

**CONTINUOUS IMPROVEMENT PROCESS**  
**FOR**  
**UNDERGRADUATE ENGINEERING EDUCATION**

**Continuous Improvement Process (CIP) Manual**

**Fall Semester 2004**



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**TABLE OF CONTENTS**

Criterion 1: STUDENTS ..... 3

    Overview..... 3

    Tasks ..... 3

        Student Recruitment..... 3

        Student Evaluation ..... 5

        Advising ..... 5

        Monitoring ..... 6

        Evaluating Transfer Students..... 6

    Assessment..... 7

        Student Recruitment..... 7

        Student Evaluation ..... 7

        Advising..... 7

        Monitoring ..... 7

        Transfer Students ..... 8

    Evaluation and Recommendation ..... 8

    Action..... 8

    Constituent Review ..... 8

Criterion 2: PROGRAM EDUCATIONAL OBJECTIVES ..... 9

    Overview and Definition..... 9

    Statement of Current Program Educational Objectives ..... 9

    Process for Revision of Program Educational Objectives ..... 9

    Metrics ..... 9

        Definitions, Sources, Frequency and Presentation ..... 10

    Responsibilities ..... 11

    Revision of Metrics..... 12

    Standards and Goals..... 12

    Assessment..... 13

    Evaluation and Recommendation ..... 13

    Action..... 13

    Constituent Review ..... 13

Criterion 3: PROGRAM OUTCOMES AND ASSESSMENT ..... 24

    Overview and Definition..... 24

    Statement of Current Program Outcomes ..... 24

    Process for Revision of Program Outcomes ..... 25

    Metrics ..... 26

        Definitions, Sources, Frequencies, Standards and Goals..... 25

    Responsibilities ..... 31

    Revisions to Metrics ..... 31

    Assessment..... 31

    Evaluation and Recommendation ..... 32

    Action..... 32

    Constituent Review ..... 32

Criterion 4 – PROFESSIONAL COMPONENT ..... 34

    Overview..... 34

Responsibilities .....	34
Assessment.....	34
Evaluation of Program Curriculum.....	34
Major Design Experience .....	34
General Education Curriculum .....	35
Evaluation and Recommendation .....	35
Action.....	35
Constituent Review .....	36
Criterion 5 – FACULTY.....	37
Overview and Composition .....	37
Faculty.....	37
Staff.....	37
Faculty Hiring .....	38
Professional Development and Registration.....	38
Promotion, Tenure and Merit Reviews.....	38
Criterion 6 – FACILITIES.....	39
Bricks and Mortar .....	39
Classroom and Laboratory Scheduling.....	40
Facilities Utilization.....	40
Criterion 7 – INSTITUTIONAL SUPPORT AND FINANCIAL RESOURCES.....	41
BAE Resources .....	41
College Resources.....	41
College of Engineering .....	41
College of Agriculture .....	41
Criterion 8 – PROGRAM CRITERIA.....	42

## BACKGROUND

The mission of the Department of Biosystems and Agricultural Engineering is to serve and benefit the people of Kentucky and beyond through learning, discovery, and engagement in engineering for food, agricultural and biological systems.

The Department of Biological and Agricultural Engineering (BAE) strives to be:

*Recognized and valued as a critical information source because its members:*

- Provide timely BAE information to address vital contemporary problems.
- Are responsive to all clientele groups.
- Contribute solutions to critical issues confronting society.
- Are catalysts for positive, innovative technological change.
- Contribute to the enhancement of the quality of life.
- Are the primary source of BAE discovery and expertise.

*A leader:*

- In the development and dissemination of knowledge in BAE program areas.
- In multidisciplinary/multi-institutional team approaches to problem-solving.
- In the design and implementation of undergraduate and graduate instruction.

*A role model for all BAE departments in the nation because:*

- It has achieved excellence and balance in its instructional, research, and extension programs.
- It has achieved excellence in its BAE programs.
- It has great faculty, staff and students who cooperatively work together to achieve excellence.

The University of Kentucky Department of Biosystems and Agricultural Engineering strives to recruit outstanding students and to prepare them for productive careers in the biological and agricultural engineering profession. To this end, the Department seeks to define and implement a curriculum and to ensure that continuous effort is devoted toward its improvement.

The Bachelor of Science in Biosystems and Agricultural Engineering at the University of Kentucky is offered jointly by the Colleges of Agriculture and Engineering. Administration of all undergraduate engineering degree programs resides in the College of Engineering under the Associate Dean for Administration and Academic Affairs. The Biosystems and Agricultural Engineering faculty and facilities reside in the College of Agriculture.

The Bachelor of Science in Biosystems and Agricultural Engineering offered by the University of Kentucky is the only undergraduate program accredited under criteria for 'Agricultural and Similarly Named Programs' in Kentucky. The program is accredited

by the Accreditation Board for Engineering and Technology (ABET). In 2000, ABET instituted accreditation criteria that require implementation and demonstration of continuous improvement engineering undergraduate programs.

The University of Kentucky Department of Biosystems and Agricultural Engineering has developed this manual to guide the faculty in the process of continuous improvement of our undergraduate program.

## **Criterion 1: STUDENTS**

### **Overview**

The Department of Biosystems and Agricultural Engineering strives to recruit and educate qualified students for successful careers in biological and agricultural engineering. The procedures described herein and illustrated in Figure 1.1 enable the Department to identify, recruit, evaluate, advise and monitor students in support of departmental educational objectives. Also, a process is described by which these procedures or tasks are implemented, assessed, evaluated and improved.

### **Tasks**

#### **Student Recruitment**

The Department benefits from student recruitment and development offices in both the College of Agriculture and the College of Engineering. The University sponsors 'Preview Nights' for prospective students at approximately ten locations throughout Kentucky and an additional three to four locations in Ohio and West Virginia. Both the College of Agriculture and the College of Engineering send representatives to these events in order to recruit and advise students interested in attending the University of Kentucky. Information regarding admission requirements, undergraduate programs, scholarship opportunities, etc. is presented to attendees. Faculty representatives are encouraged to attend these events and Department faculty members participate occasionally.

College of Agriculture recruitment activities are coordinated by the Director of Student Relations. The Director makes many high school visits and plans a variety of events for prospective students throughout each year. The Institute for Future Agricultural Leaders brings approximately 50 prospects to campus each June for four days of tours, contact sessions, recreation and social activities. Science and Agriculture Encounter Days are presented during the Spring and Fall semesters in which approximately 30 prospects attend campus for tours, advising sessions and workshops. The Department presents one or two workshops in which popular topics such as precision agriculture, bioprocessing, stream restoration and environmental control are presented. Over 200 prospects are invited to campus in September for a one-day Student Roundup, which involves contact sessions and departmental tours. Additional programs include an FFA Leadership Conference for over 400 students and a Winter Event co-sponsored by the College of Agriculture Alumni Association for prospects with high ACT scores in science and mathematics.

The Director of Undergraduate Studies (DUS) works with the Director of Student Relations in presenting tours and workshops as needed for these events. A departmental representative (the DUS or designee) attends these sessions to meet with prospects expressing interest in majoring in Biosystems and Agricultural Engineering. In addition, several departmental tours are given to prospective students and their families throughout the year. Career opportunities, curriculum requirements, scholarship opportunities and extramural activities programs are presented along with a tour of departmental facilities.

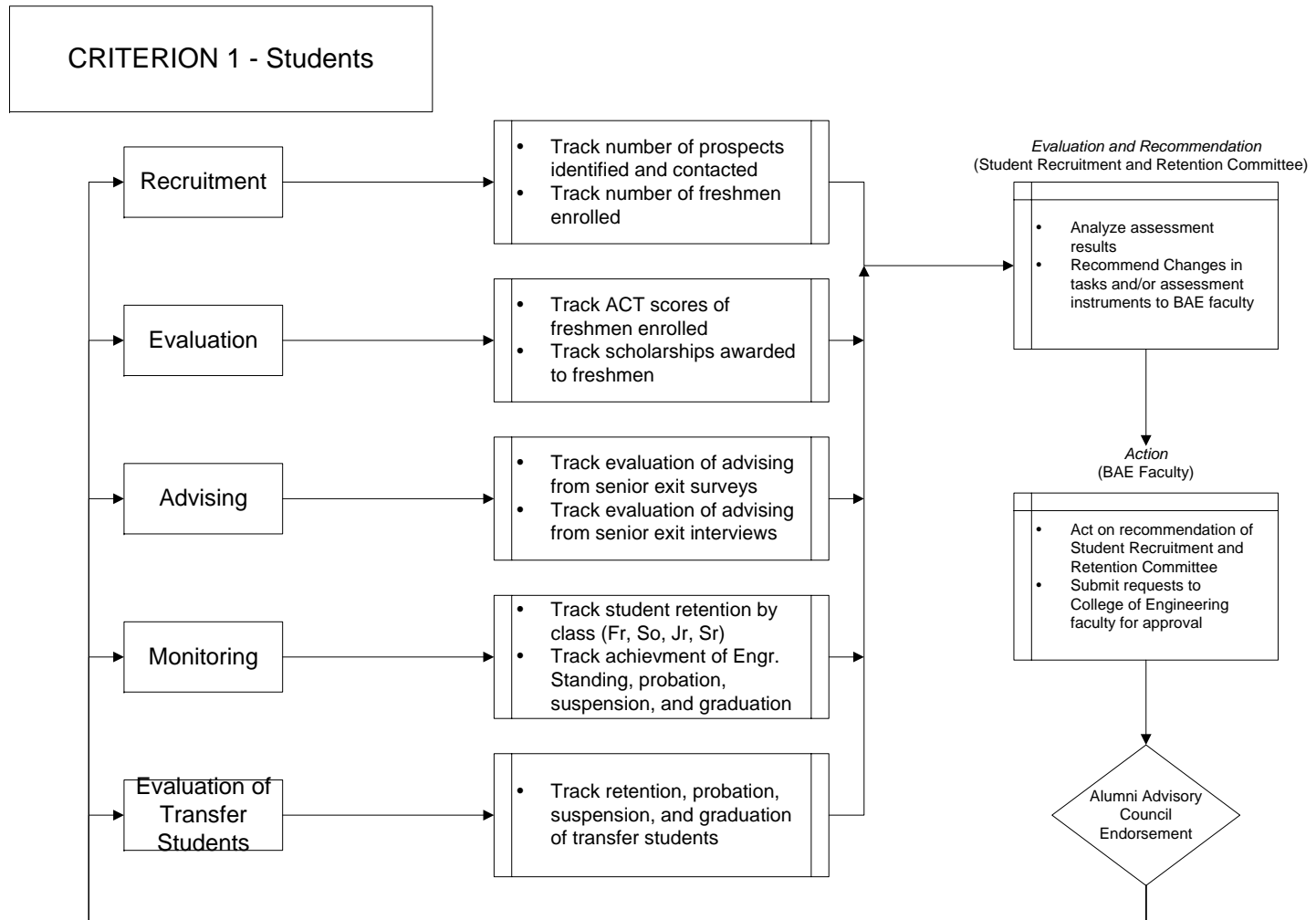


Figure 1.1. Continuous improvement process for ABET Criterion 1: Students.

College of Engineering recruitment activities are coordinated in the Student Support Services Office. College faculty and staff participate in the University 'Preview Nights' described previously. College representatives participate in state-wide community educational events such as science fairs and classroom presentations. Each year the Office coordinates national Engineering Week activities that culminate in Engineering Open House on campus. Hundreds of visitors attend this event, which occurs throughout the College of Engineering facilities. BAE students and faculty present several displays that present methods and technologies utilized in biological and agricultural engineering.

BAE students serve as Student Ambassadors in both the College of Agriculture and the College of Engineering. These students assist in recruitment activities such as tours, alumni outreach events, workshops and conferences.

Both colleges provide scholarships on a competitive basis. Applications are evaluated on the basis of high school academic achievement, ACT/SAT scores, extra-curricular activities, writing ability and financial need. BAE faculty members participate in evaluation of these applications in both colleges and of similar applications submitted to the university admissions office.

