints. Pr.: DVM degree or consent of department head.

**CS 895. Toxicology.** (3) I. Effects of harmful substances on the animal body. Emphasis placed on toxicologic principles and management of the poisoned patient. Three hours lec a week plus three one- to three-hour field trips. Pr.: Third-year standing in the College of Veterinary Medicine, BIOCH 521, and AP 747 or equiv.

### Graduate credit only

**CS 822. Breeding Diseases.** (1–5) I, II, S. Advanced studies of the breeding diseases of domestic animals. Pr.: DVM degree or consent of staff.

**CS 826. Systemic Medicine I.** (1–3) I, II, S. Study of the medical aspects of diseases of the urinary, nervous, and integumentary systems, and special senses. Pr.: DVM degree or consent of department head.

**CS 827. Systemic Medicine II.** (4) I. Study of the medical aspects of diseases of the cardiovascular, respiratory, musculoskeletal, and endocrine systems. Pr.: DVM or consent of department head.

**CS 832. Surgical Techniques.** (1–6) I, S. The study and application of developments in surgical techniques. Pr.: DVM degree or consent of the department head.

**CS 837. Interpretation of Radiologic Body Systems.** (3) I, in odd years. The rationale of radiologic procedures are studied and the interpretation of radiographs of body systems emphasized. Pr.: DVM degree or consent of department head prior to registration.

**CS 842. Comparative Gastroenterology.** (3) I, in odd 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 humans are discussed. Pr.: DVM degree.

**CS 872. Organ Transplantation.** (3) II, in odd years. The study of transplantation of tissues and associated problems. Pr.: DVM degree or consent of department head.

**CS 877. Orthopedic Surgery.** (4) II, in even years. Fundamentals, theory, and practice concerning genetic, metabolic, infectious, neoplastic, and traumatic diseases of bones and joints. Pr.: DVM degree or consent of department head.

**CS 882. Clinical Sciences Seminar.** (1) I, II, S. A required seminar for all house officers and graduate students in the Department of Clinical Sciences. One hour conference weekly. May re-enroll for total maximum of two credits. Pr.: Consent of department head.

**CS 885. Principles of Veterinary Internal Medicine.** (3) II. An intermediate course presenting the key unifying concepts of veterinary internal medicine. Each concept is introduced as a symptomatic entity ranging across the major domestic species. Interactions between body systems, the diagnostic process, and the development of rational treatments are emphasized. Pr.: DVM degree.

**CS 892. Toxins in the Biological System.** (2) I, in odd years. 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.

**CS 893. Advanced Equine Hard Tissue Surgery.** (2) I, in even years. Selected procedures in equine orthopedic surgery will be presented. Discussions will review treatment selection and indications, alternative modalities, intraoperative techniques, pathophysiology, adjunctive therapies, aftercare and complications. Pr.: DVM degree or consent of department head.

**CS 894. Advanced Equine Soft Tissue Surgery.** (2) II, in even years. A presentation of complex surgical techniques not available in the professional curriculum will be provided for the post-DVM trainee. The indications reaction, technical aspects, therapeutic attributes, and complications of selected procedures will be addressed. Pr.: DVM degree or consent of department head.

**CS 897. Current Topics in Toxicology.** (2) II, in even years and summers. An advanced toxicology course providing in-depth examination of toxicological areas of current relevance to and/or controversy on mammalian health. Specific topics will change from semester to semester. Students in PhD. programs may repeat the course. Pr.: BIOCH 521 and AP 747.

**CS 899. Thesis Research in Clinical Sciences.** (1-6) I, II, S. Individual research in any of the fields of clinical sciences. Pr.: Graduate standing. This work may form the basis for the M.S. thesis.

# Pathology and Microbiology

**Neil V. Anderson,** Professor of Food Animal Medicine, Department of Clinical Sciences. Ph.D. 1968, D.V.M. 1961, University of Minnesota. Diplomate, A.C.V.I.M. Small ruminant production medicine.

**Wayne E. Bailie,** Professor of Microbiology, Department of Pathology and Microbiology. Ph.D. 1969, D.V.M. 1957, Kansas State University. Diplomate, A.C.V.M. Diagnostic bacteriology, mycology and virulence mechanisms of pasteurellae.

**Frank Blecha,** Professor of Immunophysiology, Department of Anatomy and Physiology. Ph.D. 1981, Washington State University, M.S. 1977, University of Idaho. Cellular immunology, immunopotentiation, stress- and virus-induced immunosuppression, and cytokine regulation.

