

# BIOSYSTEMS ENGINEERING

111 Agricultural Hall, Oklahoma State University, Stillwater, OK 74078 405.744.5431

## Biosystems Engineering Assessment Plan

The Biosystems Engineering Assessment Plan is designed to facilitate continuous quality improvement in the Department's degree programs, and to meet the outcome assessment requirements of the Oklahoma State Regents for Higher Education and ABET. The Biosystems Engineering undergraduate program is accredited by ABET, the Accreditation Board for Engineering and Technology.

The following outline describes the Biosystems Engineering Assessment Plan:

1. **Name of the Academic Program**

Biosystems and Agricultural Engineering

2. **Degree programs that are assessed in this plan**

Bachelor of Science in Biosystems Engineering

Master of Science in Biosystems Engineering

Doctor of Philosophy in Biosystems Engineering

3. **Educational objective of the degree program**

For the Bachelor of Science Degree Program:

Provide the comprehensive education necessary to prepare students for successful, productive, and rewarding careers in engineering for agricultural, food, and biological systems. We expect that graduates of our program will:

Be able to apply the mathematical, physical, engineering, and biological principles needed to understand, analyze, and effect solutions to problems in food, agricultural, environmental, and biological systems.

Be effective in oral, written, and visual communication.

Be self-motivated in accomplishing tasks, both as an individual, and as a contributor to multi-disciplinary teams.

Be able to understand the social, environmental, safety, and economic impacts of their work in local and global contexts, and to perform in a professional and ethical manner.

Be committed to enhancing knowledge and skills through continuing education.

For the Master of Science Degree Program:

Provide students, who have a Bachelor of Science in Biosystems Engineering, or equivalent, with education and experience in conducting in-depth analysis of engineering problems and in conducting and reporting supervised scientific research.

For the Doctor of Philosophy Degree Program:

Provide students, who have a Master of Science in Biosystems Engineering, or equivalent, with education and experience in identifying, planning, conducting, and reporting relevant and beneficial scientific research.

4. **Expected student outcomes for the degree program**

We expect that students graduating from our program with a Bachelor of Science degree in Biosystems Engineering will have:

a) An ability to apply knowledge of mathematics, science, and engineering.

- b) An ability to design and conduct experiments, as well as to analyze and interpret data.
- c) An ability to design a system, component, or process to meet desired needs.  
This includes the ability to synthesize system specifications, make decisions based on partial knowledge, account for uncertainty and risk in design, apply engineering principles to accomplish an outcome, develop recommendations for decision makers based on engineering principles, and promulgate standards, regulations, and engineering practices.
- d) An ability to function on multi-disciplinary teams.
- e) An ability to identify, formulate, and solve engineering problems.
- f) An understanding of professional and ethical responsibility.  
This includes an understanding of the issues of safety, law, and reliability.
- g) An ability to communicate effectively.  
This includes oral, written, and graphical communications.
- h) The broad education necessary to understand the impact of engineering solutions in a global and societal context.  
This includes an understanding of the economic impacts, both internal and external, of the implementation of engineering solutions.
- i) A recognition of the need for, and an ability to engage in life-long learning.
- j) A knowledge of contemporary issues.  
Students must have the body of knowledge related to societal issues in order to demonstrate the broad education necessary to understand the impact of engineering solutions in a global and societal context and an understanding of professional and ethical responsibility.
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- l) A knowledge of appropriate agricultural and/or biological sciences, and/or natural resource topics.  
This applies to both engineering sciences and contemporary issues.

For the Master of Science Degree Program:

In addition to those outcomes given above, we expect students graduating from our program with a Master of Science degree in Biosystems Engineering to demonstrate, under the supervision of an advisor, an ability to conduct, evaluate, and report scientific research.

For the Doctor of Philosophy Degree Program:

In addition to those outcomes given above, we expect students graduating from our program with a Doctor of Philosophy degree in Biosystems Engineering to demonstrate, by supporting research or by designs, the ability to identify a problem, define alternatives, propose a solution, organize a design or an experimental investigation, carry it to completion, and report the results.

## 5. Methods used to evaluate student achievement of the expected outcomes

For the Bachelor of Science Degree Program:

**Student performance on the Fundamentals of Engineering (FE) Exam** – An assessment through written examination. This exam is taken by nearly all of the graduates of the Biosystems Engineering program. The exam assesses a student's comprehension of engineering fundamentals and assesses

outcomes described in a, e, f, and k above. The exam results are reviewed annually and used to compare performance of Biosystems Engineering students with their peers nationally and locally within the discipline and among other engineering disciplines.

