Colorado State University – Pueblo Academic Program Assessment Report for AY 2014-2015 **Due: June 1, 2015**

Program:_____Engineering_____ **Date:** ____2 June 2015____

Completed by:___Jane M Fraser_____

Assessment contributors (other faculty involved in this program's assessment): Bedoya, DePalma, Jaksic, Yuan

Please complete this form for each undergraduate, minor, certificate, and graduate program (e.g., B.A., B.S., M.S.) in your department. Please copy any addenda (e.g., rubrics) and paste them in this document, and submit it to the dean of your college/school as per the deadline established. The dean will forward it to me as an email attachment before June 2, 2014. You'll also find the form at the assessment website at http://www.colostate-pueblo.edu/Assessment/ResultsAndReports/Pages/default.aspx.

Please describe the 2014-2015 assessment activities for the program in Part I. Use Column H to describe improvements planned for 2015-2016 based on the assessment process. In Part II, please describe activities engaged in during 2014-2015 designed to close-the-loop (improve the program) based on assessment activities and the information gathered in 2013-2014. Thank you.

Comment:

In the Department of Engineering, we use ABET language. "Assessment is one or more processes that identify, collect, and prepare data to evaluate the attainment of student outcomes and program educational objectives. … "Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment processes. Evaluation determines the extent to which student outcomes and program educational objectives are being attained. Evaluation results in decisions and actions regarding program improvement." (http://www.abet.org/network-of-experts/for-current-abet-experts/refresher-training/module-4-quality-improvement-of-student-learning/)

All assessment data are kept in notebooks in Technology 274, with one notebook per outcome (outcomes a-k are specified by ABET). Each semester, faculty members complete a form reporting on the assessments done in the courses each taught that semester. The assessment data for each outcome are evaluated on a three year schedule. That evaluation and minutes from the department meeting with the discussion and conclusion are presented below the table.

I. Program student learning outcomes (SLOs) assessed in this cycle, processes, results, and recommendations.

A. Which of the program SLOs were assessed during this cycle? **Please include the outcome(s) verbatim from the assessment plan.**	B. When was this SLO last assessed? Please indicate the semester and year.	C. What method was used for assessing the SLO? **Please include a copy of any rubrics used in the assessment process.**	D. Who was assessed? Please fully describe the student group(s) and the number of students or artifacts involved.	E. What is the expected achievement level and how many or what proportion of students should be at it?	F. What were the results of the assessment?	G. What were the department's conclusions about student performance?	H. What changes/improvements to the program are planned based on this assessment?
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	Every outcome is assessed every semester. Outcome (c) was last evaluated in Fall 2013.	Specific assignments in EN 360 (BSE only), EN 362 (BSE only), EN 460 (BSE only), EN 475 (BSIE only), EN 487 (BSE only) and EN 488 (BSIE only)	All students in each course were assessed on their performance on the specific assignment.	Usually 80% achieve 80% or better. See table below in section on assessment and evaluation of outcome (c).	See below for the section on assessment and evaluation of outcome (c), which includes an excerpt from the department minutes.	See below for the section on assessment and evaluation of outcome (c), which includes an excerpt from the department minutes.	No changes are planned based on this assessment and evaluation.
(d) an ability to function on multi-disciplinary teams,	Every outcome is assessed every	Specific assignments in EN 215 (BSIE only), and EN 430 (both)	All students in each course were assessed on their	Usually 80% achieve 80% or better. See table below in	See below for the section on assessment and	See below for the section on assessment and evaluation of outcome (c), which	We plan to determine if we are teaching the correct content by asking our advisory boards what they want graduates to