**M. M. Chengappa,** Associate Professor of Microbiology, Department of Pathology and Microbiology. Ph.D. 1981, M.S. 1977, Michigan State University, M.V.Sc. 1973, India. Diplomate, A.C.V.M. Diagnostic microbiology and pathogenic bacteriology, mycology, bovine and porcine infectious respiratory disease.

**Michael W. Dryden,** Assistant Professor of Parasitology, Department of Pathology and Microbiology. Ph.D. 1990, Purdue University, D.V.M. 1982, Kansas State University. Veterinary parasitology and entomology.

**Bradley W. Fenwick,** Associate Professor of Pathology, Department of Pathology and Microbiology. Ph.D. 1985, University of California, M.S. 1983, D.V.M. 1981, Kansas State University. Diplomate, A.C.V.M. Bacterial virulence mechanisms, vaccine and serologic test development, stress-induced immunosuppression.

**John J. Iandolo,** Professor of Molecular Biology, Department of Pathology and Microbiology. Ph.D. 1965, M.S. 1963, University of Illinois. Molecular genetics of pathogenic bacteria, pathogenesis of bacterial infection.

**Kerry S. Keeton,** Professor of Clinical Pathology, Department of Pathology and Microbiology. Ph.D. 1971, University of California, D.V.M. 1966, Texas A&M University. Diplomate, A.C.V.P. Diagnostic and research clinical pathology.

**George A. Kennedy,** Professor of Veterinary Diagnostic Pathology, Department of Veterinary Diagnosis. Ph.D. 1975, Kansas State University, D.V.M. 1967, Washington State University. Diplomate, A.C.V.P. Swine enteric disease and immunochemistry.

**Samuel M. Kruckenberg,** Professor of Pathology, Department of Pathology and Microbiology. Director of Animal Resource Facility. Ph.D. 1971, M.S. 1965, D.V.M. 1963, Kansas State University. Diplomate, A.C.V.P. and A.C.L.A.M. Laboratory animal sciences and diagnostic pathology.

**Robert A. Leedle,** Assistant Professor of Pathology, Department of Pathology and Microbiology. Ph.D. 1987, Michigan State University, D.V.M. 1982, University of Illinois. Diplomate, A.C.V.P. Toxicological pathology.

**Horst W. Leipold,** Distinguished Professor of Medical Genetics, Department of Pathology and Microbiology. Ph.D. 1968, M.S. 1967, Kansas State University, D.V.M. 1963, Justus Liebig University. Genetics and pathology of bovine congenital diseases.

**Stanley E. Leland, Jr.,** Professor of Parasitology, Department of Pathology and Microbiology. Associate Director of Research, Agriculture Experiment Station. Ph.D. 1953, Michigan State University, M.S. 1950, University of Illinois. Research parasitology.

**Michael D. Lorenz,** Dean, College of Veterinary Medicine. Professor of Small Animal Medicine, Department of Clinical Sciences. Assistant Director of Agriculture Experiment Station. D.V.M. 1969, Oklahoma State University. Diplomate, A.C.V.I.M. Clinical and research dermatology and neurology.

**D. Scott McVey,** Assistant Professor of Clinical Immunology, Department of Pathology and Microbiology. Ph.D. 1986, Texas A&M University, D.V.M. 1980, University of Tennessee. Diplomate, A.C.V.M. Cellular immunology, gene expression and signal transduction in lymphocytes, clinical immunology.

**Harish C. Minocha,** Acting Associate Dean for Research, College of Veterinary Medicine. Professor of Virology, Department of Pathology and Microbiology. Ph.D. 1967, M.S. 1963, Kansas State University, B.V.Sc. 1955, Punjab University. Molecular virology, hybridoma techniques, vaccine technology, virus-induced immunosuppression.

**William E. Moore,** Professor of Clinical Pathology, Department of Pathology and Microbiology. Ph.D. 1968, University of Minnesota, D.V.M. 1958, Cornell University. Diplomate, A.C.V.P. Clinical pathology.

**Derek A. Mosier,** Associate Professor of Pathology, Department of Pathology and Microbiology. Ph.D. 1985, Oklahoma State University, D.V.M. 1978, Kansas State University. Diplomate, A.C.V.P. Morphological pathology, bacterial pathogenesis and immune responses to pathogenic microorganisms.