### **Student Evaluation**

The University of Kentucky utilizes a selective admission process in which applicants are evaluated on the basis of high school GPA and ACT scores. Admission classification is determined by a combination of these indicators and available seats in programs to which students apply. Successful applicants are screened for ACT scores in mathematics for admission into chemistry ( $\geq 21$ ) and calculus ( $\geq 26$ ). Students admitted to the College of Engineering consistently have the highest average ACT score of any college in the university.

The BAE Department has essentially no role in the evaluation of applicants. Once admitted to the university, freshmen are enrolled in the College of Engineering and evaluated by the Student Support Services Office for placement into mathematics and chemistry.

### **Advising**

All freshmen enrolled in the College of Engineering are advised by personnel in the Student Support Services Office. Students designating Biosystems and Agricultural Engineering as their major are placed in courses that satisfy BAE degree requirements. Specifically, BAE students are placed in introductory courses BAE 102 Introduction to Biosystems Engineering and BAE 103 Energy in Biological Systems.

After two semesters, students' academic records are transferred to the departments of their choice for further advising. At that point the DUS advises students until they select an area of curriculum concentration. An academic folder is maintained for each BAE student by the DUS. In addition, an Excel spreadsheet is maintained for each student by his/her academic advisor. Finally, newly implemented degree auditing software has been made available to advisors and students for the Fall 2004 semester whereby students can determine their status relative to satisfying curriculum requirements at any time on-line.



When a student selects an area of curriculum specialization, he or she is then assigned to an academic advisor specializing in his or her area of choice. Advisors approve technical electives and monitor student progress toward satisfying curricular requirements. Students may register for courses on-line but cannot do so unless a 'HOLD' is released by his/her advisor. Academic folders are maintained by the DUS' staff assistant as well as an Excel spreadsheet that lists all course requirements with grade received and the term in which each course was completed.

Career advising services are provided by the College of Engineering. A full time staff associate organizes an annual Career Day in which representatives of potential employers interview students. The career service specialist also assists students in preparing resumes. BAE faculty members advise students on these matters and inform them of information received concerning job openings through various professional contacts.

The College of Engineering provides administrative support to facilitate student participation in coop programs and internships. It is difficult for BAE students to participate in a conventional coop program because we are able to offer BAE courses only once per year. BAE faculty members also refer students to companies and agencies that offer summer internships.

### **Monitoring**

The University Registrar maintains student academic records electronically in the Student Information System (SIS). The DUS and staff assistant have access to SIS. The DUS or staff assistant can view or print student academic records for use in advising. We plan to utilize the new academic auditing software to improve students' awareness of their progress toward satisfying degree requirements.

The College of Engineering student records Monitor maintains an active roster of all students enrolled in the College of Engineering or on academic probation or suspension. The Monitor classifies a student as attaining Engineering Standing upon the recommendation of the department DUS. The Monitor informs the Associate Dean for Administration and Academic Affairs when student are to be placed on academic probation or suspended from the College. Finally, the Monitor verifies that each student satisfies the appropriate degree requirements for graduation. Questions arising concerning satisfying those requirements are resolved in consultation with the DUS.

Presently the BAE department maintains an Excel spreadsheet record for each student; data recorded include the grade received for each course and the term in which each course was taken. Courses selected to satisfy the University Studies Program as well as biological, technical and free electives are recorded along with grade received and term. We anticipate that the new academic auditing software may eliminate the need for maintaining separate academic worksheets in the BAE department, however, we will continue to do so until determined that it not necessary.

### **Evaluating Transfer Students**

The University Registrar evaluates transcripts and assigns transfer credits for students transferring to the University of Kentucky from other institutions. The Registrar maintains a list of equivalency between courses offered at other institutions in Kentucky

and courses offered at the University of Kentucky. Credit is given for such courses taken at other institutions and noted on the students' academic record.

The College of Engineering Office of Student Support Services refers academic records of transfer students to the appropriate Directors of Undergraduate Studies. The BAE DUS evaluates the transcripts to identify courses that satisfy program requirements that are not designated by the Registrar. Such determination may require that the student provide a course syllabus or a web address.

The BAE DUS or his or her designee advises incoming transfer students of BAE curriculum requirements and the opportunity to select an area of specialization. Such students are advised by the DUS until they select an area of specialization, then they are advised by faculty member specializing in the selected area of interest.

## **Assessment**

### **Student Recruitment**

The BAE department maintains a record of contacts with prospective students each academic year as identified from among the various recruiting activities. The BAE Student Recruitment and Retention Committee should track recruitment data and use these data to assess recruitment strategies and success. Similarly, the number of freshmen and transfer student enrolling in the BAE program is recorded each August. The target number of incoming freshmen is 25.

### **Student Evaluation**

ACT scores of students selecting the BAE program are recorded and tracked. The target middle interquartile range of ACT composite scores is 25-30. Also, academic scholarships awarded to incoming BAE students are compiled and tracked. As an indicator of student capability and determination, we seek a target of 50% of incoming BAE freshmen receiving scholarships from either College of Engineering or College of Agriculture.

### **Advising**

Ratings of academic advising from a College of Engineering Senior Survey of BAE seniors are recorded and tracked. A target average rating of 3.5/4 is sought for BAE faculty advisors.

Comments and suggestions regarding from BAE senior exit interviews are recorded and tracked. These interviews are used by the Chair in assessing faculty teaching, programmatic issues, and to provide an opportunity for each graduating student to give a personal and confidential opinion regarding his or her experiences at UK BAE. Results may be used to adjust course content, instructors and to provide feedback to the faculty regarding BAE and Engineering College issues.

### **Monitoring**

Retention of BAE students by classification is recorded and tracked. Instances of BAE students being placed on academic probation or being suspended are also tracked. Finally, the time required for each BAE student to satisfy program requirements is

recorded and tracked. The target retention of BAE freshmen (i.e. those returning for their sophomore year) is 70%.

### **Transfer Students**

Retention, probation, suspension and graduation of students transferring to the BAE program is tracked. The target retention and graduation of transfer students is 80%.

### **Evaluation and Recommendation**

The BAE Student Recruitment and Retention Committee compiles and analyzes assessment results listed above each August. Metric goals are established by benchmarking available indices from other UK College of Engineering programs, and similar BAE programs in the U.S. Trends in the various indices are analyzed to determine adequacy of the tasks designated to establishing a stable student enrollment and successful progression of students toward program completion.

The Committee recommends continuation or changes in the various tasks and/or the assessment methods to the faculty at a meeting held each September.

### **Action**

Each October, the BAE faculty considers recommendations of the Student Recruitment and Retention Committee relative to task definition and assessment pertaining to ABET Criterion 1: Students. Proposed changes are approved or disapproved. Further actions regarding approved changes that require action or approval outside the Department are initiated in a timely fashion.

### **Constituent Review**

Tasks and assessment methods associated with ABET Criterion 1 (Students) are presented to the BAE Alumni Advisory Council each year at a meeting scheduled during the Fall semester. Council recommendations are immediately addressed and implemented as determined by the faculty.

## **Criterion 2: PROGRAM EDUCATIONAL OBJECTIVES**

### **Overview and Definition**

The CRITERIA FOR ACCREDITING ENGINEERING PROGRAMS: 2003-2004 clearly defines the difference between educational *objectives* and educational *outcomes*. The objectives should address achievements of graduates during the *first several years following graduation from the program*. This provided key guidance for clearly separating *outcomes* from *objectives*, a terminology that can be confusing. With these considerations in mind, our educational objectives are as follows:

### **Statement of Current Program Educational Objectives**

1. Educate engineers to design components and/or processes for advancement of agricultural, biological, or environmental systems.
2. Prepare engineers for successful careers in industry, government, consulting firms, or academia. Successful careers begin with employment in their chosen field or admission to graduate and professional programs, continue with steady advancement, and include professional development.

### **Process for Revision of Program Educational Objectives**

Figure 2.1 provides an overview of the Continuous Improvement Process utilized for program assessment. The two feedback loops are used for Objective Assessment (lower left-hand loop) and Outcomes Assessment (upper right-hand loop). This graphic was designed by faculty during the CIP workshop in summer 2003.

Program Educational Objectives may be revised by a majority vote of full-time, tenure-track faculty of the Biosystems and Agricultural Engineering Department (BAE Faculty) at any meeting where a quorum of faculty are present. Revisions may be proposed on the basis of an internal assessment, an external evaluation or other circumstance(s).

### **Metrics**

BAE Faculty have established a set of eight basic metrics, each of which is associated with a single Program Educational Objective, that will be used to determine whether the Department is achieving its Program Educational Objectives. The metrics are as follows:

Program Educational Objective 1:

- a) Number of degrees granted
- b) Engineering competence as measured by surveys of alumni
- c) Graduate performance on the Fundamentals of Engineering examination
- d) Acquisition of engineering employment in desired areas

Program Educational Objective 2:

- d) Acquisition of engineering employment in desired areas
- e) Graduate performance on the Professional Engineering examination
- f) Salaries and promotions received since graduation

- g) Key roles and leadership positions attained by graduates
- h) Memberships in professional organizations
- i) Advanced degrees earned

### **Definitions, Sources, Frequency and Presentation**

- a) Number of degrees granted. Source: Office of Institutional Research, Planning and Effectiveness database at <http://www.uky.edu/IR/student.html> Frequency of Collection: annually, first quarter. Note, data tabulated by “degree year” which is summer, fall and subsequent spring semesters for the year in which the spring semester occurs.
- b) Engineering competence as measured by surveys of alumni. Source: Alumni Survey. Frequency of collection: annually. Population: alumni in the BAE database.
- c) Fundamentals of Engineering examination performance. Source: College of Engineering Dean’s Office. Frequency of collection: semi-annual, June and December. Presentation: As per Fig. 1. Population: Current calendar-year BSBAE graduates and seniors sitting for exam.
- d) Acquisition of engineering employment in desired areas. Source: Exit interviews with Department Chair, Alumni Survey. Presentation: As per Figs. 2 and 3. Population: Current calendar-year BSBAE graduates.
- e) Graduate performance on the Professional Engineering examination. Source: Alumni Survey. Frequency of collection: annually. Presentation: As per Fig. 5. Population: Alumni survey respondents with BSBAE from the University of Kentucky.
- f) Salaries and promotions since graduation. Source: Exit interviews with Department Chair, Alumni Survey. Presentation: As per Figs. 7 and 8. Population: Current calendar-year BSBAE graduates, alumni survey respondents with BSBAE from the University of Kentucky.
- g) Key roles and leadership positions attained by graduates. Source: Alumni Survey. Presentation: As per Fig. 6. Population: Alumni survey respondents with BSBAE from the University of Kentucky.
- h) Memberships in professional organizations. Source: Alumni Survey. Frequency of collection: annually. Presentation: As per Fig. 9. Population: Alumni survey respondents with BSBAE from the University of Kentucky.
- i) Advanced degrees earned. Source: Alumni Survey. Frequency of collection: biennially. Presentation: As per Fig. 4. Population: Alumni survey respondents with BSBAE from the University of Kentucky.

