k-state study guide
kansas state university

Biological Systems Engineering

Biological systems engineers develop the techniques and processes to work with living systems, including microbes, plants and animals. They provide engineering input to produce and process 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 systems engineering degree program. It is a versatile program that offers environmental, machinery, and biological engineering options.

Career opportunities

Biological systems 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 systems 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 systems engineering, three curriculum options are available: a machinery engineering option, an environmental engineering option, and a biological engineering option.

Environmental option

Biological systems engineers work at the interface between biology and engineering. They must be knowledgeable in both disciplines. Applications in the environmental option include water quality studies of lakes, rivers, and groundwater, soil and water conservation, irrigation and drainage, system design and management, waste treatment, management of air quality inside buildings and outside, remediation of land damaged by construction, mining, and other uses.

The environmental option focuses on the design and management of systems that use or impact natural resources. Non-point pollution issues have long been a component of agricultural

engineering programs. Soil conservation programs began in the 1930s, long before the environmental movement began. Point and non-point pollution sources still impact the environment, requiring biological systems engineering expertise to develop solutions to those problems. This option is distinct from but interfaces with the environmental option in civil engineering.

Secondary major in natural resources and environmental sciences
Students enrolled in biological systems engineering, regardless of option, may participate in the natural resources and environmental sciences secondary major. Courses used for the secondary major may also be used for completing regular graduation requirements. Details are found in the Natural Resources and Environmental Sciences section of the online catalog at *www.catalog.k-state.edu*.

Biological option

Biological systems range in size from cells to complex groups of living organisms. Biological engineers work with these systems in areas that include biomaterials, bioinstrumentation, biological systems modeling, bioremediation, food and fiber processing, and energy from biological products. The biological option fulfills the requirements for a bachelor of science in biological systems engineering while providing students with the flexibility to receive a strong "biological" emphasis in their engineering program. Course selections also provide students with the option of a biology minor, or they can opt to meet the requirements for a pre-medical or pre-veterinary program. Graduates in this program area can pursue careers and/or additional studies in fields such as environmental engineering, biological systems engineering, biomedical engineering, food process engineering, medicine, natural resources, and related areas.

Machinery systems option

Many biological systems engineers design, test, and evaluate the machines used in agriculture, construction, and related off-highway industries. The machinery option provides graduates with the analytical tools needed to develop machines that reduce the cost of production for both traditional and new crops, while operating within environmental and energy constraints. This option includes courses that emphasize mechanical design as well as the interaction of machines with soil and plant materials. Related technologies such as fluid power, instrumentation, and electronic controls are also included in this option.

Integrated B.S.-M.S. degree

A five-year integrated program leading to a bachelor's degree in some engineering fields at the end of four years and a master of science degree at the end of five years is available for promising undergraduate students.

Students who have completed their sophomore year and have outstanding scholastic records are invited to join the program. Each student, in consultation with a faculty advisor, will plan an individualized program of study that meets requirements for the BS. and MS degrees. Features of the program include integrated planning, participation in research as an undergraduate, and enrollment in graduate-level courses in students' senior year. Students participating in the program will be considered for financial assistance in the form of scholarships, fellowships, research assistantships, and part-time work.

Architectural, biological and agricultural, and industrial and manufacturing systems engineering departments offer formal programs in which the BS and MS degrees are completed during the same semester.

Agricultural technology management

Description and curriculum outline are listed in the College of Agriculture section of the online catalog.

Curriculum in biological systems engineering (BSE)

Bachelor of science in biological systems engineering.

128 hours required for graduation

Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, 410-347-7700.

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 systems 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: contact-l@bae.ksu.edu
www.bae.ksu.edu
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
1-800-432-8270 (toll free) or
785-532-6250
E-mail: k-state@k-state.edu
consider.k-state.edu

K-STATE
Kansas State University

5509–53140–07/09–1.5MD-500C