**Richard D. Oberst,** Assistant Professor of Pathology and Molecular Biology, Department of Pathology and Microbiology. Ph.D. 1987, University of California, D.V.M. 1983, Oklahoma State University. Molecular pathobiology, nucleic acid probes for infection agents.

**Frederick W. Oehme,** Professor of Toxicology, Medicine, and Physiology. Ph.D. 1969, University of Missouri, D.M.V. 1964, Justus Liebig University, M.S. 1962, Kansas State University, D.V.M. 1958, Cornell University. Diplomate, A.B.V.T. and A.B.T., Diplomate and Fellow, A.T.S. Clinical, environmental and investigative toxicology.

**Robert M. Phillips,** Professor of Veterinary Diagnosis, Department of Veterinary Diagnosis. Ph.D. 1972, University of Georgia, D.V.M. 1951, Kansas State University. Diagnostic virology and immunoassays.

**Robert K. Ridley,** Professor of Parasitology, Department of Pathology and Microbiology. Ph.D. 1967, Florida State University, M.S. 1960, University of Kentucky, D.V.M. 1978, Kansas State University. Veterinary parasitology; epidemiology, diagnostic methodologies, anthelmintic efficacy.

**Polly Schoning,** Associate Professor of Pathology, Department of Pathology and Microbiology. Ph.D. 1979, M.S. 1970, D.V.M. 1964, Kansas State University. Diplomate, A.C.V.P. Environmental and forensic pathology, dermatopathology, and diagnostic pathology.

**Joseph E. Smith,** Professor and Head of Pathology and Microbiology, Department of Pathology and Microbiology. Ph.D. 1964, University of California, D.V.M. 1961, Texas A&M University. Diplomate, A.C.V.P. Transfusion medicine, immunobiology of erythrocytes, iron metabolism, clinical pathology.

**Deryl L. Troyer,** Assistant Professor of Anatomy, Department of Anatomy and Physiology. Ph.D. 1985, Kansas State University, D.V.M. 1972, Kansas State University. Molecular and applied genetics, animal models of human disease.

**Jerome G. E. Vestweber,** Professor of Food Animal Medicine, Department of Clinical Sciences. Ph.D. 1973, Kansas State University, D.V.M. 1964, University of Minnesota. Pathogenesis of bovine pasteurellosis, pathology of blood vessels and type 2 pneumocytes.

## Program description

The pathology/microbiology graduate group of the College of Veterinary Medicine offers graduate programs leading to M.S., Ph.D., and combined D.V.M./M.S. degrees. The group offers Ph.D. degree programs specializing in microbiology, parasitology, pathology (anatomic, clinical, and molecular), and toxicology. Requirements for the Ph.D. degree include approved courses (90 semester hours—78 for individuals with a D.V.M. degree—including at least 30 hours of research for the dissertation), a preliminary examination, research and a written dissertation, and satisfactory defense of the dissertation at the final oral examination. The Ph.D. degree normally requires at least three years of full-time study. Demonstration of proficiency in foreign languages is not required. The university operates on a semester basis plus an eight-week summer session.

The M.S. degree is administered by individual academic departments and is offered in the same specialty areas as those for the Ph.D. degree. Minimum requirements for the master's degree are 30 semester hours, including 6 to 8 hours of research.

## Program requirements

Minimum entrance requirements include a B average in the junior and senior undergraduate years for applicants not holding a D.V.M. degree. International students must demonstrate proficiency in English by earning a satisfactory score on the TOEFL and must provide health and financial certificates. Candidates for admission to the Graduate School must be approved by the faculty of the department or interdepartmental program.

Most incoming students have a degree in veterinary medicine, but some have degrees in animal science, microbiology, biology, biochemistry/pharmacology, genetics, or food science. The most important considerations for applicants are documented academic achievement and an interest in continued study and research in pathobiology. Sufficient training in biology and a strong background in biochemistry are important requirements. Application for admission to the program in a fall semester should be made in the preceding late fall or early winter.

## Financial support

Assistantships and temporary assistant instructor positions are available for qualified candidates on a limited, competitive basis. Prospective students are encouraged to apply for federally sponsored fellowships and traineeships from agencies such as the USDA, NASA, NDEA, NIH, and NSF. Application information is available from the Dean of the Graduate School.

