

## Biological and Agricultural Engineering

Biological and agricultural engineers develop the techniques and processes to work with living systems, including microbes, plants and animals. They provide engineering input to produce and process useful products like food, fiber, energy, chemical feedstocks, and pharmaceuticals. They also emphasize efficient use of soil and water resources and environmental protection to improve water quality, control air pollution, and clean up contaminated soils.

K-State is the only university in Kansas that offers a biological and agricultural engineering degree program. It is a versatile program that offers environmental, machinery, and biological engineering options. A general option allows areas of emphasis using technical electives.

### Career opportunities

Biological and agricultural engineers apply engineering, physical, and biological principles to living systems in a diverse world of opportunities. They design machines and structures; manage natural resources such as soil, water, crops, and forests; analyze and design ways to maintain healthy environments for humans and animals; process food, feed, fiber, and waste products; and develop efficient applications of computers and automatic controls for agricultural operations and processes.

Many businesses and industries use the knowledge and experience of a biological and agricultural engineer. As a result, students graduating from K-State have found careers suited to their interests and education in Kansas and other states. The following are some positions held by recent graduates:

- Environmental engineer with local, national, and international consulting firms.
- Application engineer for an off-road equipment manufacturer.
- Design and test engineer for a Kansas manufacturer of food processing machinery.
- Environmental engineer with major energy production corporations.
- Design and test engineer with an agricultural machinery company.
- Medical school, veterinary medical school, and law school students.
- Design and application engineer for a manufacturer of air handling and pollution control equipment.
- Design engineer for an irrigation equipment manufacturing company.
- Food engineer for a contractor developing the space mission to Mars.
- Natural resources and environmental engineer for numerous government agencies (local and federal).
- Design engineer for a manufacturer of agricultural chemical application equipment.
- Field and research engineer for an oil field service company.
- Water supply development engineer for a consulting firm.
- Design engineer for a major food processing company.
- International consultant working in agricultural development.
- Project engineer for a Kansas livestock and environmental control equipment manufacturer.
- Sales engineer/technical support person for a machinery manufacturer.
- University faculty member in teaching, research, and extension (with advanced degrees).

### Academic program

The program is nationally accredited, offering bachelor of science and graduate degrees.

To prepare for university study, you are encouraged to take a college preparatory program in high school. Since the ability to communicate effectively is essential to engineers, it is important that you take courses in English and speech. High school courses in physics, chemistry, and biology are highly recommended. Mathematics entrance requirements for the college include two units of algebra, one unit of geometry, one-half unit of trigonometry, and calculus if it is available.

In the undergraduate program, you will gain an understanding of basic engineering principles, a knowledge of biological sciences, and the ability to develop new concepts and methods. Due to the diversity of biological and agricultural engineering, four curriculum options are available: a general option with a chosen area of specialization, a machinery engineering option, an environmental engineering option, and a biological engineering option.

### General engineering option

Under the general option, chemistry, physics, biology, mathematics, communications, engineering science, and other basic courses are studied throughout the freshman and sophomore years. During your junior and senior years, you will

choose courses that allow you to specialize in different technical areas of biological and agricultural engineering. These areas include:

#### **Natural resources and environment**

Learn engineering design and management practices for soil and water conservation and environmental preservation.

#### **Machinery systems**

This area covers the use of electronics, sensors, and improved engineering design in the research, development, and testing of machinery for all phases of agricultural production and processing of food, feed, and fiber.

#### **Biological processing**

Studies include the development of new processes and the handling, storage, preservation, and processing of food, feed, and fiber.

#### **Structures and environment**

Learn to design and analyze agricultural structures and environmental control systems for the livestock, food and feed processing, and greenhouse industries.

#### **Biological engineering option**

This unique program starts with courses similar to the general option in the first two years, but emphasizes biology and chemistry and their application to biological systems from molecular to ecosystem levels. You will learn about processing of food and other biobased materials, production of fermented food and biochemical products, and applications that add value to biological systems. This program can also be planned to meet pre-med, pre-vet, or pre-biomed advanced degree entry requirements.

