

BAE Program assessment for ABET accreditation

## 1. Essence Statement

BAE integrates biological sciences and engineering to enable people to develop and apply skills and knowledge to solve problems of importance to society in biological systems, agriculture, natural resources, the environment and sustainability.

## 2. Stakeholders

Students; faculty; alumni; employers; COE; CALS; State of Idaho; parents; State/Federal agencies; USA; U of I; global partners; K-12 educators and students

## 3. Scope

What it is - BS degree; professional degree; amalgamation/integration of engineering, chemistry, biosciences, soil sciences; applied science; design oriented; non-point source focus; systems approach (e.g. watershed processes); integration of undergrads in research; focus on sustainability; interdisciplinary work with other departments - MMBB, PSES, CE, ME, ChE; AERS, CNR, Geography; non-compartmentalized;

What it is not - Civil engineering (structural engineering, transportation engineering; geotechnical engineering); point-source focus; restrictive in coursework;

Boundaries - division between point and non-point source focus; otherwise fuzzy due to integrated or interdisciplinary nature of program

Gray areas – water has the most overlap

Remaining challenge – articulate the breadth versus focus issue that distinguishes our students from other engineering students. Focus on the system rather than the individual topics.

Next steps – prioritize and eliminate; goal of scope is to help eliminate new goals to clear them off the table; can't do everything.

## 4. Listing the Top Five Current and Future Goals

Current: The program will

- develop strong problems solvers
- students skilled in design, monitoring, systems development
- students that work effectively in teams
- students that communicate effectively, both orally and in writing

Future: The program will

- design courses with stronger independent learning outcomes so more knowledge will carry from one class to another (achieve level 2 learning)
- teach students to be self-directed learners.

Program Goals

- Increase enrollment

- Implement assessment to improve program and for ABET
  - ❖ Involve of all faculty and other stakeholders in assessment
- More undergraduate students involved in research
- Support junior faculty to tenure

## 5. Products and assets

### *Current products*

Graduates – clients document that they are job-ready  
 Students admitted to prestigious graduate programs in nation  
 > 90% Pass FE exam  
 Licensed faculty  
 Alumni speak highly of undergraduate program  
 Scholarships for undergraduate students  
 Students are active in campus community

### *Future products*

Articulate communicators – good writers and speakers – we had strengths here and it may be weakening

## 6. Key Processes (to accomplish goals in step 4)

- Design
- Problem-solving – where do we test?
- Assessment
- Running an effective meeting
- Designing effective communication tools
- Hiring undergrads in research
- Process for learning – teaching them self-directed learning
- Systems approach
- Career development/growth – both students and prof's can use – profs can model the performance
- Team building and growth

### Step 4 goals:

- Develop strong problem solvers: take specific identifiers (from ABET list, e.g., S, Q) and track performance in BAE courses (e.g., 142, 242, 452, capstone). Apply assessment strategy to improve courses as well as faculty-student communication of need. Track performance on FE exam.
- Students skilled in design, monitoring, systems development: take specific identifiers (from ABET list, e.g., S, Q) and track performance in BAE courses (e.g., 142, 242, bioremediation, irrigation design, 451, 452, capstone). Apply assessment strategy to improve courses as well as faculty-student communication of need.
- students that work effectively in teams: incrementally build on teaming skills in sequence of classes (e.g., 142, 242, 433, 452, 478, 479). Develop assessment strategy.
- Students that communicate effectively, both orally and in writing: Apply longitudinal tracking database during student's degree. In each courses taught by BAE faculty, document student's ability in communication where and when appropriate. Use a standard assessment form. Assessment should be shared with the student and amongst faculty. Post learning goal in department on a big poster. Promote attitude that in BAE faculty and student work together to reach this learning goal.

- design courses with stronger independent learning outcomes so more knowledge will carry from one class to another (achieve level 2 learning): develop assessment of desired knowledge of prerequisite course work.
- teach students to be self-directed learners: identify elements in BAE courses where self-directed learning is already required or can be incorporated. Develop assessment strategy throughout curricula.