## Research facility

Housed in a spacious modern building complex, a talented faculty and up-to-date equipment provide excellent opportunities for graduate research. Major equipment includes DNA sequencer, DNA synthesizer, HPLC and gas chromatographs, electron microscope, environmental chambers, cryostats, PCR thermocyclers, laser densitometer, multi-channel plate readers, computer-aided image analysis facility, photographic facility, fluorometers, recording spectrophotometers, biohazard, safety hoods, ultracentrifuges, ultramicrotomers, and a flow cytometer. Surgery and housing facilities for large and small animals, intensive library holdings and facilities, and easy access to the university's computer center are also available. Extensive research potential in food animals is enhanced by an interstate program with the University of Nebraska–Lincoln.

## Faculty contact

For the Ph.D. in pathology and microbiology:
Chairman, Pathology and Laboratory Medicine Graduate Group
Department of Pathology
College of Veterinary Medicine
Kansas State University
Manhattan, KS 66506–5605
Telephone: 913-532-5634

For the M.S. degree in microbiology, pathology, clinical sciences, and veterinary diagnosis:
Head of department (specify)
College of Veterinary Medicine
Kansas State University
Manhattan, KS 66506–5605

# Outreach

## Division of Continuing Education

Robert F. Kruh, Vice Provost and Dean of Continuing Education
Sue Maes, Associate Director, Continuing Education; Director, Academic Outreach
Douglas W. King, Director, Administrative Systems
Lynda Spire, Director, Conferences
William Cashin, Director, Center for Faculty Evaluation and Development
Enid Cocke, Director, English Language Program
Tim Peterson, Director, Kansas Regents Network (TELENET)
Linda Teener, Director, UFM

College Court Building
532-5566

The Division of Continuing Education brings together K-State's teaching resources with learners throughout Kansas who are unable to come to the campus. Classes and programs are provided in many communities by face-to-face instruction or by electronic means. In the latter case, the university makes use of both the Regents Network, an audio teleconferencing system, and the Regents Educational Communications Center, a video production facility. Credit and non-credit programs are offered for those seeking degrees, professional updates, or personal enrichment. For detailed information on offerings contact Academic Outreach at 532-5687 or 1-800-432-8222.

### K-State summer session

The summer session is designed to meet the needs of the following groups, among others:

Undergraduate and graduate students who wish to accelerate their programs of study and those who wish to make up courses missed during fall or spring semesters.

Teachers and other professionals who are unable to attend the university during the regular terms.

High school graduates seeking an early start on college. Regular introductory courses and special programs designed for high school students are available. These students find it valuable to establish study habits, become acquainted with the campus and faculty, and adjust to university life.

All facilities and services of the university available in the regular semesters are available in the summer, including housing, food service, counseling and testing services, Lafene Health Center, and K-State Union recreational programs.

The *Summer Session Bulletin* gives complete and detailed information about summer school. It is available in April each year. A free copy may be obtained from the Division of Continuing Education.

### Intersession

K-State conducts its intersession program during major breaks in the standard academic calendar. There are two intersessions each year: one in early January, the other in late May and early June. During intersession, 40 to 60 courses are offered, including both regular and new or experimental courses.

Many students use intersession as an opportunity to examine academic areas not scheduled in their current curricula. The faculty uses intersession as an opportunity to experiment with new ideas and formats for teaching.

Intersession courses are considered part of the regular K-State course offerings and can fulfill degree requirements. Students are encouraged to consult with their advisors to determine if a particular intersession course will meet requirements.

### Fort Riley courses

K-State works in cooperation with the Army Education Center to provide the Fort Riley community the opportunity to take university courses. Courses are scheduled at convenient times to assist military personnel and their dependents.

The courses are taught by regular K-State faculty members and allow the pursuit of associate, bachelor's, and master's degrees in several academic disciplines. Areas of study in highest demand include general social sciences, business administration, and education. K-State courses offered at Fort Riley are open to all area residents, although military personnel have priority.

K-State maintains an office at Fort Riley staffed by K-State personnel familiar with degree requirements and procedures on acceptance of transfer work. Students are encouraged to meet with these advisors to pursue their academic goals. For additional information contact the K-State coordinator at Fort Riley, (913) 784-5930.

### Regents Network (TELENET)

Many courses and educational programs offered on the K-State campus are available to the people of Kansas by means of the Regents Network (TELENET). The network is a teleconferencing system of educational centers located throughout Kansas and linked together via telephone lines. The locations include Abilene, Arkansas City, Atchison, Belleville, Beloit, Chanute, Colby, Concordia, Dodge City, El Dorado, Emporia, Garden City, Goodland, Great Bend, Hays, Howard, Hutchinson, Independence, Larned, Lawrence, Liberal, Manhattan, Marysville, Newton, Norton, Ottawa, Overland Park, Paola, Pittsburg, Pratt, Sabetha, Salina, Stockton, Topeka, Wathena, Wellington, and Wichita.