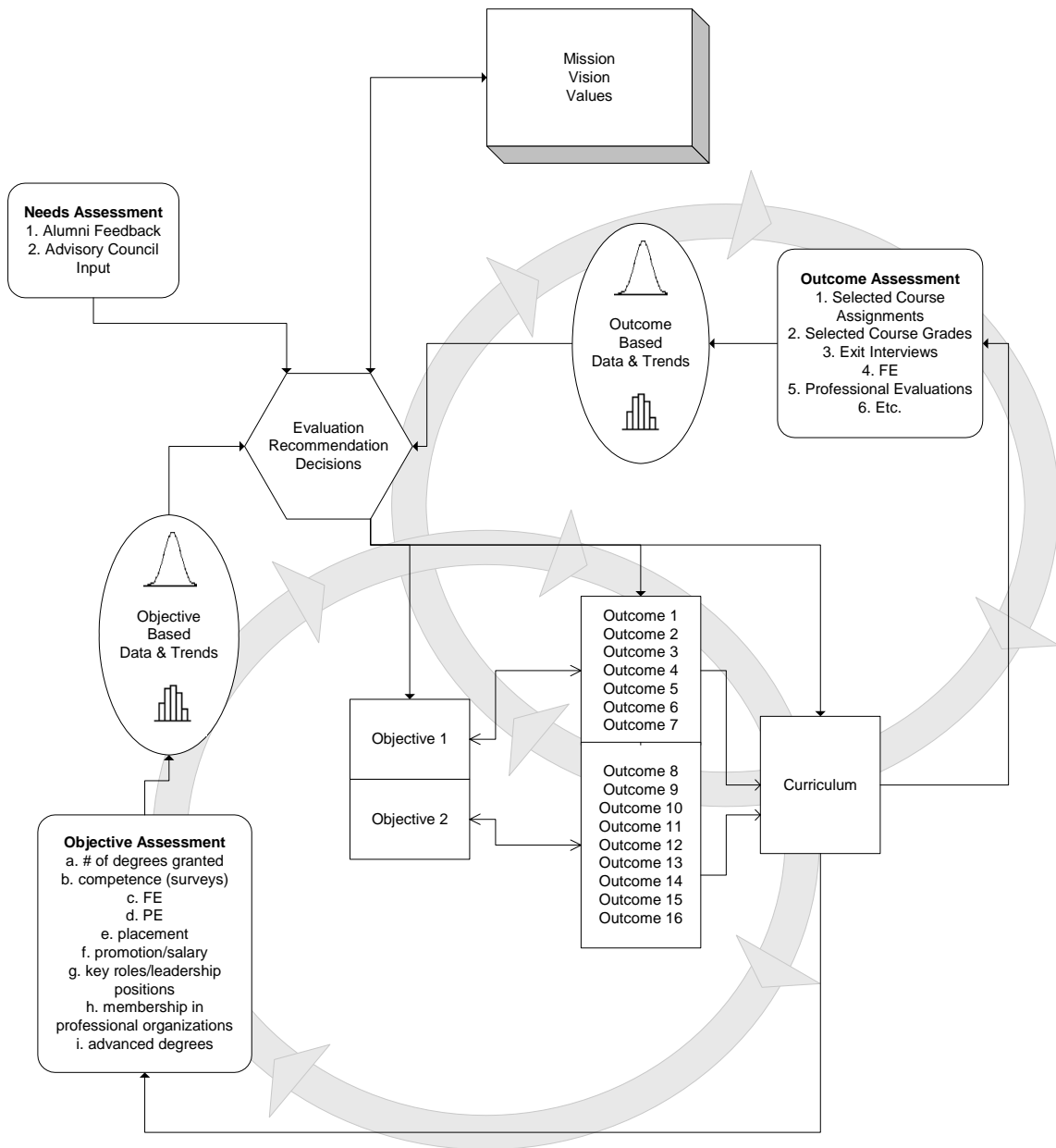


Figure 2.1: Continuous Improvement Process Model for the BAE Program

## **Responsibilities**

The DUS, with support from the Administrative Assistant to the DUS, has responsibility for collecting, analyzing, archiving and presenting all data used to assess achievement of Program Educational Objectives.

## **Revision of Metrics**

Metrics may be revised by a majority vote of full-time, tenure-track faculty of the Biosystems and Agricultural Engineering Department (BAE Faculty) at any meeting where a quorum of faculty are present.

## **Standards and Goals**

Standards and/or goals may be revised by a majority vote of full-time, tenure-track faculty of the Biosystems and Agricultural Engineering Department (BAE Faculty) at any meeting where a quorum of faculty are present.

Current standards and goals associated with each metric are as described below, as applicable.

- a) Number of degrees granted.  
Goal: 15/calendar year  
Standard: 12/calendar year as per Council on Post-Secondary Education.
- b) Engineering Competence  
Goal: re-examine whether this is measurable with our survey.
- c) Fundamentals of Engineering examination performance.  
Goal: 100% of eligible students sit for and pass the exam.  
Standard: 50% of eligible students sit for and pass the exam.
- d) Acquisition of engineering employment in desired areas  
Goal: 100% of BSBAE graduates are employed in an engineering field within six months of graduation.  
Standard: 75% of all BSBAE graduates are employed within six months of graduation, 50% of all BSBAE graduates are employed in an engineering field within six months of graduation.
- e) Graduate performance on the Professional Engineering examination  
Goal: 75% of BSBAE graduates achieve PE status.  
Standard: 50% of BSBAE graduates achieve PE status.
- f) Salaries and promotions received since graduation  
Goal: Median starting salary for BSBAE graduates is 110% of National average for the discipline.  
Standard: Median starting salary for BSBAE graduates is 85% of National average for the discipline.
- g) Key roles and leadership positions attained by graduates  
Goal: 50% of all BSBAE graduates are in supervisory positions within 10 years of graduation.  
Standard: 25% of all BSBAE graduates are in supervisory positions within 10 years of graduation.
- h) Memberships in professional organizations

Goal: 75% of all active BSBAE graduates are members of a professional engineering society.

Standard: 50% of all active BSBAE graduates are members of a professional engineering society.

i) Advanced degrees earned

Goal: 20% of BSBAE graduates achieve an advanced degree.

Standard: 5% of BSBAE graduates achieve an advanced degree.

### **Assessment**

The DUS will provide to the BAE Undergraduate Curriculum and Course Committee a summary of metrics meeting and failing goals/standards, following the spring semester of odd-numbered years.

### **Evaluation and Recommendation**

The committee will review the DUS summary of metrics, and draft recommendations for possible revision of the program objectives and/or methods of assessment (including goals and standards). The committee may, at their discretion, consider metrics not achieving goals. The committee must consider and act on metrics not meeting standards. In the event that a metric standard is not met, possible actions include:

- a. Adopt a new metric, goal and standard.
- b. Revise the standard.

### **Action**

The draft recommendations for revised program objectives and/or methods of assessment will be reviewed and voted upon by the faculty.

### **Constituent Review**

Faculty recommendations will be made at least two weeks prior to the annual meeting of the Department's Advisory Board. The Chair will provide this information to the Department's Alumni Advisory Council. The Chair will also solicit and record comments and guidance from the Alumni Advisory Council. The Chair will circulate a summary of the Council's comments and guidance no later than two weeks following their meeting, and convene a faculty meeting within six weeks after their meeting, for final adoption of any changes.



### Fundamentals of Engineering Pass Rate (Passed/Took/Eligible)

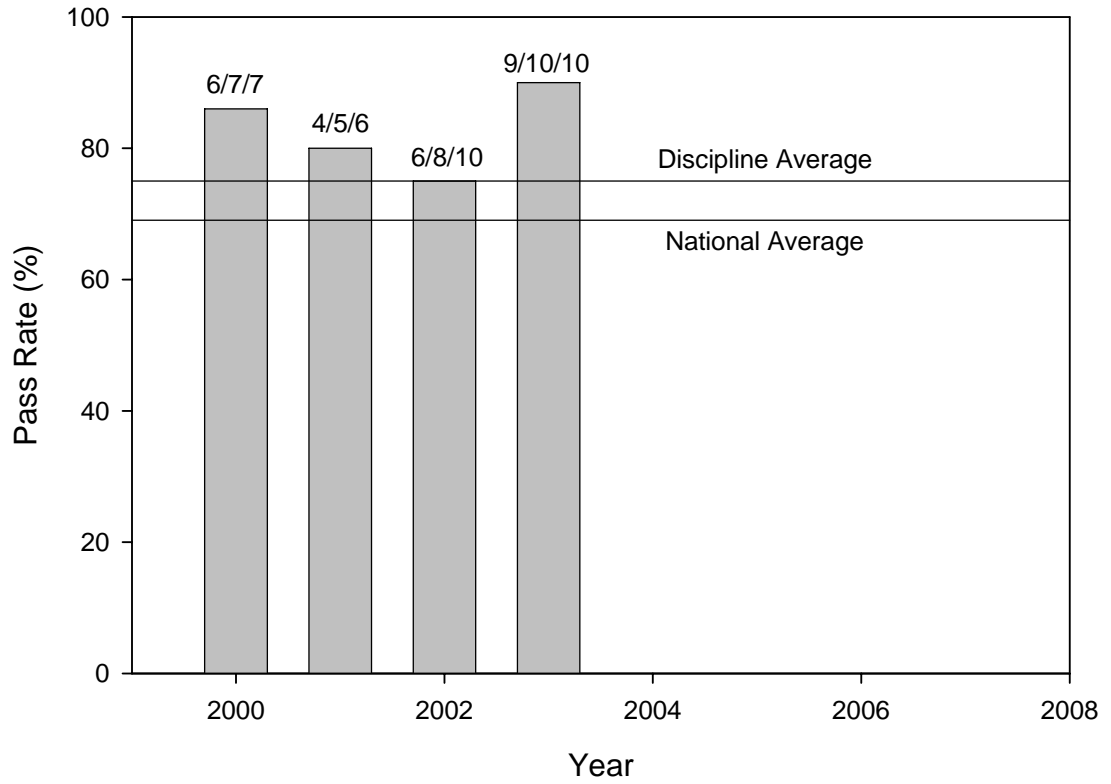


Fig. 1. Sample presentation of Fundamentals of Engineering exam performance.

## Timing of Employment

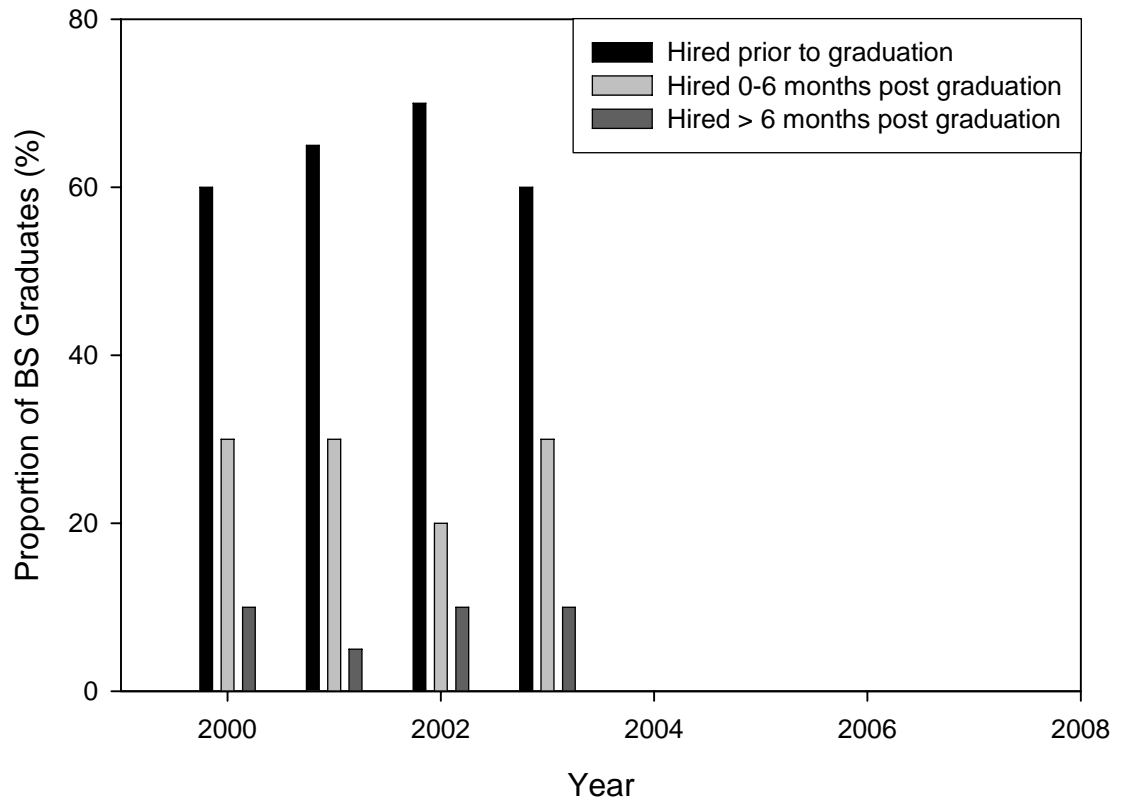


Fig. 2. Sample presentation of Timing of Employment.

