

Introduction to Graduate Program

*Department of Biological and Agricultural Engineering
Kansas State University*

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Department Head:

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Mark E. Casada, (Adjunct) Ph.D., North Carolina State University.

Do Sup Chung, Ph.D., Kansas State University.

Floyd E. Dowell, (Adjunct) Ph.D., University of Illinois.

Lawrence J. Hagen, (Adjunct) Ph.D., Kansas State University.

Joseph P. Harner III, Ph.D., Virginia Polytechnic Institute and State University.

Stacy Lewis Hutchinson, Ph.D., Kansas State University.

James K. Koelliker, Ph.D., Iowa State University.

Ronaldo G. Maghirang, Ph.D., Pennsylvania State University.

Kyle R. Mankin, Ph.D., The Ohio State University.

James P. Murphy, M.S., Kansas State University

Thomas C. Pearson, (Adjunct) Ph.D., University of California at Davis.

Danny H. Rogers, Ph.D., Oklahoma State University.

Mark D. Schrock, Ph.D., Kansas State University.

John W. Slocombe, Ph.D., Iowa State University.

Charles K. Spillman, Ph.D., Purdue University.

James M. Steichen, Ph.D., Oklahoma State University.

Larry E. Wagner, (Adjunct) Ph.D., Kansas State University.

Donghai Wang, Ph.D., Texas A & M University.

Robert E. Wolf, Ph.D., University of Illinois.

Naiqian Zhang, Ph.D., Virginia Polytechnic Institute and State University.

Program description

The Department of Biological and Agricultural Engineering (BAE) of Kansas State University (KSU) offers courses of study leading to the Master of Science (M.S.) in biological and agricultural engineering, and the Doctor of Philosophy (Ph.D.) in engineering.

The department consists of 19 graduate faculty members, six adjunct graduate faculty members, and about 25 graduate students. Ph.D. and M.S. students may specialize in (1) environmental engineering, (2) bioprocessing engineering, (3) information and electrical technology, (4) machinery systems, (5) natural resource engineering, and (6) structure and environment.

The minimum requirements for an M.S. degree 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 problem work.

The minimum requirements for a Ph.D. degree are 90 credit hours beyond the bachelor's degree, including a Ph.D. dissertation of at least 30 semester hours based upon major, original research. Students who hold an M.S. degree may request transfer of up to 30 credit hours of that degree toward a Ph.D. degree. Award of a doctorate requires successful completion of the equivalent of at least three full years of full-time study beyond the baccalaureate.

Program requirements

Admission to an M. S. program requires a degree of Bachelor of Science in biological and agricultural engineering or its equivalent and meeting all requirements for admission to the Graduate School. Graduates from other engineering curricula or a strong physical/biological science curriculum may be admitted provisionally with undergraduate deficiencies specified.

An application for admission to a graduate program in BAE should be made at least six months prior to the start of the term in which enrollment is desired. Additional information on graduate programs and on application for admission to the Graduate School of KSU may be obtained by browsing appropriate Websites and by writing the department.

A minimum TOEFL score of 600 (paper-based) or 250 (computer-based) is required of those students whose native language is not English. The TOEFL score must reflect results of a TOEFL test that was taken within two years prior to the application. Students with a TOEFL score of 550-599 (paper-based) or 213-249 (computer-based) may be granted a provisional admission. The provision may be removed by successfully passing the English Proficiency Test managed by the KSU English Language Program (ELP) upon arrival or after taking appropriate ELP courses..

GRE scores are not required by the BAE graduate programs. However, applicants are encouraged to submit the GRE scores as a supporting evidence of qualification.

