Assessment Plan

Chemical and Biological Engineering Department

Updated Spring 2009

Major: Chemical Engineering

Name, phone, and e-mail of primary assessment contact

Ron Larsen, Department Head
406-994-3790
ronl@montana.edu

Department Mission

The mission of the Department of Chemical and Biological Engineering is to:

- Serve the State of Montana and the nation through education, research and service to meet the mission of Montana State University and the College of Engineering while encouraging diversity in the student population.
- Provide B.S., M. S. and Ph. D. Ch E. degree programs and contribute to interdepartmental M. S. and Ph. D. degree programs.
- Be recognized by colleagues in industry and other institutions as possessing excellent undergraduate and graduate programs in defined areas of specialization.
- Maintain a professional faculty who
    - Maintain expertise through continued professional development.
    - Provide excellent teaching.
    - Provide excellent advising.
    - Are nationally competitive in research.
- Provide state-of-the-art facilities in support of Department and interdepartmental degree programs.
- Develop and disseminate new knowledge through research.
- Provide opportunities, including cooperative education, for students to augment their career orientation through interaction with regional and national industry professionals.

Approved April 2005 (formerly called "Goals" of the Department)

Assessment Management Structure

Our assessment plan is based on three assessment cycles:

1. **Inputs Cycle**
   Our primary inputs are the design of our curriculum, and the design of our courses.

2. **Outcomes Cycle**

   Our outcomes are the "A-K" outcomes prescribed by ABET. Outcomes are understood to be measurable capabilities at graduation.

3. **Periodic Review Cycle**

   Some program elements, such as our Program Educational Objectives are reviewed once every three years according to a prescribed schedule. Our Program Educational Objectives were reviewed in 2006-07 and rewritten with input from our constituencies (faculty, students, alumni and employers). Objectives are understood to be desirable traits in our graduates in the years after graduation

The review of the results from the various assessment tools is split up to manage workload, but each of these cycles is completed every three years.

Inputs Cycle

Each course is reviewed at least once every three years. The course inputs (syllabus, course outcomes, handout materials) are reviewed by the faculty with immediate feedback. The instructor "closes the loop" by describing what changes (if any) will be made to the course as a result of the assessment process.

Course	Term			
CHBE 100	Fall	2004	2006	2009
CHBE 120	Spring	2005	2008	2011
CHBE 213	Fall	2004	2007	2010
CHBE 215	Fall	2005	2007	2010
CHBE 216	Spring	2004	2007	2010
CHBE 307	Fall	2006	2009	2012
CHBE 321	Spring		2007	2010
CHBE 322	Fall		2007	2010
CHBE 323	Spring	2004	2007	2010
CHBE 328	Spring	2006	2009	2012
CHBE 407	Fall	2004	2008	2011
CHBE 411	Fall	2005		
CHBE 411	Spring		2008	2011
CHBE 412	Spring	2005	2008	2011
CHBE 424	Fall		2006	2009
CHBE 438	Spring	2006	2009	2012
CHBE 442	Fall	2005	2008	2011
CHBE 443	Spring	2006	2009	2012
CHBE 451	Spring	2005	2008	2011

Outcomes Cycle

Each year a portion of the various outcomes are assessed; this is done according to a schedule to ensure that the Outcomes Cycle is completed every three years. We use direct outcomes assessment on examples of student work:

	Project/Activity	Outcome(s)	Collected	DAC Review
CHBE 411	Interim design report	C and H	Fall 2007, 2010	2008, 2011
	Oral presentation	G	Fall 2007, 2010	
CHBE 412	Final design report	C	Spring 2008, 2011	2009, 2012
CHBE 412	Ethics case studies	F	Spring 2009, 2012	2009, 2012
CHBE 443	Unit Operations lab report	B and G	Spring 2006, 2009, 2012	2006, 2009, 2012
CHBE 424	Transport modeling project	A and E	Fall 2006, 2009	2007, 2010
Various	Computer-based projects	K	2006-07, 2009-10	2008. 2011
Various	Contemporary issues examples	H, I and J	Sp, Fa 2008, Sp, Fa 2011	2009, 2012

The student work is reviewed members of our DAC using scoring rubrics that have been prepared for each outcome. The DAC reports their results to the faculty. Response thresholds have been developed that invoke a faculty response if scores on any rubric are below the assigned threshold.

Proposals for curriculum, course, or other changes as a result of outcomes assessment are prepared by faculty, and reviewed (with suggestions for revision, if needed) by members of our DAC and students. Faculty review the suggestions and decide how to implement the change.

Periodic Review Cycle

Each year a portion of the results of various objectives assessment tools are reviewed; this is done according to a schedule to ensure that the Periodic Review Cycle is completed every three years.

Program Objectives   2006-07   2009-10
Assessment Course/Outcomes Matrix 2007-08   2010-11
Response Thresholds   2008-09   2011-12

Tools used to assess achievement of our program objectives include:

- Alumni Surveys
- Employer Surveys
- FE Exam Results
- Departmental Advisory Committee (DAC) input (alumni and employers)

The tool results are reviewed by faculty and members of our DAC. Proposals for changes are typically prepared by faculty, and reviewed (with suggestions for revision, if needed) by members of our DAC and students. The faculty reviews the suggestions and decides how to implement the change.