## Nature of Employment

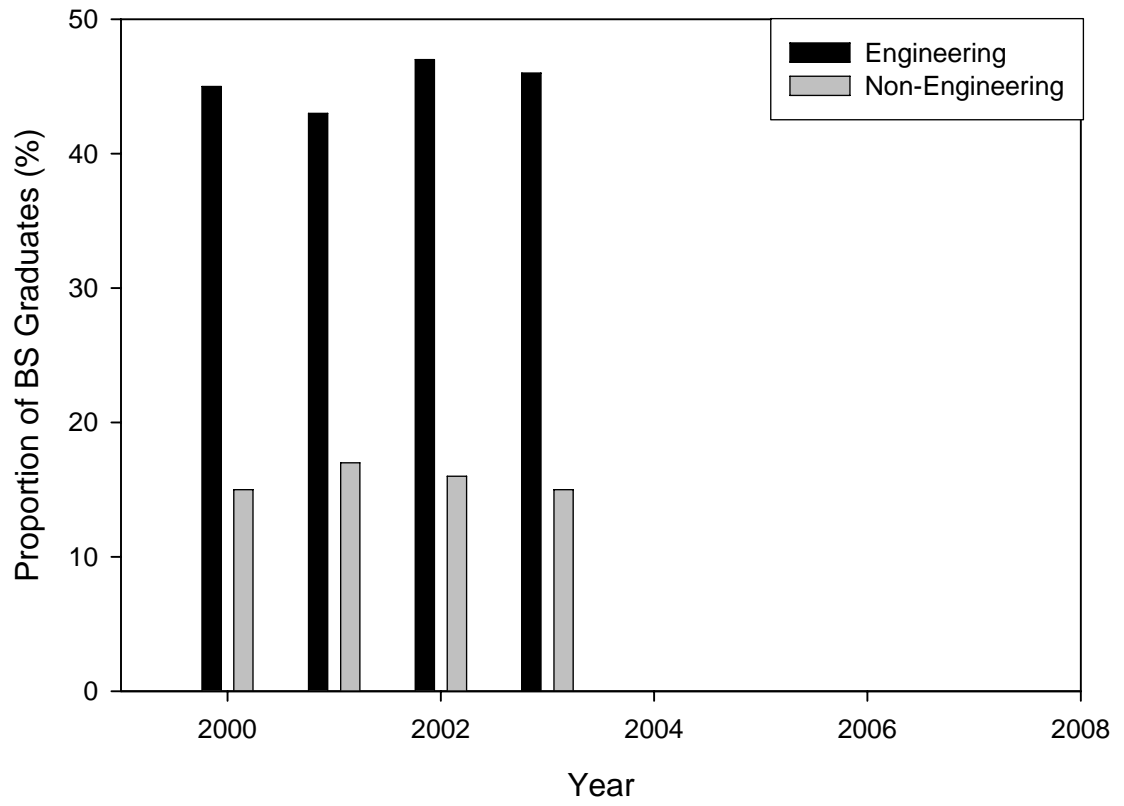


Fig. 3. Sample presentation of Field of Employment.

## Graduates with Advanced Degrees

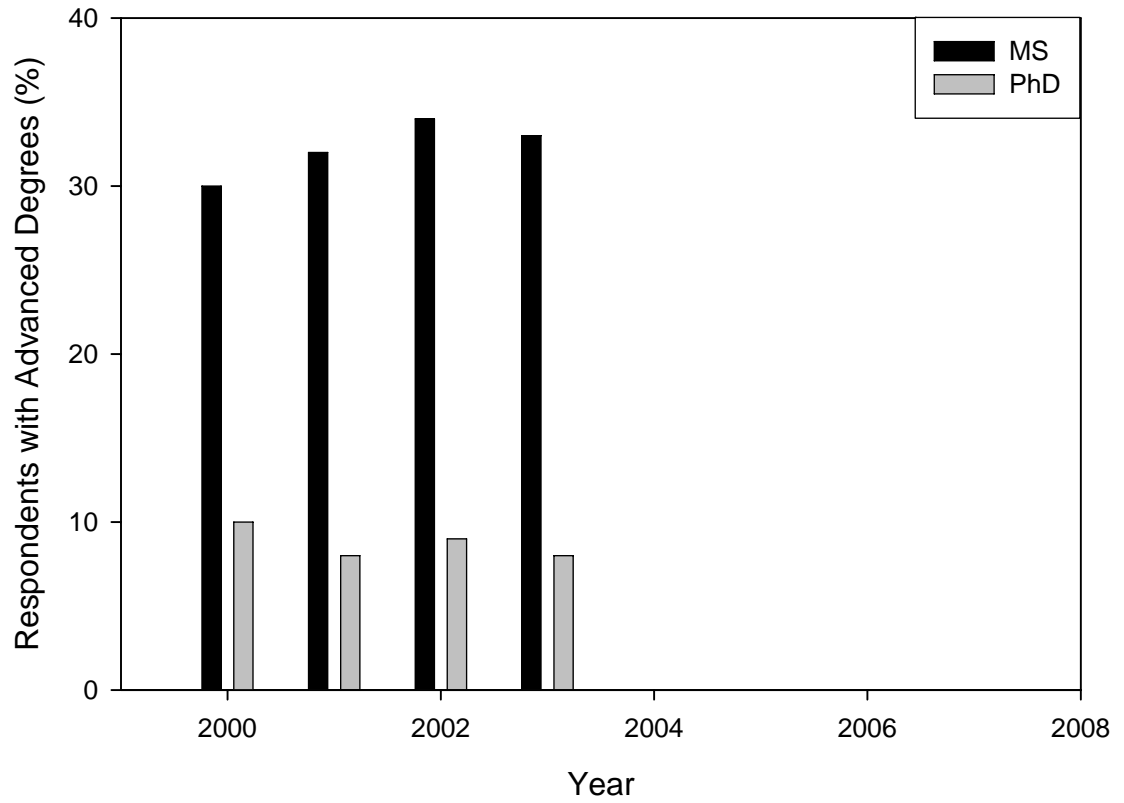


Fig. 4. Sample presentation of Achievement of Advanced Degrees.

## EIT/PE Status of Graduates

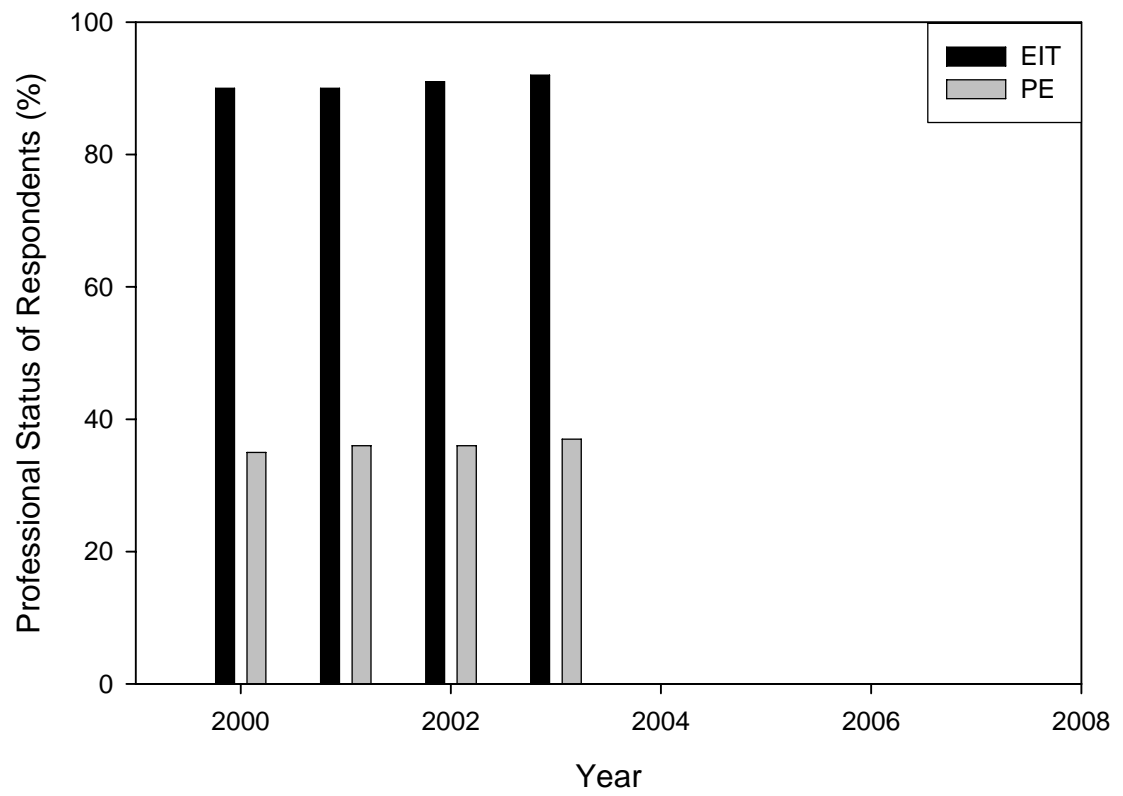


Fig. 5. Sample presentation of Professional Status.

## Supervisory Responsibility by Experience Level

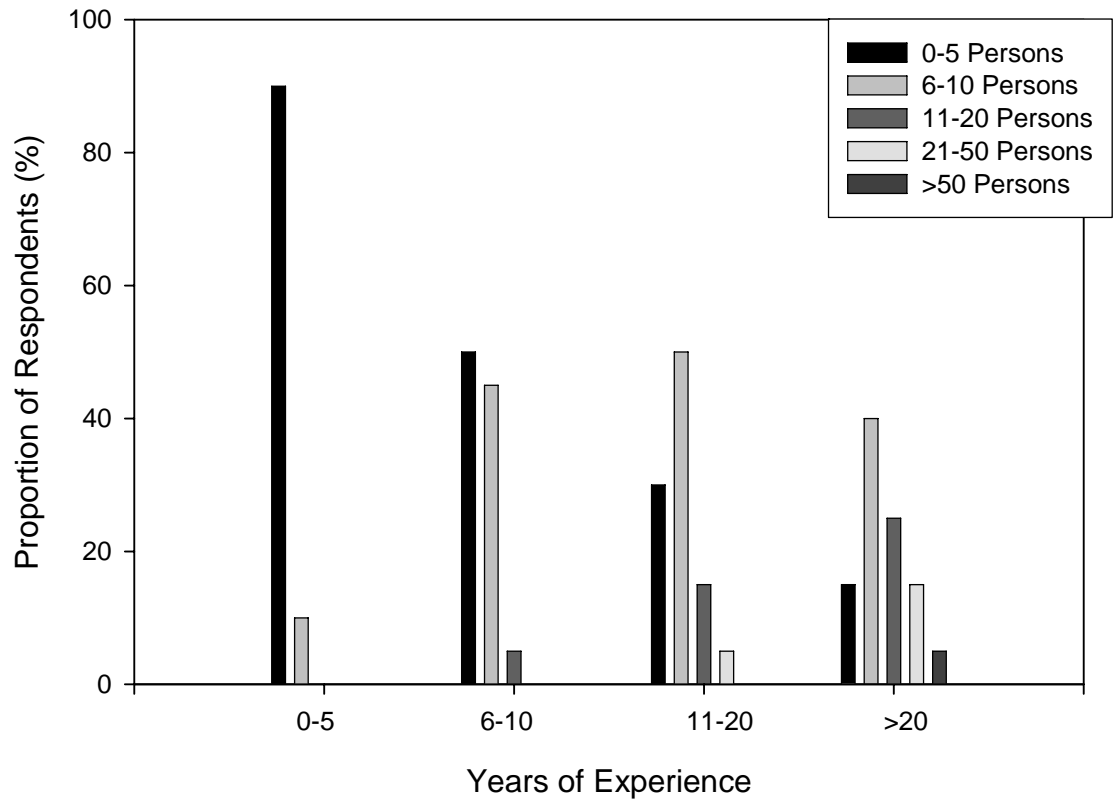


Fig. 6. Sample presentation of Career Progression.