**Evaluation of performance in senior design experience** – “Senior Design” is a two course series comprising a capstone experience in Biosystems Engineering. Performance in this class is particularly an indication of a student’s competency in outcome 4c above, but it also provides a measure of all of the other items in 4 above. This assessment is conducted annually as a part of the course and includes outside reviewer assessments, peer reviews, and instructor assessment.

**Exit interview** – An assessment through written questionnaire and face-to-face interview designed to measure the extent to which graduating seniors of the Biosystems Engineering program believe that they have met each of the outcomes described above in item 4. This private interview is conducted by the department head each semester for each student that is graduating from the program at that time.

**Instructor evaluation of student performance** – Faculty who teach Biosystems Engineering courses during a particular semester provide review of student performance. Assessment is provided regarding the extent that students meet outcomes defined for the course. These course outcomes have been related to the outcomes described in 4 above.

**Alumni survey (conducted by the Office of University Assessment)** – An assessment through questionnaire conducted as a telephone interview. This survey is designed to measure the extent to which alumni of the Biosystems Engineering program believe that they have met each of the outcomes described above in item 4. Presently, this interview is executed once every two years for all students who have graduated within the past three years.

**Departmental Advisory Committee program review** – Biosystems and Agricultural Engineering employs a departmental advisory committee made-up of our constituents who review departmental programs including the Biosystems Engineering academic program. This committee examines educational objectives for relevancy and reviews the assessment process. The committee considers all of the outcomes defined above in 4. The committee meets annually.

**ABET accreditation review** – An outside review team visits and assesses the program and assessment process at least once during each six-year period. This review assesses all outcomes and reviews all assessment tools for undergraduate programs.

**Informal student feedback** – A qualitative and somewhat ad hoc method of assessment. Through informal conversations and discussions with students, departmental faculty often can learn about the students’ perspectives on program strengths and weaknesses.

For the Master of Science and Doctor of Philosophy Degree Programs:

**Program self-assessment** – A program self-assessment conducted by Biosystems and Agricultural Engineering Faculty. This assessment will review the existing curriculum and the adequacy of the program to meet educational objectives. In addition, the placement of graduates and their success in the profession will be examined. This assessment will be conducted approximately every four years.

**Alumni survey (conducted by the Office of University Assessment)** – An assessment through questionnaire conducted as a telephone interview. This survey is designed to measure the extent to which graduate alumni of the Biosystems Engineering program believe that they have met the outcomes for graduate programs. Presently, this interview is executed once every two years for all students who have graduated within the past three years.

**Graduate committee and advisor assessment** - Coursework, the qualifying exam (Ph.D. only), the research thesis/dissertation, graduate student presentations, and the final exam and thesis/dissertation defense will be utilized to assess the program. Advisors and the students’ graduate committees will make this assessment as a part of the final examination process for each student.

**Review by external experts** – An assessment conducted approximately every four years by an external review panel consisting of faculty of graduate programs from other universities. This panel reviews the

curricular offerings, student plans of study, departmental policies and procedures, success of graduates, etc., and offers recommendations for program improvement.

**6. How assessment results are used in curriculum planning and program development.**

For the Bachelor of Science Degree Program:

Assessment results from the measures described in 5 above are reviewed by the Biosystems and Agricultural Engineering ABET and Undergraduate Curriculum Committee. This committee, composed of approximately 60% of the Biosystems Engineering teaching faculty, is responsible for overseeing the assessment process and assuring that it meets ABET requirements. Results of each of the assessment methods are summarized once per year and a consensus generated based on the composite results. The committee then produces a recommendation with justification for program revision that may include curriculum and other aspects of the program. That recommendation is conveyed to the faculty as a whole where the recommendation is reviewed and then implemented as appropriate. Figure 1 presents a block diagram of the process.

For the Master of Science and Doctor of Philosophy Degree Programs:

Assessment results from the measures described in 5 above for graduate programs are reviewed by the Biosystems and Agricultural Engineering Graduate Committee. This committee, composed of Biosystems Engineering faculty, is responsible for overseeing the assessment process and assuring that the process is suitable. Results of each of the assessment methods are summarized and a consensus generated based on the composite results. If applicable, the committee then produces a recommendation with justification for program revision that may include curriculum and other aspects of the program. That recommendation is conveyed to the faculty as a whole. Faculty will then have an opportunity to discuss the results and implement program changes as appropriate.

