

Contact: Diana Gonzalez

REQUEST FOR A NEW PROGRAM AT IOWA STATE UNIVERSITY
BACHELOR OF SCIENCE PROGRAM IN BIOLOGICAL SYSTEMS ENGINEERING

Action Requested: Consider approval of the request by Iowa State University to establish a new Bachelor of Science Program in Biological Systems Engineering which will be administered by the Department of Agricultural and Biosystems Engineering in the College of Engineering.

Executive Summary: The proposed program is an engineering discipline that integrates life sciences with engineering to solve problems related to, or using, biological systems. Biological systems may include microbes, plants, animals, humans, or ecosystems. This proposal was reviewed by the Board Office and the Council of Provosts and is recommended for approval. No concerns were raised when it was presented to the Iowa Coordinating Council for Post-High School Education. The proposed program addresses the Board of Regents Strategic Plan priority (1.0) to “ensure high-quality educational opportunities for students.”

Background:

- ◇ **Description of program.** Biological systems engineering analysis may include characterization, measurement, and modeling of biological processes and interactions between living systems and their environment. Biological systems engineering design may include developing processes and systems that monitor, simulate, replace, modify, control, optimize, or utilize the mechanisms of living organisms and their products. The proposed program will have four options.
 - Biorenewable resources engineering option will focus on understanding the economics, environmental impacts, and sustainability of biorenewable resource production systems, biomass-derived fuels, and processing of biomass for energy or chemicals.
 - Bioenvironmental engineering option will focus on the biology and engineering principles relevant to soil, water, and air quality.
 - Food engineering option will focus on the science and engineering needed to design and operate modern food processing systems.
 - Pre-professional and pre-graduate option will focus on students who are expecting to enter a professional track other than engineering.

- ◇ **Educational objectives.** Graduates of the program will be able to:
 - Perform engineering design in a biological context, which includes thinking creatively, formulating problem statements, applying fundamental mathematical, scientific, and engineering principles, communicating effectively, synthesizing information, and evaluating and implementing solutions.
 - Demonstrate an awareness and accommodation of such issues as ethics, safety, cultural diversity, globalization, environmental impact, and social and economic impact.
 - Demonstrate the ability to lead and/or collaborate with diverse groups of people and to manage multiple projects simultaneously.

- ◇ Relationship to existing programs at ISU. The proposed program builds on two options currently offered at ISU under the Agricultural Engineering program – food and biological engineering option and environmental portion of the agricultural and environmental systems option. The proposed program includes more bioscience-related courses and integrates more biology into the associated engineering courses. The Biorenewable Resources Engineering option exposes students to bioprocessing and downstream processes needed to work with graduates from the Chemical Engineering program.
- ◇ Duplication. The proposed program does not exist elsewhere in the state of Iowa. The University of Iowa has a biomedical engineering program which “educates engineering students who will promote human health by solving problems dealing with living systems.” There is minimal overlap between this program and the proposed program because the proposed program focuses on the non-medical areas of natural resource production, protection, and processing, rather than on human health and medicine. There is some overlap in the core engineering content of the proposed program and the engineering program offered at Dordt College, but there is minimal overlap in the programmatic emphasis.
- ◇ Student demand. Institutions with a biological engineering program have experienced strong student demand. During the past four years, students in the agricultural engineering program/food and biological engineering option at ISU have expressed interest in a biological systems engineering program that would offer more of a biological focus than was possible in the option alone.
- ◇ Unique features. There are a number of features that make ISU an appropriate place to initiate the proposed program:
 - The strength of the agricultural and biosystems engineering department at ISU.
 - The institutional emphasis on the bioeconomy initiative at ISU.
 - The leadership roles played by Agricultural and Biosystems Engineering faculty in the bioeconomy initiative.
 - The unique position of the agricultural and biosystems engineering department at ISU, bridging the College of Engineering and the College of Agriculture and Life Sciences.
 - The highly collaborative environment at ISU.
- ◇ Resources. Most faculty, facilities, and equipment for the proposed program will be those already supporting other programs in the Agricultural and Biosystems Engineering Department and other departments in the College of Engineering. However, the growth of the department underscores the need to complete the new agricultural and biosystems engineering building to provide improved teaching facilities for the proposed program.
- ◇ Cost. The University projects that the cost for the proposed program will be \$76,000 in Year 1, increasing to \$531,000 by Year 7. The sources of funds for the proposed program include department and college reallocations, University funds, and grants. The new budget model will distribute tuition funds according to the site at which the teaching activities occur.

- ◇ Need/Demand. The National Science Foundation stated¹ that “the global competitiveness of the U.S. science and engineering workforce and domestic competitiveness of science and engineering careers will depend ultimately on how schools, colleges, universities, and other education providers develop and refine human resources.” The proposed program will provide unique educational experiences that prepare students to address issues of significant societal importance, including environmental quality, food production, and biorenewable resources production and processing.
- ◇ Projected enrollment. The projected enrollment is 15 students in Year 1, increasing to 120 students by Year 7. The department also anticipates non-majors enrolling in specific courses of the proposed program. Students from Iowa and surrounding states with a strong interest in engineering and biology related to natural resources production, protection, and processing are likely to be attracted to the proposed program.
- ◇ Articulation agreements. ISU anticipates developing articulation agreements with Iowa community colleges, such as Iowa Central Community College and Indian Hills Community College.
- ◇ Link to institutional strategic plan. The proposed program addresses ISU’s mission “to create, share, and apply knowledge to make Iowa and the world a better place.” It also addresses ISU’s Strategic Plan priority “to strengthen undergraduate, graduate, and professional education to enhance student success at the university and beyond.”

¹ 2003 National Science Board Report.