OVERVIEW: ChE ABET Preparation Plan

April 16, 2003, rwl (DRAFT)

The review process for our ABET accreditation focuses on several topics, all strongly tied together:

- College of Engineering Educational Objectives (see COE EC2K Plan)
- Chemical Engineering Program Objectives (these are characteristics we want to see in our graduates 3 to 5 years after graduation.)
- Chemical Engineering Program Outcomes (these are characteristics we want our students to have at graduation.)
- Course Instructional Objectives

Because we have a tight time frame for developing our review materials, we have chosen to accept the current program objectives and program outcomes – these have been reviewed in the past and have been accepted by the faculty after constituent input. Our focus within the department has been on developing instructional objectives for all ChE courses, and getting the procedures in place to complete the assessment process ("closing the loop"). We are presently finalizing the development of instructional objectives for the last courses.

A significant effort has been placed on developing functional data handling processes to expedite the assessment process well beyond the immediate requirements. We have been entering all of our course instructional objectives into a database, and mapping the relationships between instructional objectives and the program outcomes in the database. The mapping is called the "a-k grid", and each instructor has indicated which of their objectives map onto each program outcome using a 1 to 3 scale, with 3 indicating that the instructional objective strongly supports the particular program outcome.

Sample "a-k grid" for CHE 328

CH E 328 Chemical Reaction Kinetics

Objective	a	b	c	d	e	f	g	h	i	j	k
1 Ability to design isothermal reactors for homogeneous and heterogeneous	3		2		3						1
2 Ability to determine a rate law and reaction mechanism from laboratory rate data.	3				2						1
3 Ability to analyze a catalytic mechanism and establish rate limiting step(s).	3				2						1
4 Ability to work as a team to achieve laboratory and research project goals.				2			2				
5 A basis for incorporating safety into any reactor design.						2		1	1		

The Program objectives (a-k) are summarized as:

a. Ability to apply knowledge of math, engineering, and science.
b. Ability to design and construct experiments.
c. Ability to design a system, component, or process.

d. Ability to function on multi-disciplinary teams.
e. Ability to identify, formulate, and solve engineering problems.
f. Understanding of professional and ethical responsibility.
g. Ability to communicate effectively.
h. …broad education … to understand the impact of engineering solutions in a global and societal context.
i. Recognition of the need for and ability to engage in life-long learning.
j. Knowledge of contemporary issues.
k. Ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

L. Quickly contribute in their focus area.
M. Team contributors.

Program outcomes L and M are specific to the CHE program at Montana State University, while a-k are common to all ABET-accredited engineering programs.

The use of the database has allowed us to work with this information to help identify primary courses we can use to demonstrate how we attempt to develop the desired outcomes in our students. We use a strength map which of our courses, as shown below. The higher numbers in each column indicate strength related to each program outcome.

CHE Program Outcome Strength Map

	a	b	c	d	e	f	g	h	i	j	k	L	M		
CH E 328	60				20									**Chemical Reaction Kinetics**	Daniel L Shaffer
CH E 215	83.				50								16.	**Elementary Principles I**	Jim Duffy
CH E 424	10				60						80			**Transport Analysis**	Joseph Seymour
CH E 213			60							20	20			**Materials Science**	John Mandell
CH E 322	60		36		60						16			**Fluid Mechanics and Heat Transfer**	Ron Larsen
CH E 251 V						50	66.	50		16.	33.			**Societal Impacts of Chemical Engineering**	Phil Stewart
CH E 323	90.		72.								9.0			**Mass Transfer Operations**	Duffy
CH E 100								33.		33.			33.	**Freshman Seminar**	Seymour
CH E 215	4.5				22.						9.0			**Elementary Principles I**	Deibert
CH E 216					23.									**Elementary Principles II**	Deibert
CH E 216	85.				57.								14.	**Elementary Principles II**	Duffy
CH E 220	76.										94.			**Computations in Chemical Engineering**	Larsen
CH E 307			21.		78.						15.			**Chemical Equilibrium**	Sears
CH E 338														**Bioprocesses in Engineering**	Pasmore
CH E 400						33.		33.						**Professionalism in Chemical and Biological**	Larsen
CH E 402			33.		66.						5.5			**Chemical and Petroleum Industries**	Sears
CH E 411 C	40		60				20							**Design of Chemical and Petroleum Processes I**	Shaffer
CH E 412 C	25		25				25						25	**Design of Chemical and Petroleum Processes II**	Shaffer
CH E 415			45								10			**Design Case Studies**	Deibert
CH E 438	42.		14.									71.		**Bioprocess Engineering**	Stewart
CH E 441	28.	42.			28.		14.						42.	**CH E Laboratory**	Sears, Seymour, Yurt
CH E 444						25		25	50	25				**Hazardous Waste Management**	Shaffer
CE 445	60		80	10	60	20	10	30		10	20	40	10	**Hazardous Waste Treatment**	King
CH E 451	68.	12.	12.		81.						68.			**Process Dynamics and Control**	Larsen

Assessment Plans - Input

A multi-layered assessment plan will be used including the following items:

- Instructional Objectives Surveys for each course

- Internal and External Evaluation of Design Projects
- Employer Surveys
- Alumni Surveys
- Senior Exit Interviews

Assessment Plans - Closing the Loop

The data from each of the items listed above will be used to assess how we are doing at meeting our courses instructional objectives, program outcomes, and program objectives. We will then respond to the assessment results by making any changes indicated by the assessment process.