Biosystems engineers are trained in biological, environmental, and engineering sciences and challenged to improve the sustainability of production systems, decrease or eliminate environmental hazards, and preserve natural resources.

solve problems that CHANGE THE WORLD

www.uky.edu/bae/
American Society of Agricultural & Biological Engineers
B.A.E. Student Branch is a chapter of the ASABE which holds biweekly meetings that focus on a variety of topics such as areas of specialization, career opportunities, and social events. Students have the opportunity to visit other schools as part of the Southern and Midwest Regional Rallies. An annual lawnmower clinic serves as the group’s fundraiser and allows students to get hands-on experience in the Agricultural Machinery Research Lab.

Wildcat Pulling Quarter Scale Tractor Team
The Quarter Scale Tractor Team provides a 360° engineering experience: The team is responsible for design, manufacturing and testing of its tractor. Each year the team travels to Peoria, Ill., for a week-long ASABE-sponsored competition, during which a panel of industry experts evaluate design and performance. UK’s team has placed in the top 3 since 2012, including three national championship wins in 2012, 2014 and 2015.

Alpha Epsilon Honor Society
Alpha Epsilon is an honor society for outstanding agricultural, biological and food engineers. The objectives of the honor society are to promote the high ideals of the engineering profession, to give recognition to those who manifest worthy qualities of character, scholarship and professional attainment, and to encourage and support the profession. Graduate students in the UK chapter sponsor a peer mentoring program for undergraduate students.
# Bachelor of Science in Biosystems Engineering

## Common First Year

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Second Semester</th>
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<tbody>
<tr>
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<td>MA 213 Calculus III</td>
<td>4 ME 220 Thermodynamics</td>
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<td>3 PHY 232 General Univ Physics II</td>
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**Semester Hours:** 18

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**Semester Hours:** 18

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<td>CE 341 Fluid Dynamics</td>
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<tr>
<td>EE 305 Electrical Circuits</td>
<td>3 BAE 305 DC Circuits and Microelectronics</td>
</tr>
<tr>
<td>EM 313 Dynamics</td>
<td>3 EM 302 Strength of Materials</td>
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<tr>
<td>Bio 152 Principles of Biology II</td>
<td>3 Bio Sci Elective</td>
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<td>WRD 204 Technical Writing</td>
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<tr>
<td>BAE 400 Senior Seminar</td>
<td>1 BAE 403 Biosystems Engr. Design II</td>
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<td>BAE 402 Biosystems Engr. Design I</td>
<td>2 ME 340 Introduction to Mechanical Systems</td>
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<tr>
<td>Core or Tech Elective</td>
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**Semester Hours:** 18

This is only to be used as an illustrative schedule.

Advisor should be seen every semester.

Some classes are not available every semester.

C - Core course (9 credits)

TE - Technical Electives (12 credits)

BE - Biological Science Elective (3 credits)

Total 132
Discover... Biosystems Engineering

Biosystems Engineers ensure growing population has the necessities for life
- Safe and abundant food and water
- Timber and fiber for shelter and clothing
- Plentiful and renewable energy resources
- A healthy environment in which to live

Finding Solutions for Life on a Small Planet
40% projected increase in world population by 2030 will add 2 billion people to the planet
Growing world population requires more food, water, energy, goods
Limited resources demand we do more with less, without degrading our natural world

Why Choose Biosystems Engineering?
Can’t decide whether to study math, physical sciences, or biological sciences? Biosystems Engineering allows you to combine them all!
Unique curriculum offers valuable experience in other engineering disciplines and prepares graduates for multi-disciplinary teams common in today’s workforce.
Make a lasting mark on the world around you!