Check list for application

- Application form

(can be downloaded from <http://www.ksu.edu/grad/application/index.htm>)

- Application fee:
 - \$30 for U.S. citizens and permanent residents
 - \$55 for international students
- Three (3) recommendation letters
- Statement of Objectives

- Official transcripts from previously attended undergraduate and graduate programs
- Affidavit of Financial Support (for international applicants only)

(can be downloaded from <http://www.ksu.edu/grad/application/index.htm>)

- Official TOEFL score report (for international students only)
- Official GRE score report (recommended)
- Academic vita (recommended)
- Other supporting documents demonstrating credentials (optional)

Deadlines for international application

- For enrollment starting the Spring semester: August 1 of the previous year
- For enrollment starting the Summer semester: December 1 of the previous year
- For enrollment starting the Fall semester: February 1 of the same year

Research facilities

The department is located in Seaton Hall. The department possesses 16 well-equipped instructional and research laboratories, including the computer laboratory, and laboratories for instrument and control, physical properties, image processing, thermal food processing, grain wet processing, bioprocessing and bioconversion, air quality and control, water quality and control, hydrology, engine testing, machinery systems, and biomass energy systems. Field studies may be carried out at experiment fields near Topeka and St. John and at Research Extension Centers near Garden City and Colby. Opportunities also exist for research in the U.S. Grain Marketing and Production Research Center and the Wind Erosion Research Unit, USDA-ARS, both located in Manhattan.

Financial support

Students are admitted into the Biological and Agricultural Engineering graduate program either with a graduate research 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 experiences 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.

Biological and agricultural engineering courses

Undergraduate and graduate credit in minor field

BAE 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.

BAE 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.: BAE 200. Pr. or conc.: ME 513.

BAE 530. Natural Resource Engineering. (3) II. Principles and measures for controlling storm water runoff and soil erosion including hydrology and surface water flow; design of water handling structures for land drainage, flood protection, and irrigation; pipeline flow and pump selection. Two hours rec. and three hours lab a week. Pr.: STAT 490; Pr. or conc.: ME 571. Not available for students with credit for CE 550.

BAE 531. Natural Resource Engineering Field Laboratory. (1) II. In depth, field applications of Natural Resource Engineering analysis and design for controlling storm water runoff and soil erosion; design of water handling structures for land drainage, flood protection, and irrigation; economic analysis of design options. Three hours lab a week. Pr.: AGRON 305 or CE 522; Pr. or conc.: ME 571; Conc. BAE 530.

BAE 533. Applied Hydrology. (3) II. Study of water sources and movement above, on, and beneath the earth's surface. Topics include water law relating to water quality and water supply. Three hours rec. Pr.: ATM 160 or PHYS 113 or PHYS 115.

BAE 535. Fundamentals of Structures and Environment Engineering. (3) I. Principles of environmental control for agricultural buildings and structures; analysis and design of structural systems and members for agricultural structures. Two hours rec and three hours lab a week. Pr.: ME 513 and CE 333.

BAE 536. Agricultural Engineering Design I. (2) I. Team-oriented design laboratory, with projects selected to address design of equipment or systems to produce or process food, fiber, and energy, or to preserve environmental quality, remediate damage, and conserve natural resources. Two 3-hour labs a week. Pr.: ME 533 or BAE 530 or BAE 575.

BAE 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 320 or ME 571.

Undergraduate and graduate credit

BAE 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.

BAE 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.: BAE 575 or CHE 531. Pr. or conc.: BAE 625.

BAE 636. Agricultural Engineering Design II. (2) II. A continuation of BAE 536. Completion of a team-oriented design project, with emphasis on construction, evaluation, documentation, and presentation of the design. Two 3-hour labs a week. Pr.: BAE 536.

BAE 640. Instrumentation and Control for Biological Systems. (3) II. Fundamentals of instrumentation and control engineering applied in biological and agricultural systems and processes. Time-domain analysis and frequency response methods. Sensors and actuators in feedback control systems. Control system design. Case studies. Two hours rec. and three hours lab a week. Pr.: EECE 510 or EECE 519, and MATH 240.