(Program goals still to do)

**7. BAE Qualities for which we should write p.c.'s** (performance criteria - Tests for good pc:  
Should be significant to the overall performance; When people read it, should lead to shared understanding

Problem solving (a, e)

Rigorous (b)

Technical (a)

Applied

Strong communication (g)

Interdisciplinary & teams (d) Interdisciplinary (or multi?)

Technological awareness (k)

Collegial

Community Service

Career oriented (i)

Globally aware (h, j)

High Ethics (f)

Faculty – world-class, productive, collegial, active in interdisciplinary research and education

What to strive for in writing performance criteria:

- Aspects
  - ID the most important,
  - Organized around a fluid presentation (clear understanding to all readers), Concise.
- Then visualize and describe.

**Rigorous - aspects**

- Strong writing performance
- Improvement oriented
- High expectation of assessment/communication
- Higher level of learning (Bloom's taxonomy)
- Greater breadth of knowledge
- **High Performance environment**

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- Aspects
  - ID the most important,
  - Organized around a fluid presentation (clear understanding to all readers), Concise.
- Then visualize and describe:

Rigorous – a high performance environment, with clear expectations, strong performance criteria, effective and timely assessment, where students perform through writing, research, and teamwork, resulting in high level learning outcomes.

**Quality Communication** (oral and written); (sequential)

- Clarity
- Grammatically correct
- Meets target audience needs
- Meets cultural conditions of audience
- Engaging
- Body language
- Accuracy (right amount of preparation, well-researched)
- Did it have a significant impact
- Completeness
- Substantiates knowledge base (evidential)
- Gets attention

Expectation: Identify an important message, appropriate for audience and medium, prepare good development process, quality presentation performed to expectations of the audience/medium and assess performance to improve future performance.

**Interdisciplinary – aspects**

- Coursework incorporates biological, chemical, physical, instrumentation, electr' power and controls – interdisciplinary
- Strong biological, chemical, physical foundation and interdisciplinary
- Upper division classes synthesize different disciplines
- Interdepartmental team projects
- System-wide perspective (e.g. ecosystem, watershed, hazwaste site)
- Faculty model – we all do research with other depts. Our research is integrated.

Performance expectations: students synthesize and integrate knowledge of biological sciences and engineering using a system-wide perspective leveraging faculty multidisciplinary research.

To do: go beyond student learning outcomes: Quality of the faculty, Connection of program to the community.

**Career oriented – aspects**

- Curricula content is linked to different career paths
- Knowledge of field of study
- Knowledge of jobs in different sectors
- Have used internships/REU
- Make contacts in their field
- Awareness of job types and functions
- Level of education for target career
- Life-long learning goals
- Connected to professional organizations

Performance expectations: students and faculty work together in matching of student interest and competencies with biological and agricultural engineering career options using curriculum selection, internships/REU opportunities, contacts in their fields, and knowledge of professional organizations.

**Applied – aspects** (discussion around the issue of getting students ready for jobs and/or graduate school)

- Extension of fundamental knowledge

## **8. Key performance measures**

Interdisciplinary

Performance expectations: students synthesize and integrate knowledge of (biological and agricultural) sciences and engineering using a system-wide perspective leveraging faculty multidisciplinary research.

- ability to transfer to new contexts
- ability to converse in language of other disciplines

Career oriented

Performance expectations: students and faculty work together in matching of student interest and competencies with biological and agricultural engineering career options using curriculum selection, internships/REU opportunities, contacts in their fields, and knowledge of professional organizations.

Students are mentored constantly in developing and updating a strong life vision with integrated career plan using their educational experiences, intern/REU opportunities, networks, and appropriate professional organizations to produce job or graduate school opportunities upon graduation in their desired field.

- Numbers (internships, REU, attend meetings, get a job or go to grad school)
- Surveys (exit or 5-yr out)