# BS Graduate Initial Salaries

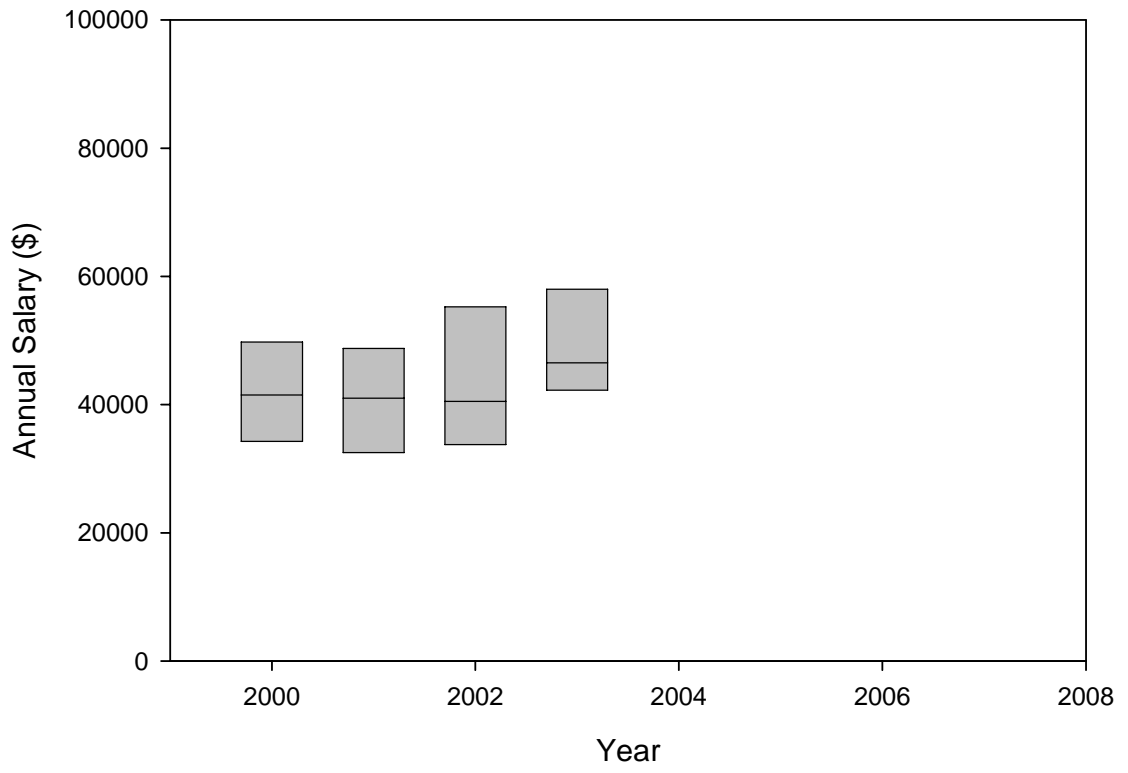


Fig. 7. Sample presentation of Salary, Part 1.

### Salaries By Experience Level

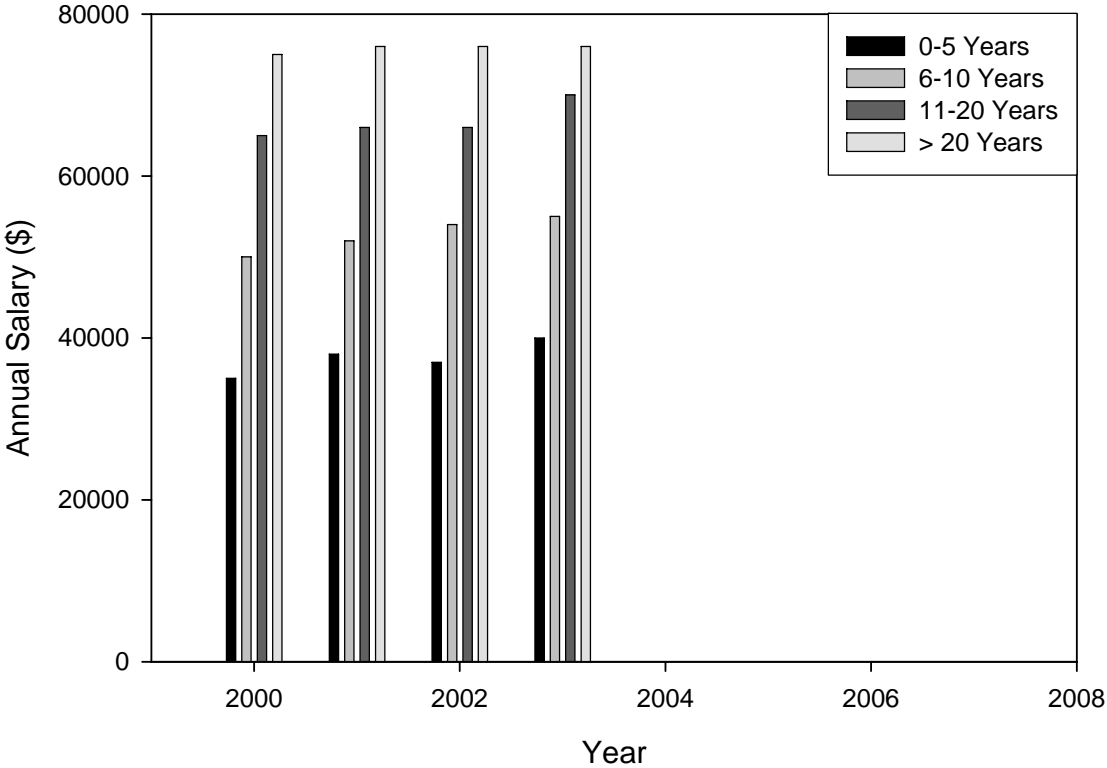


Fig. 8. Sample presentation of Salary, Part 2.



## Professional Society Memberships

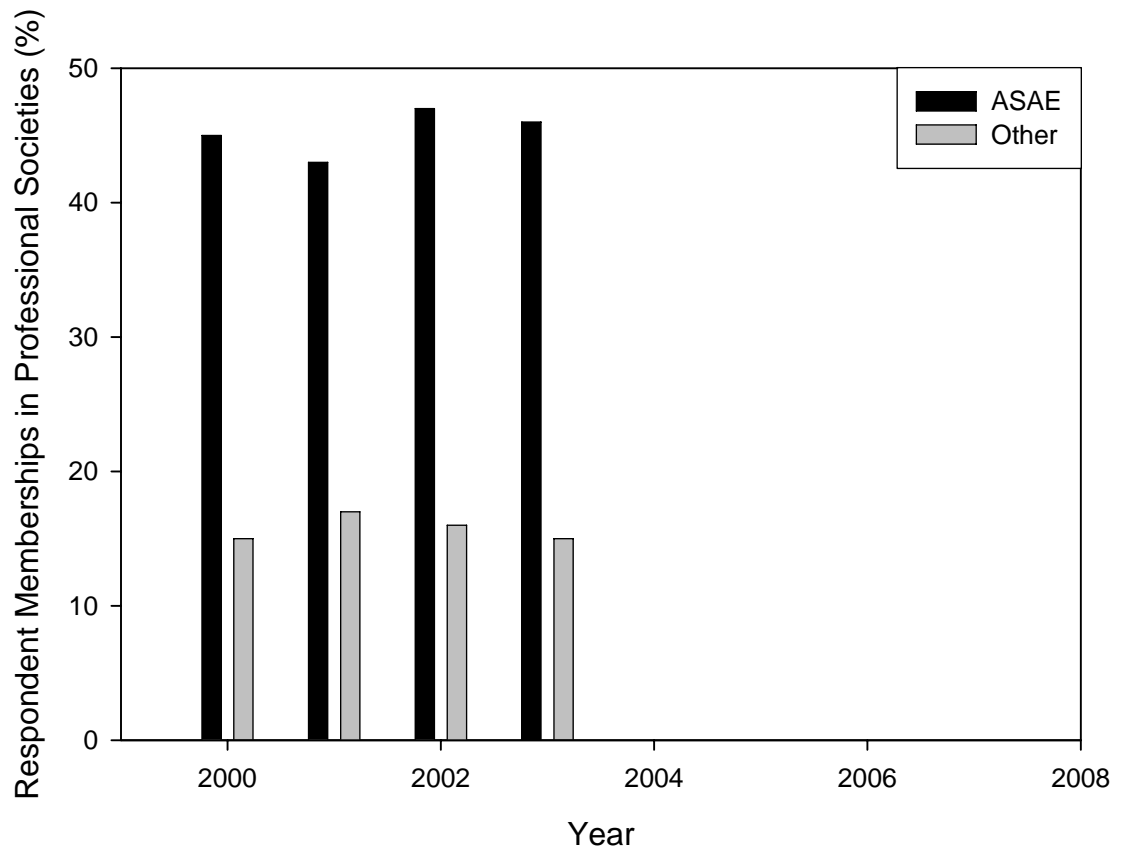


Fig. 9. Sample presentation of Professional Society Membership.

## Continuing Education

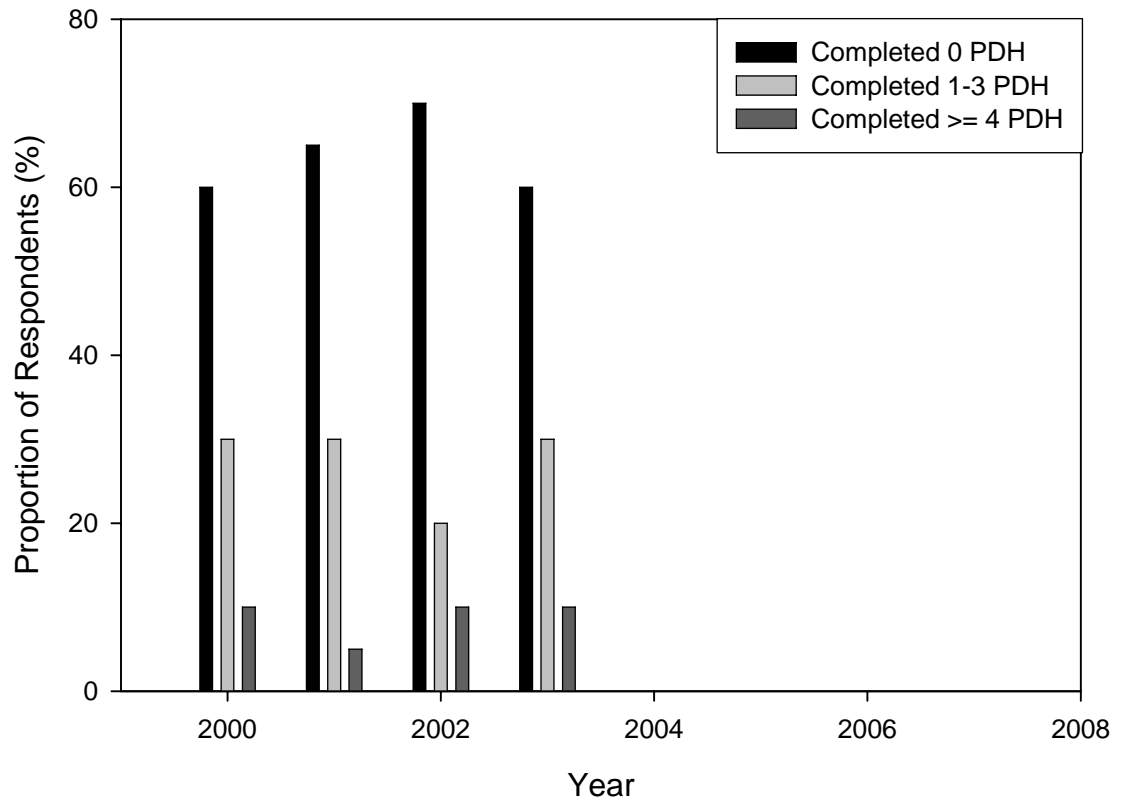


Fig. 10. Sample presentation of Continuing Education.