BAE 650. Energy and Biofuel Engineering. (3) II. Energy use and production in agriculture and related industries. Energetics of primary production, including crop energy conversion. Energy and material balances of biomass energy production and processing systems, including energy embodied in fertilizers and pesticides. Review of the role of fossil fuels in agricultural and forestry operations, including opportunities for energy conservation. Impact of alternative fuels on internal combustion engine emissions. Three hours lecture a week. Pr. or conc.: ME 513.

BAE 651. Air Pollution Engineering. (3) II. Air pollution legislation, standards, measurement, and terminology. Design and economics of particulate pollution control systems including cyclones, fabric filters, wet scrubbers, and electrostatic precipitators. Abatement of gas and vapor pollution using VOC incineration, gas adsorption and gas absorption. Meteorology and atmospheric dispersion modeling. Three hours rec. Pr.: ME 513, 571.

BAE 690. Non-Point Pollution Engineering. (3) I. Management of diffuse sources of pollution generally resulting from storm water and runoff. Use of models and Geographic Information Systems (GIS) to evaluate the extent and magnitude of non-point pollution, legislation and programs affecting non-point pollution, and design of treatment and management systems. Non-point pollutants addressed include: nutrients, pesticides, sediment, and hazardous wastes. Three hours lec. a week. Pr.: BAE 551 or CE 551.

Graduate credit

BAE 705. Irrigation Engineering. (3) II, on sufficient demand. Design and operative problems on the fundamentals of irrigation system design and management. Soil, plant, and water relationships; pipeline and system hydraulic design; design of irrigation

systems; filtration systems and chemigation; sources of water and water quality. Two hours rec. and three hours lab a week. Pr.: BAE 530 and AGRON 305 or CE 522. Pr. or conc.: ME 571.

BAE 740. Biomaterials Processing. (3) I, in even years. Technologies of bio-based material processing including starch extraction (wet milling), plant oil extraction and refining, plant protein extraction and processing, cellulose processing, biofuel production, chemicals bioconversion, and drying technologies or biomaterials. Course is cross-listed with GRSC 740. Three hours rec. a week. Pr.: BAE 500 or BAE 575 or GRSC 602.

BAE 750. Analysis and Design of Off-Highway Vehicles. (3) II, on sufficient demand. Analytical study of design, testing, construction, and operating characteristics of off-highway vehicles and machinery. Includes human factors, mobility, and precision agriculture. Two hours rec. and three hours lab a week. Pr.: BAE 536 or ME 574.

BAE 761. Natural Treatment Systems. (3) I, even years. Engineering analysis, modeling, and design of natural systems for treating liquid and solid wastes. I Applications of plant and microbial systems. Three hours rec. a week. Pr.: MATH 221, and one of the following courses: BAE 530, CE 563, BIOL 529 or 612, ATM 661.

BAE 768. Geoenvironmental Engineering Design. (3) II. A capstone design project in geoenvironmental engineering focused on resolving issues related to containment of pollutants and remediation of soil and groundwater. Pr. one of the following: AGRON 605, AGRON 746, BAE 690, CE 625, CE 654, CHE 531, or GEOL 611. Cross-listed with CE 768 and CHE 768.

BAE 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.

BAE 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 and PHYS 113 or 213.

BAE 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.

BAE 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.

BAE 840. Measurement Systems. (3) I. Theory and application of measurement systems for biological and agricultural systems with emphasis on sensors and data-acquisition systems for measurement of variables related to soils, plants, animals, machines, and processes. Two hours rec. and three hours lab a week. Pr.: BAE 640.

BAE 898. Master's Report. (Var.) I, II, S. Topics selected with approval of major professor and department head.

BAE 899. Master's Thesis. (Var.) I, II, S. Topics selected with approval of major professor and department head.

BAE 999. Dissertation Research. (Var.) I, II, S. Topics selected with approval of major professor and department head.

For more information

For additional information and application materials please contact:

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