	semester. Outcome (d) was last evaluated in Fall 2011.		performance on the specific assignment.	section on assessment and evaluation of outcome (d).	evaluation of outcome (d), which includes an excerpt from the department minutes.	includes an excerpt from the department minutes.	know; we plan to review how and what we are teaching about teamwork; and we plan to review how we are assessing teamwork.
(e) an ability to identify, formulate, and solve engineering problems	Every outcome is assessed every semester. Outcome (e) was last evaluated in Spring 2011.	Specific assignments in EN 231 (both), EN 260 (BSE only), EN 471 (BSIE only), EN 487 (BSE only) and EN 488 (BSIE only)	All students in each course were assessed on their performance on the specific assignment.	Usually 80% achieve 80% or better. See table below in section on assessment and evaluation of outcome (e).	See below for the section on assessment and evaluation of outcome (e), which includes an excerpt from the department minutes.	See below for the section on assessment and evaluation of outcome (c), which includes an excerpt from the department minutes.	No changes are planned based on this assessment and evaluation.
(j) a knowledge of contemporary issues	Every outcome is assessed every semester. Outcome (j) was last evaluated in Spring 2011	Specific assignments in EN 101, EN 343 (both), EN 440 (BSIE only), EN 487 (BSE only) and EN 488 (BSIE only)	All students in each course were assessed on their performance on the specific assignment.	Usually 80% achieve 80% or better. See table below in section on assessment and evaluation of outcome (j).	See below for the section on assessment and evaluation of outcome (j), which includes an excerpt from the department minutes.	See below for the section on assessment and evaluation of outcome (c), which includes an excerpt from the department minutes.	No changes are planned based on this assessment and evaluation.

Comments: In the 2013-2014 report, we noted the problem that we currently assess the BSE and BSIE programs jointly. We are working to disaggregate these assessments, but the changes are not sufficiently implemented to be reflected in this report. Thus, the BSE and BSIE reports are still identical, despite our statement last year that they would not be. **We need to make sure we implement those changes this year.**

Assessment and evaluation of outcome (c)

(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

Report given to the faculty at the 16 Dec 2014 department meeting:

Outcome c

Course	Semester	Goal met?	Notes	IE, E, or both?	Criteria (student/score)%
			Courses Identified for Design assessment--- IE :EN 475, 477, 488 E: EN 360, 362,460, 487		
EN362	Fall 13	yes	Design of a simple digital control system with four inputs and 2 outputs	E	75/75
EN487	Spring 13	yes	Senior design projects: electro mechanical devices	E	75/75
EN460	Spring 13	yes	Find a stable range of a closed loop control system	E	75/75
EN 360	Fall 12	yes	Feed back control system design	E	75/75
EN460	Fall 12	yes	Design a digital phase-lead compensator	E	75/75
EN 362	Fall 12	yes	Design START, SWITCH and STOP section using micro-controller	E	75/75
EN 360	Spring 12	yes	Find a stable range of a closed loop control system	E	75/75
EN362	Fall 2011	yes	Design START, SWITCH and STOP section using micro-controller	E	75/75
EN 475	Fall 2011	YES	Block layout of facility	IE	67/40

EN 475	Fall 2012	YES	Block layout of facility	IE	67/46
EN 475	Fall 2013	YES	Block layout of facility	IE	67/46
EN 477	Spring 12	NO	Forecasting and Planning	IE	67/66
EN 477	Spring 13	YES	Forecasting and Planning	IE	67/66
EN 360	Fall 14	YES	Plot graph for the poles of a transfer function so that the system would satisfy given requirements	E	75/75
EN 460	Fall 13	NO	design a digital PD controller	E	70/70
EN 477	Fall 13	yes	Aggregate Planning AND Total cost	IE	85/75
EN 477	Fall 14	yes	Aggregate Planning AND Total cost	IE	85/75
EN475	Fall 14	YES	create a standard facility layout to manufacture the new toolbox	IE	85/75

problems selected represented the design content well and the students performance satisfy the design criteria

From 23 Jan 2015 department meeting minutes:

> Outcome c (design, Ananda). We corrected some criteria numbers and some semesters of offering. Ananda said we seem to be using good design problems and the performance satisfies the criteria. We discussed how we teach the design process. We teach it very explicitly in EN 101, EN 486, and then they apply it in EN 487/488. In other classes we might give somewhat different versions of the design process, but we agree that we all teach the same essence of a design process: state the problem, collect data, consider alternatives, evaluate, iterate, one criterion is always cost. In some classes we focus on just part of the design process. We concluded we are being consistent in what we teach students and our students are performing well on this criterion.