A TELEbridge has been added to the Regents Network to allow additional temporary teleconferencing classrooms to be established anywhere in Kansas for university courses, in-service training, meetings, or conferences.

### Non-Traditional Study Program

The Non-Traditional Study Program is designed for undergraduate students who have encountered obstacles to traditional college attendance, helping them surmount barriers created by distance, physical handicap, employment, or family need. Staff may be able to assist returning K-State students in finding remedies for past academic deficiencies.

NTS advisors assist students in planning individual programs of study and serve as guides to faculty and media resources. The advisors help students select options such as evening or off-campus classes; correspondence study; credit by examination; audio and video courses; telecourses; TELENET courses; internships; or independent study.

Students may earn baccalaureate degrees in traditional academic areas.

### Conference Office

The Conference Office makes university facilities and resources available to individuals and organizations through the design and management of conferences, short courses, workshops, special interest programs, and non-credit programs. For further information, contact the Conference Office at 532-5575.

### Center for Faculty Evaluation and Development

The Center for Faculty Evaluation and Development was created in 1975 by a grant from the W. K. Kellogg Foundation. The center is now supported by fees received for its services. For additional information contact the Center for Faculty Evaluation and Development at 532-5970.

### UFM

UFM is a community learning center that develops and conducts informal educational opportunities that do not involve prerequisites, grades, or credits. More than 500 programs are available during the three sessions a year. Classes, symposia, forums, and unstructured learning experiences covering a range of human interests, activities, and concerns are offered.

**English Language Program**
See entry under Services for Students in this catalog.

# International Agricultural Programs

Jim Jorns, Acting Director
108 Waters Hall
532-5714

Since 1956, K-State has extended its outreach mandate to include people around the world through multi-million dollar USAID funded projects in developing countries; individual faculty research, consulting, and sabbatical activities; and hundreds of educational programs for international participants.

The first major projects helped establish land-grant type agricultural universities in India and Nigeria. Recent projects have provided specialized assistance for universities and ministries of agriculture in the Philippines, Botswana, Honduras, and Pakistan. As a partner in the MidAmerica International Agriculture Consortium faculty have been involved in projects in Peru, Morocco, Liberia, Tunisia, and Kenya. Through these projects, faculty members and their families have experienced other cultures and have brought these experiences back to K-State students and the community.

The International Meat and Livestock Program and the International Grains Program have helped hundreds of international participants develop new skills and knowledge. The Food and Feed Grain Institute has provided training in more than 50 countries to help solve postharvest problems of grain storage, transportation, processing, and marketing.

# Kansas Regents Educational Communications Center

Melvin Chastain, Director
Bob Dole Hall
532-7041

The Educational Communications Center houses instructional television and related telecommunications studios, and production, editing, and distribution facilities, including Ku-Band satellite uplinks, fiber optics, Low Power TV, and compressed video. The center also houses studio and control room facilities for instructional use by journalism and mass communications faculty and students, as well as offices and studios for both Cooperative Extension and TELENET.

The ECC provides electronic access to and interconnection between each of the Kansas Regents' institutions. The center not only produces and distributes university-level instructional material, but also develops course work and in-service content for public schools, as well as credit and non-credit continuing education material.

# Division of Cooperative Extension

123 Umberger Hall
532-5820

The basic mission of extension is to deliver informal, out-of-school, noncredit educational programs that help people solve their problems. These programs are based on up-to-date research and practical applications of knowledge conducted by this and other institutions.

The Cooperative Extension Service provides an important learning bridge between the university and the people of the state. It takes scientific knowledge, principles, and practices that bear directly on the grass roots problems of Kansans. At the same time, this unique information delivery system brings back requests for new knowledge to the research staff at the university.

The Cooperative Extension Service helps maintain County Extension Offices, operated by off-campus K-State faculty members, in all 105 Kansas counties.

County extension agents, as official representatives of the United States Department of Agriculture, are responsible for making people aware of educational programs affecting agriculture, family living, youth, community development, and related areas. The agents serve as a local source of information regarding programs of many other governmental agencies, such as the Soil Conservation Service, Rural Electrification Administration, Farm Credit Administration, and Agricultural Stabilization and Conservation Service.