In AY 2006-07 the faculty modified the typical approach for a more fundamental review of our Program Objectives. There was a desire to have the DAC and students start with a clean slate and propose a set of desired Program Objectives to the faculty. This was done at the February

2007 DAC meeting and the new Program Objectives have been approved by the faculty, and are presented in the next section.

Curriculum Review

Curriculum changes are made for a variety of reasons, which may or may not be related to the assessment process. For example, staffing needs may drive curricular changes. Most typically, curriculum changes are proposed by the faculty in response to a perceived need or opportunity to make a curricular improvement.

Curricular improvements may be in response to a concern identified as part of our assessment process. These types of curriculum changes are made after input from our constituencies (faculty, students, alumni and employers) based on assessment results. The following tools are used as part of the overall curriculum review:

- Alumni Surveys (2 and 4 years after graduation)
- Employer Surveys
- Departmental Advisory Committee input (alumni and employers)
- FE Exam Results

Degree (Program) Objectives

The Degree Objectives are termed Program Objectives in the terminology of our accreditation agency, ABET. Our Program Objectives were proposed by our Departmental Advisory Committee and student representatives, and adopted by the faculty on February 16, 2007.

Our graduates:

- will be confident in their ability to apply chemical engineering fundamentals.
- will be proactive problem solvers.
- will pursue lifelong learning.
- will be effective communicators.
- will be effective team members.
- will be highly ethical engineering professionals.

Expected Competencies

In the terminology of our accreditation agency, the expected competencies are termed Program Outcomes. ABET requires 11, and programs are allowed to add others, or regroup and rephrase ABET's required outcomes. We have elected to simply use ABET's outcomes A through K as our Program Outcomes.

Our graduates will have:

A. An ability to apply knowledge of math, engineering, and science.
B. An ability to design and construct experiments.
C. An ability to design a system, component, or process.

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.
G. An ability to communicate effectively.
H. The broad education necessary to understand the impact of engineering solutions in a global and societal context.
I. A recognition of the need for and ability to engage in life-long learning.
J. A knowledge of contemporary issues.
K. An ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

Additional Goals

It is also our goal to:

- Provide a valuable and useful educational experience to our students.
- Provide excellent instruction.
- Create a "student-friendly" environment.
- Provide state-of-the-art experimental and computational facilities.

Plan for Gathering and Summarizing Data

Because of the small numbers graduating each year, we have found that it is effective to accumulate some data to obtain a more descriptive data set. Because of this we may collect data annually, but only review the accumulated data once every three years. This is indicated in the following table in the Collected and Reviewed columns.

Tool	Use(s)	Collected	Reviewed
Course Notebooks	• Used to assess the inputs to a course to see if stated instructional outcomes are consistent with course materials. • Used to assess whether the program outcomes tied to the course are consistent with the course content.	Some courses are reviewed every semester according to a predefined schedule. Each CHBE course is reviewed once every three years.	Each course is reviewed once every three years according to a predefined schedule. Note: The review procedure was changed in 2008, and all CHBE courses were reviewed in 2008-09 using the new procedure. We will return to the three-year rotation in the future.
Alumni Survey	• Used to assess program objectives.	Alumni 2 and 4 years after graduation are surveyed every summer.	Collected survey responses are reviewed once every three years.

Employer Survey	• Used to assess program objectives.	Employers of alumni 2 and 4 years after graduation are surveyed every summer.	Collected survey responses are reviewed once every three years.
DAC Input	• Used to assess program outcomes and objectives.	DAC (alumni and employers) meets annually.	DAC is assigned a subset of all review tasks each year (complete cycle after three years), but their feedback on all aspects of our program is welcome.
FE Exam	• Used to assess program outcomes.	Collected each semester.	Reviewed once every three years.
Student Examples	• Used to assess program outcomes	Specific assignments are collected to demonstrate particular outcomes	Complete portfolio contents will have been reviewed every three years.

Plan for Utilizing Data

The data from each of the assessment tools feeds into one or more of the assessment cycles.

For the Course Review portion of the Inputs Cycle, the instructor presents his or her course assessment to the entire faculty, which provides immediate feedback.

For changes with larger scope, such as curriculum changes or revision of program objectives, suggestions for change can come from faculty, DAC members, or students. Then proposals for change are typically generated by the faculty, and reviewed (with suggestions for revisions, if needed) by the DAC and student representatives. Proposals for are presented to an open meeting of students for their input. After the faculty has reviewed the DAC and student suggestions, an implementation plan is developed by the department head with the faculty.

Each of the assessment cycles repeats annually, but the targets of assessment change according to a predefined schedule to ensure a complete review is accomplished every three years.

The major annual assessment events include:

- Faculty Retreat, every Fall
- Faculty meetings, approximately weekly throughout the academic year, bi-weekly in summer
- DAC meeting, every Spring – the DAC meets with the faculty and with student representatives
- Student mass meeting (when a proposal is pending for student review) – Spring