#### **Environmental engineering option**

The first two years of the environmental option are almost identical to the general option. In your junior year, additional biological sciences courses are taken, along with environmental engineering courses taught in the biological and agricultural engineering department such as natural resources engineering, air pollution, and non-point source pollution. Other technical electives are chosen to enrich the program.

#### **Machinery engineering option**

The first two years are similar to the general option. In your junior year, additional courses focus on machinery design, power transmission, fluid power, instrumentation and controls. Additional machinery system and team-based design courses are included to enhance the program.

Classroom instruction for all the options is enhanced by practical hands-on experience and the application of computers to class problems and exercises. The curriculum is supported by faculty members with strong academic qualifications, as well as research, extension, industry, and foreign and domestic consulting experiences. This provides a firm basis for a comprehensive education in biological and agricultural engineering.

#### **Natural resources and environmental sciences secondary major**

Many environmental and natural resource problems are so complex that they lie beyond the scope of any one discipline. The natural resources and environmental sciences (NRES) secondary major broadens your perspectives through course offerings and interaction with students and faculty from many disciplines. The secondary major prepares you to apply broad-based knowledge to the use, management, sustainability, and quality of soil, air, water, mineral, biological, and energy resources.

The NRES secondary major is available to any K-State undergraduate. It includes entry requirements and an interdisciplinary capstone course. The requirements mesh very well with the biological and agricultural engineering general option requirements. The NRES secondary major can be completed by using various elective requirements in the general option and does not require any extra hours to graduate.

#### **Student activities**

All students are encouraged to join the student branch of the ASABE, the society for engineering in agricultural, food, and biological systems. The student branch promotes academic involvement and provides an enjoyable source of learning and student interaction outside the classroom.

The club hosts field trips, faculty/student picnics, displays at K-State Open House, club parties, and other interesting events. Student design teams have an outstanding record of success at regional and national design competitions sponsored by ASABE.

#### **Financial aid**

Financial aid is available to you in the form of scholarships offered by the Department of Biological and Agricultural Engineering and the College of Engineering. You can also receive aid in the form of loans, grants, work-study awards, and employment both on and off campus, including a variety of employment opportunities offered by the Department of Biological and Agricultural Engineering.

#### **For more information about biological and agricultural engineering, contact:**

Department of Biological and Agricultural Engineering  
Kansas State University  
129 Seaton Hall  
Manhattan, KS 66506-2906  
785-532-5580  
Fax: 785-532-5825  
E-mail: [gac@ksu.edu](mailto:gac@ksu.edu)  
[www.bae.ksu.edu](http://www.bae.ksu.edu)  
[www.engg.ksu.edu](http://www.engg.ksu.edu)

#### **For more information about Kansas State University, contact:**

Office of Admissions  
Kansas State University  
119 Anderson Hall  
Manhattan, KS 66506-0102  
785-532-6250  
E-mail: [k-state@k-state.edu](mailto:k-state@k-state.edu)  
[consider.k-state.edu](http://consider.k-state.edu)



#### **Notice of nondiscrimination**

Kansas State University is committed to nondiscrimination on the basis of race, sex, national origin, disability, religion, age, sexual orientation, or other nonmerit reasons, in admissions, educational programs or activities and employment (including employment of disabled veterans and veterans of the Vietnam Era), as required by applicable laws and regulations. Responsibility for coordination of compliance efforts and receipt of inquiries concerning Title VI of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, the Age Discrimination Act of 1975, and the Americans With Disabilities Act of 1990, has been delegated to Clyde Howard, Director of Affirmative Action, Kansas State University, 214 Anderson Hall, Manhattan, KS 66506-0124. (Phone) 785-532-6220; (TTY) 785-532-4807. Paid for by K-State.

3685-41002-6/06-IMD-300A-400C