## Extension Agricultural Programs

Daryl D. Buchholz, Acting Assistant Director, Professor

Specialists in several departments of the Colleges of Agriculture, Engineering, and Veterinary Medicine offer direct educational and technical assistance to citizens throughout the state.

In addition, extension offers interdisciplinary programs in four areas: food, feed, and forage production; animal production and utilization; resource use and conservation; and farm business and financial management.

### Extension agricultural economics
Orlan Buller, Acting Head
Barry L. Flinchbaugh, State Leader

### Farm management
Professors Barnaby, Fausett, Flinchbaugh, Johnson, L. Langemeier, and Schlender; Assistant Professors M. Langemeier and Nelson; Administrator DeLano; Farm Management Association Fieldmen Allen, J. Dawson, R. Dawson, Everson, Freeze, Herod, Huschka, Manny, McCorkle, Miller, Rempe, Roddy, Rowell, Schwarzentraub, Smith, Stucky, Tarrant, Thompson, Wahl, Wilken, Witt, Wood, and van der Hoeven; Emeriti: Professors Thomas and Whitehair; Associate Professors McReynolds and Parker; Assistant Professor Overley; Farm Management Association Fieldmen Collins, Dickson, Faidley, Germann, Greene, Hackler, Hageman, Mullen, Sturdevant.

The extension educational program in farm management is divided into two areas: Kansas Farm Management Association programs and area and state farm management programs.

In the Kansas Farm Management Association program, the 24 farm management fieldmen conduct an intensive educational program with approximately 2,600 Kansas farm families in the six farm management associations.

The extension farm management program is conducted by state specialists and area economists. It is done with in-depth educational programs in cooperation with the county extension agents. The area 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.

### Agricultural policy
The public affairs extension educational program provides educational information on policy issues of current interest. Problems are analyzed, alternatives and consequences examined, and the people are challenged to reach decisions.

The economic information program provides current data on factors affecting farming, business and industrial operations, labor supply and demand, and family living costs.

### Extension marketing
Professors Barton and Erickson; Associate Professors Mintert and Tierney; Emeriti: Professor Walker.

The main projects of marketing include marketing information, agri-business, and commodity marketing activities. News releases, monthly teleconferences, publications directed to the general public, and special information directed toward specific agricultural audiences are used to disseminate information.

### Extension economic development
Associate Professor Darling.

Extension economic development assists communities in development efforts. News releases, publications, and seminars are offered through county extension agents and area community development specialists.

### Extension local government
Assistant Professor Young.

The extension local government program provides direct educational assistance in the areas of management, finance, and policy. Educational programs are conducted in cooperation with county extension agents and area community development specialists.

### Extension agricultural engineering
Stanley J. Clark, Head
James P. Murphy, State Leader

Professors Clark, Harner, and Murphy; Associate Professors Black, Kuhlman, Powell, and Rogers; Assistant Professor Taylor; Emeriti: Professors Holmes, Jepson, and Wendling; Associate Professor Schindler.

Extension agricultural engineering carries on an educational program dealing with application of engineering principles to various phases of agriculture.

### Extension agronomy
Gerry Posler, Head
David A. Whitney, State Leader

Professors Kilgore, Lamond, Posler, Regehr, Shroyer, Welch, and Whitney; Associate Professors Devlin, Mikesell, Ohlenbusch, Hickman, Fjell, and Peterson; Assistant Professors Duncan, and Kok; Emeriti: Professors Bieberly, Bohannon, Dicken, and Edelblute; Associate Professor Harper.

Extension agronomy conducts a statewide educational program in agricultural crop production and natural 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.

### Extension animal sciences and industry
Jack G. Riley, Head
Larry R. Corah, State Leader

Professors Brazle, Call, Corah, Dunham, Henderson, Kuhl, Riley, Schafer, Simms, Spaeth, and Zoellner; Associate Professor Nelssen; Assistant Professors Blasi, Bolze, Boyle, Eck, Goodband, and Tokach; Extension Assistant Olson; Emeriti: Professors Adams, Francis, Good, Moyer, and Westmeyer; Assistant Professor Orwig.

Extension specialists in animal sciences and industry provide leadership for state programs in beef cattle, dairy cattle, horses, poultry, sheep, swine, meats, dairy products, and wildlife damage control.