### **Criterion 3: PROGRAM OUTCOMES AND ASSESSMENT**

#### **Overview and Definition**

The CRITERIA FOR ACCREDITING ENGINEERING PROGRAMS: 2003-2004 clearly defines the difference between educational *objectives* and educational *outcomes*. The outcomes should address student abilities achieved during their *undergraduate program*. With these considerations in mind, our program outcomes are as follows:

#### **Statement of Current Program Outcomes**

The following list of Program Outcomes is linked directly to Program Educational Objectives, with Program Outcomes 1-7 being associated with Program Educational Objective 1, and Outcomes 8-16 associated with Objective 2.

1. Graduates must demonstrate their ability to apply knowledge of mathematics, science and engineering to solve problems.
2. Graduates should demonstrate an ability to use techniques, skills and modern engineering tools necessary for engineering practice.
3. Graduates should be able to design and conduct experiments as well as to analyze and interpret data.
4. Graduates must demonstrate an ability to identify, formulate and solve engineering problems.
5. Graduates must demonstrate an ability to design a system, component or process to meet desired needs.
6. Graduates should gain experience in solving BAE problems that are vague or poorly constrained.
7. Graduates should be exposed to research and technical literature and have the ability to interpret key issues and concepts.
8. Graduates must demonstrate effective interpersonal, formal and technical communication skills whether oral or written.
9. Graduates must recognize the need for, and ability to engage in, lifelong learning.
10. Graduates should be able to work within a team approach to complete projects that include multiple facets.
11. Graduates should demonstrate an appreciation for working in a multidisciplinary environment.
12. Graduates should demonstrate an understanding of professional and ethical responsibility.
13. Graduates should demonstrate knowledge of contemporary issues.
14. Graduates should demonstrate the broad education necessary to understand the impact of engineering solutions in a global and social context.
15. Graduates should know the importance of, and be engaged in, the process of becoming a Registered Professional Engineer.
16. Graduates should have been active in student clubs and professional organizations.

## Process for Revision of Program Outcomes

Program Outcomes may be revised by a majority vote of full-time, tenure-track BAE faculty at any meeting where a quorum of faculty are present. Revisions may be proposed on the basis of an internal assessment, an external evaluation or other circumstance(s).

Figure 3.1 provides an overview of the Continuous Improvement Process utilized for program assessment. The two feedback loops are used for Objective Assessment (lower left-hand loop) and Outcomes Assessment (upper right-hand loop). This graphic was designed by faculty during the CIP workshop in summer 2003.

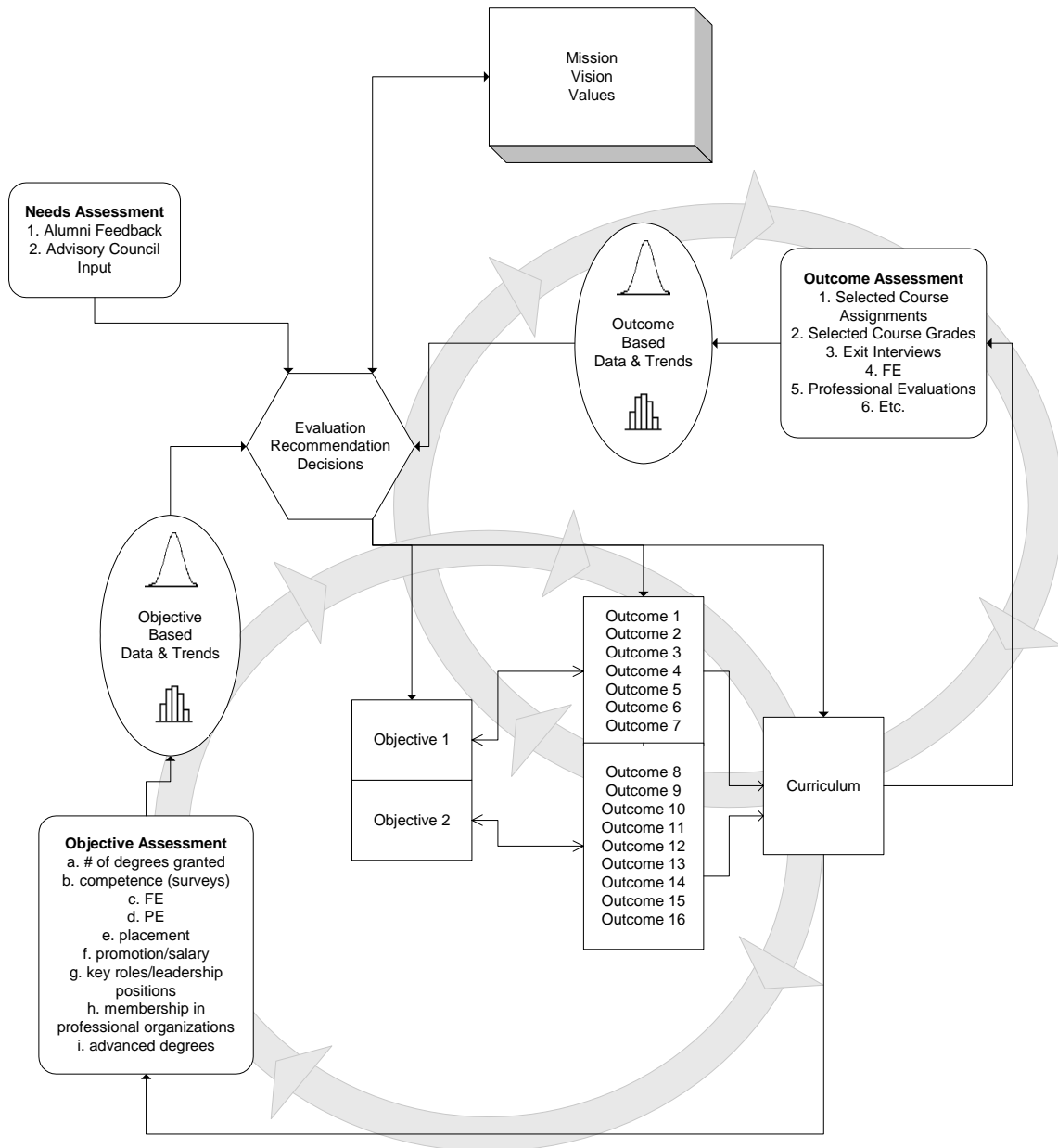


Figure 3.1: Continuous Improvement Process Model for the BAE Program

## **Metrics**

The BAE Faculty have established one or more metrics associated with each Program Outcome. These metrics were developed to provide quantitative data to allow us to determine whether we are achieving the Program Outcomes. While one Outcome may have several metrics, each metric is associated with only one Outcome. The metrics, their sources for assessment, frequency of acquisition, and current standards and goals associated with each Program Outcome are as follows:

### **Definitions, Sources, Frequencies, Standards and Goals**

1. Graduates must demonstrate their ability to apply knowledge of mathematics, science and engineering to solve problems.
  - a. Grade point average on pre-engineering standing coursework (ENG 101, ENG 102, MA 113, MA 114, MA 213, MA 214, CHE 105, CHE 107, PHY 231, PHY 241, PHY 232, PHY 242, CS 221, EM 221). Data to be collected annually (June) from the Engineering Dean's Office. Population: all pre-engineering standing BAE students. Goal: Grade point average of 3.0. Standard: Grade point average of 2.25.
  - b. Normalized average score (average of BAE students divided by national average) on the math and chemistry sections of the FE Exam. Data to be collected semiannually (July and January) from the Engineering Dean's Office. Population: All BAE students/graduates taking the FE exam during the respective test dates. Goal: Normalized average score of 1.1. Standard: Normalized average score of 1.0.
2. Graduates should demonstrate an ability to use techniques, skills and modern engineering tools necessary for engineering practice.
  - a. Grade point average on Computer-Aided Drafting (ME 205 and CE 106) courses and on computer programming courses (CS 221). Data to be collected annually (June) from the Engineering Dean's Office. Population: all BAE students enrolled in ME 205, CE 106 and/or CS 221. Goal: Grade point average of 3.0. Standard: Grade point average of 2.5.
  - b. Normalized average score (average of BAE students divided by national average) on the computer section of the FE Exam. Data to be collected semiannually (July and January) from the Engineering Dean's Office. Population: All BAE students/graduates taking the FE exam during the respective test dates. Goal: Normalized average score of 1.1. Standard: Normalized average score of 1.0.

- c. Average score on exercise to assess proficiency in Excel and MatLab to be administered during BAE 102. Data to be collected annually from the instructor of record. Population: all BAE students enrolled in BAE 102. Goal: Average score of 80%. Standard: Average score of 70%.
- 3. Graduates should be able to design and conduct experiments as well as to analyze and interpret data.
  - a. Average score on an assignment requiring the design of an experiment to determine whether design requirements of a prototype are satisfied, to be administered during BAE 202. Data to be collected annually from the instructor of record. Population: All BAE students enrolled in BAE 202. Goal: Average score of 80%. Standard: Average score of 70%.
  - b. Average score on a lab assignment requiring design of an experiment, acquisition and analysis of reports, and proper conclusions, to be administered near the conclusion of BAE 305. Data to be collected annually from the instructor of record. Population: All BAE students enrolled in BAE 305. Goal: Average score of 80%. Standard: Average score of 70%.
  - c. Completion rate on an assignment requiring design of an experiment, acquisition and analysis of results, and proper conclusions regarding the performance of an experimental prototype, to be administered during BAE 403. Data to be collected annually from the instructor of record. Population: All BAE students enrolled in BAE 403. Goal: Average completion rate of 80% by the conclusion of BAE 403. Standard: Average completion rate of 70% by the conclusion of BAE 403.
- 4. Graduates must demonstrate an ability to identify, formulate and solve engineering problems.
  - a. Grade point average on Statics, Dynamics, Mechanics of Materials, Fluid Mechanics, Thermodynamics, Heat Transfer and Electrical Circuits. Data to be collected annually (June) from the Engineering Dean's Office. Population: all BAE students enrolled in one or more of the above courses. Goal: Grade point average of 3.0. Standard: Grade point average of 2.5.
  - b. Normalized average score (average of BAE students divided by national average) on the statics, mechanics of materials, dynamics, fluid dynamics, electrical circuits and thermodynamics sections of the FE Exam. Data to be collected semiannually (July and January) from

the Engineering Dean's Office. Population: All BAE students/graduates taking the FE exam during the respective test dates. Goal: Normalized average score of 1.1. Standard: Normalized average score of 1.0.

5. Graduates must demonstrate an ability to design a system, component or process to meet desired needs.
  - a. Average scores on assignments or exam portions requiring students to demonstrate design capabilities, to be administered during the BAE core design courses: BAE 417, BAE 427, BAE 437 and BAE 447. Data to be collected annually from the instructors of record. Population: All BAE students enrolled in one or more of the above courses. Goal: Average score of 80%. Standard: Average score of 70%.
6. Graduates should gain experience in solving BAE problems that are vague or poorly constrained.
  - a. Average scores assigned by professional advisors to teams on conclusion of their BAE 402/403 design project assigned by the professional advisor and specified in vague and poorly constrained terms. Data to be collected annually from the instructor of record. Population: All BAE students enrolled in BAE 403. Goal: Average score of 80%. Standard: Average score of 70%.
7. Graduates should be exposed to research and technical literature and have the ability to interpret key issues and concepts.
  - a. Average scores on assignments structured to specifically require the acquisition, interpretation and application of technical literature and/or research results, to be administered during the BAE core design courses: BAE 417, BAE 427, BAE 437 and BAE 447. Data to be collected annually from the instructors of record. Population: All BAE students enrolled in one or more of the above courses. Goal: Average score of 80%. Standard: Average score of 70%.
8. Graduates must demonstrate effective interpersonal, formal and technical communication skills whether oral or written.
  - a. Average scores on final oral presentations of students enrolled in BAE 400 as determined from volunteers from Toastmasters International. Data to be collected annually from the instructor of record. Population: All BAE students enrolled in BAE 400. Goal: Average score of 80%. Standard: Average score of 70%.