Biosystems Engineers—what do they do?
- Devise practical, efficient solutions for producing, storing, transporting, processing, and packaging biological products
- Develop solutions for responsible, alternative uses of agricultural products, byproducts and wastes and of our natural resources - soil, water, air, and energy
- Solve problems related to systems, processes, and machines that interact with humans, plants, animals, microorganisms, and biological materials

Bioenvironmental
Improving conservation by understanding the complex mechanics of soil and water
- Wetlands protection
- Stream restoration
- Water control structures: dams, reservoirs, floodways
- Drainage
- Erosion control
- Pesticide and nutrient runoff
- Water treatment systems
- Irrigation

Food and Bioprocess Engineering
Using microbiological processes to develop useful products, treat municipal, industrial, and agricultural wastes, and improve food safety
- Packaging, storage, transportation of perishable products
- Pasteurization, sterilization, irradiation techniques
- Food processing technologies
- Fuels and chemicals from biomass
- Fermentation
- Nutraceuticals, pharmaceuticals
- Biodegradable packaging materials

Machine Systems Automation
Improving efficiency and conservation in agricultural, food, and biological systems
- Agricultural tractors, combines, implements, and transportation equipment
- Turf and landscape equipment
- Equipment for special crops
- Global positioning systems
- Machine instrumentation and controls
- Data acquisition and "Bioinformatics"—biorobotics, machine vision, sensors, spectroscopy

Controlled Environment Systems Engineering
Engineering a healthy environment for living things
- Animal and plant housing
- Grain storage
- Waste storage, recovery, re-use, transport
- Climate, ventilation, disease/pest control systems
- Energy efficiency and green buildings

Pre-Biomedical Engineering
Applying engineering practice to problems and opportunities related to medicine and human health
- Bioinstrumentation
- Biomechanics
- Biomaterials
- Systems Physiology
- Clinical Engineering
- Bioinformatics
- Rehabilitation Engineering
- Medical implants

For more information visit: [http://www.uky.edu/bae](http://www.uky.edu/bae) or email Alicia Modenbach at alicia.Modenbach@uky.edu
BIOSYSTEMS ENGINEERING

BIOENVIRONMENTAL
Prepares engineers to work in natural resource conservation and environmental quality enhancement. Engineers in this area study: surface water hydrology, groundwater hydrology, sediment transport, water quality, chemical rate and transport, waste management, reclamation of disturbed lands, site remediation, irrigation, and drainage.

MACHINE SYSTEMS
Prepares engineers to conceive and design power units, tillage, planting, and harvesting systems, materials handling equipment, and processing equipment. Production and processing of biological products relies heavily on the use of automated machinery. Engineers in this area work with fundamental concepts including: system dynamics, kinetics, automated controls, machine design, kinematics, fluid power, soil dynamics, plant-machine interactions, and digital electronics.

PRE-BIOMEDICAL
Allows students to complete an undergraduate degree in Biosystems Engineering that has been approved by the Center for Biomedical Engineering (CBME) at the University of Kentucky, which only offers graduate-level degrees. Undergraduates who have completed this option and are in good academic standing are encouraged by the CBME to apply for the Biomedical Engineering graduate program at UK.

FOOD & BIOPROCESSING
Involves the development of equipment and methods for efficient and ecologically sound manufacturing of food products (from the farm to the grocery) and biological commodities (such as proteins, enzymes, biofuels). Engineers in this area receive extensive training in: microbiology, biochemical engineering, heat and mass transfer, enzyme kinetics and fermentation, storage of biological products, and materials handling.

CONTROLLED ENVIRONMENT
Involves the development and design of heating, cooling and ventilation systems for the control of indoor environments. Environmental control is an essential component of total confinement animal housing, greenhouse production, aquaculture, and human housing. Engineers in this area study: heat and mass transfer, physics of plant and animal environments, air quality, biometeorology, structural design, and heating, ventilation and air-conditioning design.