### Extension communications
Robert R. Furbee, Head

Professors Brandsberg, Sullins, and Titus; Associate Professors Atkinson, Baker, Buchanan, Frank, Furbee, Jorgensen, McGlashon, Terry, Ward, and Wright; Instructor Ballou; Emeriti Professors Burke, Graham, Medlin, Thomas, Unrun, and Warner; Associate Professors Dexter, and Peck; Assistant Professors Kuehn, Nelson, and Tennant.

The Department of Communications supports the Cooperative Extension Service through the media. Information is channeled through newspapers, magazines, publications, circulars and posters, printed annual reports, exhibits, slides, radio, and television. Editing, printing, graphics, and media services are available.

The Department of Communications administers and programs KKSU, an institution-owned, public radio station on the air on 580 Hz, The K-State Radio Network is both a live and audiotape service to Kansas commercial radio stations. Television programs are presented on cooperating television stations, provided for extension agents and specialists, and delivered via satellite videoconferences.

### Extension entomology
C. Michael Smith, Head
Randall A. Higgins, State Leader

Professors Bauernfeind, Brooks, Cress, Mock, Sloderbeck, and Smith; Associate Professors Higgins and Lippert; Emeritus: Professor Gates.

Extension entomology is concerned with practical insect control measures for Kansas citizens. Pilot pest management projects are used to introduce and validate newer, integrated approaches to managing pest populations.

### State and extension forestry
Raymond G. Aslin, State Forester
Thomas D. Warner, Head, Department of Horticulture, Forestry, and Recreation Resources
John K. Strickler, Extension Forester

Professors Aslin, Loucks, Naughton, Nighswonger, Pinkerton, and Strickler; Associate Professors Lynch and Rowland; Assistant Professors Bruckerhoff, Kunkel, and Strine; Emeritus Associate Professor Gould.

This department 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.

### Extension grain science and industry
Richard R. Hahn, Head
Timothy J. Herrman, State Leader

Professors Curran, Pederson, and Ponte; Assistant Professor Herrman; Instructors Bequette and Pudden; Emeritus: Balding, Schoeff, and Wilcox.

This extension program assists personnel in the formula feed and allied industries in: (1) the adoption and use of the latest manufacturing techniques, safety equipment, and practices; and 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.

### Extension horticulture, forestry, and recreation resources
Thomas D. Warner, Head
Frank D. Morrison, State Leader

Professors Leuthold, Marr, Morrison, and van der Hoeven; Assistant Professors Gast and Stevens.

Programs in extension horticulture and landscaping serve persons interested in horticultural plants, including fruits, nuts, vegetables, flowers, turf, shrubs, and ornamental and shade trees.

### Extension plant pathology
Fred W. Schwenk, Head
Douglas J. Jardine, State Leader

Professor Schwenk; Assistant Professor Bowden; Associate Professors Jardine and Tisserat; Instructor O'Mara; Emeritus: Professor King and Willis.

Plant pathology extension specialists provides information about the occurrence and nature of plant diseases and the economic means for their control.

### Extension veterinary medicine
Associate Professor Breeden.

Extension veterinary medicine serves all facets of companion animals and the livestock industry, including veterinarians as a source of scientific material pertaining to the most recent information on disease prevention and control and proper drug use.

# Extension Home Economics Programs

### College of Human Ecology
Marilyn B. Corbin, Assistant Director of Extension, Home Economics Programs

Professors Bowers, Clarke, Murray, Penner, Peterson, and Smith; Associate Professors Bradshaw, Corbin, Jones, Mark, Phillips, and Walker; Assistant Professors Aramouni, Munson, Peters, Price, Wilken, and Young; Emeriti: Professors Allen, Anderson, Carlson, Ellithorpe, Neufeld, Slinkman, and Tucker; Associate Professors Appleby, Atkinson, Clonts, Howe, Johnson, Schroeder, Wells, H. B. Wiggins, and M. C. Wiggins; Assistant Professors Crist, Guthrie, Miller, and Starkey.

Educational programs designed to improve the quality of living are carried on in each Kansas county under the direction of extension home economics programs.

Program emphases are on: development of children and youth; marital and parental roles; changing roles of men and women; management in allocation of family resources; family financial security; time and money management; consumer performance in the market; nutrition and health; food preparation and preservation; food safety and sanitation; clothing management; textiles; health and safety; hazards in the home and community; home selection, building, buying, and remodeling; housing costs and finance; community factors in housing decisions; furnishing and equipping the home; developing community economic, social, cultural, and human resources, including understanding public concerns affecting families; expansion and improvement of cultural opportunities; and development of leadership abilities.