- b. Average scores on final oral presentations and written reports of students enrolled in BAE 403 as determined from the design teams' respective professional advisors. Population: All BAE students enrolled in BAE 400. Goal: Average score of 80%. Standard: Average score of 70%.
- 9. Graduates must recognize the need for, and ability to engage in, lifelong learning.
  - a. Average scores on exam portion focused specifically on benefits of lifelong learning and professional organizations, to be administered during BAE 400. Data to be collected annually from the instructor of record. Population: All BAE students enrolled in BAE 400. Goal: Average score of 80%. Standard: Average score of 70%.
- 10. Graduates should be able to work within a team approach to complete projects that include multiple facets.
  - a. Average scores on team laboratory assignment during BAE 102 and 305. Population: All BAE students enrolled in BAE 102 and 305. Data to be collected annually from the instructor of record. Goal: Average score of 80%. Standard: Average score of 70%.
  - b. Average scores team effectiveness on capstone design project (BAE 402/403) as assigned by respective professional advisors. Data to be collected annually from the instructor of record. Population: All BAE students enrolled in BAE 403. Goal: Average score of 80%. Standard: Average score of 70%.
- 11. Graduates should demonstrate an appreciation for working in a multidisciplinary environment.
  - a. Average scores on an assignment to describe roles of non-engineering professionals and methods to improve interactions with non-engineers, to be administered during BAE 400. Population: All BAE students enrolled in BAE 400. Data to be collected annually from the instructor of record. Goal: Average score of 80%. Standard: Average score of 70%.
- 12. Graduates should demonstrate an understanding of professional and ethical responsibility.
  - a. An introduction including an exercise on professional and ethical responsibilities of engineers will be given in BAE 102. Population: All BAE students enrolled in BAE 102. Frequency: annually. Goal: 100% completion. Standard: 100% completion.



- b. Average scores on an exam portion focused on appreciation for professionalism and ethical practice, to be administered during BAE 400. Population: All BAE students enrolled in BAE 400. Data to be collected annually from the instructor of record. Goal: Average score of 80%. Standard: Average score of 70%.
    - c. Normalized average score (average of BAE students divided by national average) on the ethics section of the FE Exam. Data to be collected semiannually (July and January) from the Engineering Dean's Office. Population: All BAE students/graduates taking the FE exam during the respective test dates. Goal: Normalized average score of 1.1. Standard: Normalized average score of 1.0.
13. Graduates should demonstrate knowledge of contemporary issues.
- a. Grade point average on all social studies, humanities and cross-cultural courses. Data to be collected annually (June) from the Engineering Dean's Office. Population: all BAE students enrolled in any courses associated with the above areas. Goal: Grade point average of 3.25. Standard: Grade point average of 2.75.
14. Graduates should demonstrate the broad education necessary to understand the impact of engineering solutions in a global and social context.
- a. Average scores on homework assignments and exam portions focused on describing and evaluating the social and global implications of engineering practices, to be administered during the BAE core design courses: BAE 417, BAE 427, BAE 437 and BAE 447. Population: All BAE students enrolled in one or more of the above courses. Data to be collected annually from the instructor of record. Goal: Average score of 80%. Standard: Average score of 70%.
15. Graduates should know the importance of, and be engaged in, the process of becoming a Registered Professional Engineer.
- a. An introduction regarding the importance of becoming a registered professional engineer will be given in BAE 102. Population: All BAE students enrolled in BAE 102. Frequency: annually. Goal: 100% attendance of this unit. Standard: 100% attendance of this unit.
  - b. Average scores on exam portion focused on describing the importance of professional registration, to be administered during BAE 400. Population: All BAE students enrolled in BAE 400. Data to be collected annually from the instructor of record. Goal: Average score of 80%. Standard: Average score of 70%.

16. Graduates should have been active in student clubs and professional organizations.

- a. Proportion of students who consider themselves as having been “active” (greater than 75% attendance at all meetings and events) in one or more student club or other professional organization, as determined through exit interviews with the BAE Department Chair. Population: All graduating BAE students. Data to be collected upon graduation or soon thereafter. Goal: 80% of all graduating students are “active” in one or more student organizations. Standard: 70% of all graduating seniors are “active” in one or more student organizations.

### **Responsibilities**

The DUS, with support from the Administrative Assistant to the DUS, has responsibility for collecting, analyzing, archiving and presenting all data used to assess achievement of Program Educational Outcomes and Assessments.

The UCCC has the responsibility for annual review the syllabi of the core technical electives (BAE 417, 427, 437, 447) to ensure that the required assessment instruments are properly executed and the evaluations are made available to the DUS.

### **Revisions to Metrics**

Metrics and/or goals and standards may be revised by a majority vote of the BAE Faculty at a meeting where a quorum of faculty are present, but proposed revisions may be brought to a vote only after being presented to the Alumni Advisory Council and only after the Council’s written comments have been provided to the BAE Faculty. During the discussion any revisions, the BAE Department Chair will ensure that the implications of the revisions with regard to long-term inferences are described. Revisions may be proposed at any BAE Faculty meeting by any BAE Faculty member or any Alumni Advisory Council member (through the BAE Department Chair) on the basis of an internal assessment, an external evaluation or other circumstance(s). If no revisions are proposed during any two-year period, the BAE Department Chair will request the Alumni Advisory Council to affirm and/or recommend changes to current metrics, goals and standards, communicate the outcome to the BAE Faculty, and request the BAE Faculty to affirm and/or revise the metrics, goals and standards.

### **Assessment**

The Undergraduate Curriculum and Course Committee (UCCC) will collect and assemble for BAE Faculty review. This will be initiated each August for prior degree year data, and to provide time to submit any changes by the October deadline. A presentation of the metrics and a summary of metrics meeting and failing goals/standards will be presented to the faculty, along with suggestions for improvement.

The faculty may, at their discretion, consider and act on metrics not achieving goals. The faculty must consider and act on metrics not meeting standard. In the cases of non-standard metrics, possible actions include:

- a. Adopt a new metric, goal and standard (after comment from the Alumni Advisory Council, as described above).
- b. Revise the standard (after comment from the Alumni Advisory Council).
- c. Refer the matter to the Curriculum and Course Committee for recommended action, with guidance provided to the committee and a due date for considering the recommended action. In this case, it will be the responsibility of the DUS to ensure follow-up.
- d. In the case of BAE courses, require the instructor(s) to implement course revisions. The DUS will be responsible for ensuring implementation of the revisions, to be determined by review of the course syllabus, review of exams/assignments and/or visitation during class.
- e. In the case of non-BAE courses, recommend that the BAE Chair consult with the Chair(s) of the academic unit(s) involved with the goal of implementing beneficial changes to course format, prerequisites, and/or other measures. The Chair will be responsible for providing progress reports at subsequent faculty meetings until the outcomes of those consultations are substantially complete.

### **Evaluation and Recommendation**

The faculty will review the UCCC summary of metrics and recommendations for possible revision of the program outcomes and/or methods of assessment (including goals and standards). The faculty may, at their discretion, consider metrics not achieving goals. The faculty must consider and act on metrics not meeting standards. In the event that a metric standard is not met, possible actions include:

- a. Adopt a new metric, goal and standard.
- b. Revise the standard.

### **Action**

The faculty will formulate revised program outcomes and/or methods of assessment, as deemed necessary, and will put these to a faculty vote.

### **Constituent Review**

When feasible and possible, faculty recommendations regarding outcomes will be made at least two weeks prior to the annual meeting of the Department's Alumni Advisory Council. The Chair will provide this information to the Department's Alumni Advisory Council, and solicit and record comments and guidance from the Council. The Chair will circulate a summary of the Council's comments and guidance no later than two weeks following their meeting, and convene a faculty meeting within six weeks after

their meeting, in conjunction with faculty review of Council's assessment of program objectives.

## **Criterion 4 – PROFESSIONAL COMPONENT**

### **Overview**

The Department of Biosystems and Agricultural Engineering strives to meet the Professional Component Criterion by meeting or exceeding the ABET CRITERIA FOR ACCREDITING ENGINEERING PROGRAMS, 2004-2005. The BAE curriculum is structured to provide students with a broad coverage of topics associated with biosystems and agricultural engineering practice while also permitting students to concentrate in one of six areas of specialization.

Required courses in calculus, chemistry, physics and biology totals 37 credits, which exceed the 32 credits required by Criterion 4. The program curriculum of engineering science and design courses (52 credits) exceed the 48 credits also required by Criterion 4.

A capstone design sequence (BAE 402/403) is used to prepare students for engineering practice. This two-course capstone design sequence is used to incorporate into a major design experience the knowledge and skills acquired in earlier coursework, while addressing appropriate engineering standards and realistic constraints.

The balance of program curriculum requirements of writing and oral communication, university social studies, humanities and cross-cultural requirements and a free supportive elective is used to support the general education component of the student's educational experience.

### **Responsibilities**

The UCCC has the responsibility for annual review the syllabi of the core requirements (BAE 102, 202, 305, 400, 402, 403) and the core technical electives (BAE 417, 427, 437, 447) to ensure that the required assessment instruments are properly executed and the evaluations are made available to the DUS.

### **Assessment**

#### **Evaluation of Program Curriculum**

The Undergraduate Curriculum and Course Committee (UCCC) is tasked with curriculum oversight. The UCCC reviews the BAE curriculum annually to assure that professional component requirements specified by Criterion 4 of the ABET CRITERIA FOR ACCREDITING ENGINEERING PROGRAMS are met or exceeded. The UCCC also reviews university course offerings annually to identify technical electives for any of the six areas of curriculum concentration.

New course offerings are initiated by faculty members when they determine that a body of knowledge would be beneficial to a student's skill set. Typically these courses are taught at least two times experimentally as a special problems course before a formal new course request is processed. The UCCC then reviews the course proposal and recommends approval by the faculty.

#### **Major Design Experience**

The students are prepared for engineering practice through advanced courses which culminate in a major design experience based upon the knowledge and skills

acquired in earlier course work. Each student completes a two-course, 4 credit capstone design sequence.

Students are assigned to 3- or 4-person teams and select problems submitted by professional advisors. The student teams research the problems and propose design solutions, specifying measurable design requirements. Design solutions are developed and presented for evaluation. After responding to recommendations of the professional advisors and the instructor, design prototypes are fabricated or constructed. The student teams design and conduct experiments whereby the prototypes are tested to assess the attainment of design requirements. Student teams prepare a final design report, as well design drawings and specifications.

One of three credits of oral communication required by the university is satisfied by this sequence. Students receive instruction in preparing and delivering technical oral presentations and are required to present four formal presentations of their design work (proposal, preliminary design, progress and final design).

The capstone design sequence consists of 50 minutes per week of lecture and 2 hours per week of team collaboration. Instruction is presented in team roles and teamwork, technical oral presentation, technical writing, design modeling, design analysis, estimating design costs, selection of design materials, design reliability, statistical hypothesis testing, engineering ethics, environmental protection, design safety, multidisciplinary design teams, and other topics. Students evaluate themselves and their peers' relative contributions to the design effort.

The UCCC annually reviews the syllabi of the capstone design sequence to ensure that the requirements specified by the Criterion 4 of the ABET CRITERIA FOR ACCREDITING ENGINEERING PROGRAMS are met or exceeded.

### **General Education Curriculum**

The Department uses the University Studies Program (USP) to provide the general education component consistent with the University's objectives. Each advisor works with the individual student to select courses that are appropriate to the students own needs and aspirations.

The UCCC determines annually if courses designated to fulfill the University Studies requirement in social studies, humanities and cross-cultural studies satisfies the general education requirements specified by Criterion 4 of the ABET CRITERIA FOR ACCREDITING ENGINEERING PROGRAMS.

### **Evaluation and Recommendation**

The UCCC meets annually following the Spring semester to recommend: a) additions to the list of approved technical electives, b) approval or disapproval of new BAE course proposals, c) appropriate changes in the capstone design sequence and d) any action needed to assure that general education requirements are met.

### **Action**

The BAE faculty meets annually in September to consider recommendations for changes in the curriculum. A majority affirmative vote with a quorum present is required for approval of such changes.