PRE-MED/PRE-VET
Brings a problem-solving approach to a pre-med pathway or an approved pre-vet curriculum in which the student may obtain a Biosystems Engineering degree and simultaneously fulfill the requirements for admission to medical or veterinary school.

www.uky.edu/bae/
Many problems can be approached from multiple angles, and the same can be said for selecting a major that best fits you. Knowing where your interests lie can help you make that decision. Biosystems engineers tackle many of the same problems that engineers from other disciplines take on, but we also think about the impact on or to the surrounding living systems (i.e. stream restoration on ecosystems, agricultural equipment with crops and soil, medical devices on people), or take advantage of processes that other living systems do naturally (i.e. conversion of sugars to alcohol by microorganisms). The following figure is meant to illustrate how the various specialization areas within the Biosystems Engineering program overlap with other engineering disciplines.

**This list is not intended to be all-inclusive.**
BIOSYSTEMS ENGINEERING

MACHINE SYSTEMS

CAREER AREAS
- Design Engineer
- Test Engineer
- Quality Engineer
- Mechanical Engineer
- Product Engineer
- Sales Engineer
- Manufacturing
- Machinery

EXAMPLES OF EMPLOYERS
- Off-Road
- Construction
- Agriculture
- Hydraulics
- Analytical
- Heavy Equipment
- Automation

Faculty Contact: Michael Sama · 119 C.E. Barnhart Building · 859.218.4325 · michael.sama@uky.edu

BIOENVIRONMENTAL

CAREER AREAS
- Water Resources
  - Environmental Engineering
  - Civil Engineering
  - Stream Restoration
  - Low-Impact Development
  - Ecosystem Design
  - Stormwater Management
- Hydrology
- Sustainability
- Conservation
- Irrigation
- Wetlands Protection
- Waste Water
- Mine Reclamation

EXAMPLES OF EMPLOYERS
- Strand Associates
- Palmer Engineering
- Stantec
- US Army Corps of Engineers
- Third Rock

Faculty Contact: Carmen Agouridis · 207 C.E. Barnhart Building · 859.218.4344 · carmen.agouridis@uky.edu

PRE-BIOMEDICAL

CAREER AREAS
- Biology
- Prosthetics
- Medical Devices
- Pharmaceutical
- Artificial Joints
- Medical Implants
- Polymer Science
- Biomaterials
- Drug Delivery
- Neuroscience
- Nanotechnology
- Mechanobiology
- Biomimetics
- Biometrics

EXAMPLES OF EMPLOYERS
- Smith & Nephew
- Integra Life Sciences
- U.S. Air Force
- Hanger

Faculty Contact: Czarena Crofcheck · 213 C.E. Barnhart Building · 859.218.4349 · crofcheck@uky.edu

www.uky.edu/bae/
BIOSYSTEMS ENGINEERING

FOOD & BIOPROCESSING

CAREER AREAS
- Food Engineer
- Process Engineer
- Biology
- Microbiology
- Enzymes
- Agriculture
- Organic
- Packing Engineer
- Raw Materials

EXAMPLES OF EMPLOYERS
- USDA
- HASKELL
- Altech
- Yum!
- Piedmont Biofuels
- Chiquita

Faculty Contact: Czarena Crofcheck · 213 C.E. Barnhart Building · 859.218.4349 · crofcheck@uky.edu

CONTROLLED ENVIRONMENT

CAREER AREAS
- Mass & Energy Balance
- Air Quality
- Water Quality
- HVAC
- Livestock
- Beam Stress Analysis

EXAMPLES OF EMPLOYERS
- Duke Energy
- alpha Energy Solutions
- TRANE
- Kentucky Division for Air Quality

Faculty Contact: Donald Colliver · 211 C.E. Barnhart Building · 859.218.4348 · dcolliver@uky.edu

PRE-MED/ PRE-VET

CAREER AREAS
- Anesthesiology
- Cardiology
- Cardiothoracic Surgery
- Emergency Medicine
- General Practice
- Internal Medicine
- Neurosurgery
- Pediatrics

Professional Programs
- Public Health
- Oncology
- Sports Medicine
- Animal Welfare
- Large or Small Animal
- Equine
- Laboratory Animal Medicine

Faculty Contact: Czarena Crofcheck · 213 C.E. Barnhart Building · 859.218.4349 · crofcheck@uky.edu

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