### Extension expanded food and nutrition education program
Marilyn B. Corbin, Assistant Director of Extension, Home Economics Programs

Assistant Professor Stroh.

An educational program in nutrition education for adults and youth from families with limited resources, the program with individual family members and youth is conducted through para-professionals who work under the supervision and administration of an extension home economist. The program is conducted in designated counties.

# 4–H Youth Programs

C. R. Salmon, Assistant Director of Extension

Professor Apel; Associate Professors Adams, Fisher, Kling, McFarland, and Salmon; Assistant Professors Severinson and Godke; Emeriti: Professors Bates, Busset, Eyestone, Johnson, Redman, and Regnier; Associate Professors Borst and Whipps; Assistant Professor Weaver.

Kansas 4–H, Kansas' largest youth education apart from the public schools, is the pre-college-level education program of the university, conducted in cooperation with County Extension Councils and the United States Department of Agriculture.

4–H specialists staff and county extension agents interpret, extend, and encourage the application of relevant and current information to concerned adults, parents, and community leaders on techniques of working with children and youth so that the children and youth will become self-directing, contributing members of society. Programs help children and youth build self-confidence, develop inquiring minds, learn to make decisions, relate to others, and develop a concern for the community and those in it.

# Extension Community Development Programs

William M. Eberle, Assistant Director of Extension

Associate Professors Eberle, and Utermoehlen; Assistant Professor Albright; Emeritus: Professors Frazier and Norby; Associate Professors Halazon and Albright.

Extension community development programs help Kansans arrive at group decisions and take actions to enhance their communities as economic, social, service, and living centers. Major community development education program components include organization and leadership development, economic development, and local government.

**Kansas PRIDE program**
Associate Specialist McAdoo.

The Kansas PRIDE Community Improvement Program is a cooperative effort between government, education, and private industry to develop an organizational and leadership structure for community-wide volunteer action. The Kansas PRIDE program is jointly administered by the Kansas State University Cooperative Extension Service and the Kansas Department of Commerce.

**Kansas DIRECT program**
Associate Professor Sisk; Associate Specialists Hobson and Williams.

The Kansas DIRECT Program is a referral and information service providing a single point of contact for individuals needing information or assistance in economic, rural, or business development.

# Extension Energy Service

Richard B. Hayter, Assistant Director

Professor Hayter; Assistant Professor Nelson; Instructors Gardner, Logan, Matteson, Meyer, Nelson, Snead, and Walter.

The Energy Extension Service provides educational programs for the small energy consumer. This outreach is directed toward four program areas: residential, agricultural, institutional, and small business and industry. Assistance is offered through short courses, technical publications, and on-site visits.

# Extension Area Offices

**Southwest Research–Extension Center, Garden City**
James A. Schaffer, Head
Paul Hartman, Area Extension Director and Associate Head

Professor Sloderbeck; Associate Professors Dhuyvetter and Young; Assistant Professor Eck; Emeriti: Professor Mann; Assistant Professor Blankenhagen.

**Northwest Research–Extension Center, Colby**
Richard S. White, Head
Reba B. White, Area Extension Director and Associate Head

Professor R. S. White; Associate Professors Mikesell and Nelson; Assistant Professors Bolze and Albright; Emeritus: Assistant Professor Overley.

**South Central Area Extension Office, Hutchinson**
Earl L. Van Meter, Area Extension Director

Associate Professor Phillips; Assistant Professors Blasi, Duncan, and Warmann; District Forester Atchison; Emeriti: Professor Cox; Associate Professors Albright, McReynolds, and Wiggins; Assistant Professor Orwig.

**Northeast Area Extension Office, Manhattan**
Bob W. Newsome, Area Extension Director

Professor Newsome; Associate Professors Devlin, Mark, and Utermoehlen; Assistant Professors Tokach and Vandeveer; District Forester New; Emeriti: Professors Figurski and Francis; Instructors Burkhart and Marlow.

**Southeast Area Extension Office, Chanute**
Benny S. Robbins, Area Extension Director

Professors Brazle, Fausett, Kilgore, and Robbins; Associate Professors Lippert, and Rowland; Assistant Professors Bruckerhoff and Price; Emerita: Associate Professor Appleby.

**County extension offices**
There are county extension offices in each of the 105 counties.

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**SETSER, DONALD W.,** Prof. of Chemistry (1963). BS 1956, MS 1958, Kansas St. U.; PhD 1961, U. of Washington.

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