**Constituent Review**

Changes in the BAE curriculum are reviewed by the BAE Alumni Advisory Council at a regular meeting during the Fall semester. The Council provides feedback as to the acceptability of the BAE curriculum and can recommend changes.

## **Criterion 5 – FACULTY**

### **Overview and Composition**

#### **Faculty**

The BAE Department faculty consists of four Assistant Professors, five Associate Professors, and eight Professors, for a total of seventeen, as listed below. We have two Extension vacancies, with one search approved and underway. The faculty has received numerous College, University, Regional and National awards, and we pride ourselves on our excellence in teaching. The faculty work hard to create a supportive environment, and students evaluations of the program consistently praise the faculty.

#### Assistant Professors:

Regular Title Series: Crofcheck, Montross, Norikane

Extension Title Series: Stombaugh

#### Associate Professors:

Regular Title Series: Colliver, Nokes, Workman

Extension Title Series: McNeill, Overhults

#### Professors:

Regular Title Series: Edwards, Gates, Payne, Shearer, Wells

Extension Title Series: Fehr, Taraba, Warner

#### Other:

Duncan, 50% post-retirement Extension

Turner, Walton: Associate Deans in College of Agriculture

Extension Food Engineer: search underway

The composition of the faculty is eleven Regular Title Series and six Extension Series (plus a half-time post-retirement, and a vacancy). Two of the seventeen faculty are female (one Assistant Professor, one Associate Professor, both Regular Title series). Unlike many other departments at this and other Universities, the Extension Faculty take an active role in undergraduate and graduate instruction. Extension faculty typically teach one course per year, primarily either upper division undergraduate or graduate courses. Fourteen BAE faculty have formal teaching assignments; the remaining two are Extension only.

#### **Staff**

The Department has an Administrative Coordinator, whose duties are to coordinate the fiscal and personnel matters of the department and direct activities of three administrative assistants and an accounts clerk. The administrative coordinator has signature authority and is responsible for payroll, monitoring purchases and providing accounting for extramural grants and Departmental state and federal accounts. The primary duty of one administrative assistant is to assist in the administration and documentation associated with the Department's Graduate and Undergraduate degree programs. The Department also has technical and professional support personnel who assist the faculty in the execution of laboratory exercises and the fabrication of research apparatus and senior design project prototypes. Dr. Larry Wells is the Director of



Undergraduate Studies and serves as the leader of the Continuous Quality Improvement efforts and ex officio member of the Undergraduate Curriculum and Course Committee (Dr. Steve Workman, Chair; members Shearer, Montross, Crofcheck, Norikane). This committee is responsible for the annual Outcomes Assessment review and brings forward suggestions for improvement of curriculum, and various current issues related to the program, to the full faculty.

### **Faculty Hiring**

Faculty hires involve a substantial degree of strategic planning and discussion, with all department faculty consulted. All faculty are heavily involved in the hiring process. Regular strategic planning meetings are conducted to refine current staffing needs, funding opportunities and new program opportunities. Prioritization of faculty hiring is done by consensus, with final approval for hires made by the Dean of the College of Agriculture (M. Scott Smith).

### **Professional Development and Registration**

The BAE faculty have the highest percentage of Professional Engineer registrations in the College of Engineering. Registration is required by state law to teach engineering design. Thirteen faculty hold the P.E. license, two of which were earned by Assistant Professors this past academic year. Licensure is considered important by the faculty. Two professional staff have the P.E. registration, and all engineering associates are required to take the FE exam.

### **Promotion, Tenure and Merit Reviews**

Non-tenured faculty are reviewed annually, according to Administrative Regulations, and must be formally reviewed by the Chair with input from all tenured faculty after two and four years of service. The Promotion and Tenure Committee, consisting of an elected Professor, the Directors of Graduate and Undergraduate Studies, and the Extension Leader review dossiers for any faculty considered for promotion, and provide input to the faculty and Chair. The Chair writes the two and four year review letter which is included in the dossier when the faculty elect to put forward an individual for promotion and tenure.

All faculty with an Instructional component, including Extension Series faculty, must submit a Teaching Portfolio as part of their formal dossier.

Tenured faculty are reviewed every two years. The process begins during October, and faculty submit information to the Chair for review. The Chair solicits the faculty to nominate two representatives to review all materials and provide objective input to the Chair. The Chair assigns a numerical rating to each element of the Distribution of Effort (Instruction, Research, Extension, Special Assignment) along with a brief statement of positive aspects of each individual's program and suggestions for improvement. These ratings are then forwarded to the Associate Dean for Administration in the College of Agriculture, for review by all Associate Deans. In January, the Chair meets with the Dean and Associate Deans and negotiates final ratings. Subsequently, the Chair meets with individual faculty and discusses the result. Faculty may request a meeting with the Dean and Associate Deans if they protest a rating; there is also a formal appeal process available.

## Criterion 6 – FACILITIES

### Bricks and Mortar

In 1990, the BAE faculty moved into the Charles E. Barnhart Building (CEBA), which houses the Department of Biosystems and Agricultural Engineering and the Agricultural Weather Center, along with Agricultural Economics and some staff for the Agricultural Data Center. This modern facility consists of a four-story office tower and an attached laboratory building. A virtual tour of this facility is available from the Department website: <http://www.bae.uky.edu/AboutBAE/Facilities/Tour/default.htm> .

The University of Kentucky maintains detailed facilities information, which can be reviewed at the Physical Plant website: <http://www.ppd.uky.edu/Facilities/Floorplans> . The Barnhart Building number is 0276, consisting of about 23,000 ft<sup>2</sup> of office space and 50,000 ft<sup>2</sup> of laboratory space, for a gross reported area of 92,115 ft<sup>2</sup> on first and second floors, or 114,562 ft<sup>2</sup> total for the entire building.

Each floor of the office tower consists of twenty-one perimeter offices (125 ft<sup>2</sup> each). The first floor includes central administrative offices (business manager, accounts clerk, Chair's staff associate and the Chair each have an office), as well as a computer laboratory with twenty stations, a file server room, office for the systems administrator, and two special-purpose interior offices that house a large plotter, related CAD supplies and two post-doctoral scholars. There is also an extension storage room, blueprint copy and storage room and a common graduate student room with space for six graduate students. The second floor includes twenty one perimeter offices, a student study area, one University classroom (227 CEBA), one BAE department design room used for many BAE classes (236 CEBA), a faculty reference room, three interior offices for graduate students, a small room with sink and microwave oven, and a large conference room that can be divided (228 CEBA).

The laboratory area consists of two large high-ceiling bays (151 and 181 CEBA) that attach to a central corridor. All laboratories to the courtyard side of this corridor have high ceilings, and are used for research work including rainfall simulators, grain handling and storage, environment control and building energy efficiency, machinery automation research, a yield harvest calibration laboratory, and various processing operations. The remainder of the laboratory building includes electronics areas for research and extension, a laboratory/classroom used for instrumentation and electronics, a biochemistry laboratory, water quality laboratory, soils laboratory, biomechanics, materials properties, the Grain Quality Laboratory, and assorted storage areas.

In addition the CEBA building, BAE has the Agricultural Machine Research Laboratory (ARML, #0184, 9,909 ft<sup>2</sup>), the Electric HVAC Laboratory (HVAC, #0184, 2,030 ft<sup>2</sup>), and we are working to span these two buildings for additional research fabrication space and painting (2,400 ft<sup>2</sup>). The College of Agriculture research farms have some facilities under the department's responsibility, including a storage shed and parts several bays in a converted pallet barn on the Main Chance Farm, and a large converted tobacco barn used for equipment storage on the Woodford County Farm.

The University of Kentucky Research and Education Center in Princeton KY has some facilities used by faculty and staff of BAE, including three offices and a fabrication shop. These facilities are not directly controlled by BAE.

### **Classroom and Laboratory Scheduling**

At the beginning of each semester the DUS formulates a schedule of courses and room assignments for the following semester. Classrooms 236 and 227 are utilized, along with computer laboratories 136 (BAE's lab) and 246 (College of Agriculture lab) and the electronics laboratory 156 CEBA. Occasionally, physical properties laboratory 175 CEBA, hydraulics laboratory 151 CEBA, environment control laboratory 182, food engineering laboratory 189 CEBA, and the processing laboratory 181 CEBA, are used for laboratory exercises. This shared use of research space for instructional exercises works well.

### **Facilities Utilization**

The BAE Building, Maintenance and Safety committee meets annually following the spring semester to evaluate assignment of facilities for teaching and to consider requests by faculty developing new BAE courses. This Committee consults the Chair and recommends any reassignment of rooms or laboratories to the faculty. The faculty then accept or rejects the committee recommendations by majority vote with a quorum present.

## **Criterion 7 – INSTITUTIONAL SUPPORT AND FINANCIAL RESOURCES**

### **BAE Resources**

The Department has an Administrative Coordinator, whose duties are to coordinate the fiscal and personnel matters of the department and direct activities of three administrative assistants and an accounts clerk. The administrative coordinator has signature authority and is responsible for payroll, monitoring purchases and providing accounting for extramural grants and Departmental state and federal accounts. The primary duty of one administrative assistant is to assist in the administration and documentation associated with the Department's Graduate and Undergraduate degree programs. The Department also has technical and professional support personnel who assist the faculty in the execution of laboratory exercises and the fabrication of research apparatus and senior design project prototypes. Dr. Larry Wells is the Director of Undergraduate Studies and serves as the leader of the Continuous Quality Improvement efforts and ex officio member of the Undergraduate Curriculum and Course Committee (Dr. Steve Workman, Chair; members Shearer, Montross, Crofcheck, and Norikane). This committee is responsible for an annual Outcomes Assessment review and brings forward suggestions for improvement of curriculum, and various current issues related to the program, to the full faculty.

Facilities are completely adequate for the undergraduate and graduate instruction needs. Current infrastructure challenges related to several years of budget shortfall include the need for a new roof, renovation of the campus classroom 227, and implementation of wireless transmitters.

### **College Resources**

#### **College of Engineering**

The College of Engineering has instituted a \$15 per credit engineering course credit hour to all students. These fees support the College IT group. The Council on Post-Secondary Education provides some funds to the College for instructional equipment, and the BAE department has received about \$10,000 per year over the review period. In addition, the Associate Dean for Instruction has disseminated a large number of Lexmark equipment donated to the College, and the BAE department has received one multifunction color printer/scanner and seven other printers.

#### **College of Agriculture**

The annual budget is developed in conjunction with the Dean of the College of Agriculture. The teaching budget for FY 04 was \$476,577 and has remained relatively stable. The departmental and University accounting systems do not readily provide for determining actual expenditures for teaching-related activities (e.g. copier use, telephones, etc.).

### **Criterion 8 – PROGRAM CRITERIA**

The program criteria for “Agricultural and similarly named engineering programs” require the following:

- Demonstrated proficiency in mathematics through differential equations: The BAE curriculum (Table I-1) satisfies this.
- Biological sciences consistent with program educational objectives: our curriculum requires three courses in biology (Table I-1)
- Engineering sciences consistent with program educational objectives: BAE students are required to pass Statics, Mechanics of Materials, Dynamics, Thermodynamics, Fluid Mechanics, Heat Transfer, Circuits, and Systems Analysis. Up to four additional technical electives can be applied as preparation for study in the student’s area of concentration.
- Engineering design: BAE students are required to pass three of four core Biosystems and Agricultural Engineering design courses (Machine Systems Design, Structures and Environment Design, Land and Water Resources Engineering, and Bioprocess Engineering). Three or four additional technical electives can be applied toward the student’s area of concentration.
- Capstone experience: A unique feature of the curriculum is that each student must pass a two-semester synthesis of engineering design (BAE 402/403) that includes team experiences, problem formulation, multiple presentations to a technical audience that includes engineers from appropriate industries, and prototype fabrication/construction, testing and analysis.

The Department Chair is a member of the ASAE Academic Chairs (AC-5) committee and of the Southern Region administrative group. These committees regularly meet and provide leadership on the evolving issues surrounding accreditation for our program. ASAE is working to develop leadership in Biological Engineering programs.