Assessment and evaluation of outcome (d)

(d) an ability to function on multi-disciplinary teams,

Report given to the faculty at the 16 Dec 2014 department meeting:

Outcome d Teamwork

Course	Semester	Goal met?	Notes	IE, E, or both?	
EN 215	Fa11	No	One mean was below 4.0 on 1-5 scale: "Attends meetings on time."		
EN 215	Fa12	Yes	Two students rated low on "Contributes fair share of work."	IE	Fraser
EN 215	Fa13	Yes	Item averages all above 4.0 on a scale of 1-5.	IE	Fraser
EN 215	Fa14	Yes	Assessment done by observation of teams.	IE	Fraser
EN 430	Fa11			Both	Paredes
EN 430	Fa12			Both	Russel
EN 430	Sp14			Both	Sarper

The assessment process in EN 215 has been working well, but that course is only taken by IE students. Material by Lencioni is used.

EN 430 is a good place to do this assessment since both majors take the course, but assessments have not been done mostly because the course was taught by adjuncts.

Based on this evidence, and on frequent faculty discussion of how we have our students work in teams, I believe our students are achieving this outcome, but we need to assess this outcome better.
Jane M. Fraser, 16 December 2014

From 16 Dec 2014 department meeting minutes:

> Outcome d (teams, Fraser), We don't know how we are doing on this outcome. We need to teach more about teams and we need to evaluate team performance better. We reviewed a handout (about Five Dysfunctions) and a team evaluation form from EN 215. We

could evaluate team performance in labs (eg 473 CIM and 441 Manufacturing). We should create a form all will use, so it serves as a teaching tool and an evaluation tool also. If we evaluate the students consistently with this form, they will learn what makes a good team member. Jane will look at ASEE papers for best practices. We will ask for input from our advisory boards in 2015 – what should we teach and how should we evaluate teams. Can we evaluate teams by observing them? Leonardo looks for empathy (eg they all sit together), project management (they have a time line), and task assignment (each team member knows what tasks they have to do). Ananda assigns roles in teams in labs. Can team members evaluate each other? Can they evaluate how well the team is working?

Assessment and evaluation of outcome (e)

(e) an ability to identify, formulate, and solve engineering problems

Report given to the faculty at the 16 Dec 2014 department meeting:

Outcome e: an ability to identify, formulate, and solve engineering problems				
Course	Semester	Goal met?	Notes	
EN 231	Fall 11	?		
	Fall 12	Yes		
	Fall 13	Yes/No	The mean score for a similar problem given during the final was above the goal	
	Fall 14	?		
EN 260	Spring 11	Yes		
	Spring 12	Yes		
	Spring 13	Yes		
	Spring 14	?		
EN 471	Fall 11	Yes		
	Fall 12	No	Eighty percent of the students (4 out of 5) were able to formulate, solve and perform sensitivity and duality analysis on several optimization problems.	
	Fall 13	No	Fifty eighty percent of the students (7 out of 12) were able to formulate, solve and perform sensitivity and duality analysis on several optimization problems.	
	Fall 14	Yes		
EN 488-487	Spring 11	Yes	All three projects met the goal	
	Spring 12	?		
	Spring 13	Yes	All six projects met the goal. However, two of them were not operational	
	Spring 14	Yes	All five projects met the goal	

The assessment process uses EN 231, EN 471, and EN 488 for BSIE students, for BE students EN 260 is added. The process is working well but adjustment was required to meet (or improve) the goal for student performance in EN 231 and EN 471.

The outcome is not being achieved in EN 471 during some semesters. However, for the last fall semester (2014) 90% of the students achieved the outcome. In this course, the students are getting the problem statements in advance and both their mathematical and LINGO/LINDO/Excel solutions. During class they are discussing the math formulation and the sensitivity and duality analysis for different types of optimization problems.
For EN 231, the evidence shows improvement (goal for student performance meet in the final) when the basics concepts of KVL and KCL are explained in detail.
For EN 488, all the projects have met the goalhowever, some of them are not fully operational but most of their components perform correctly.
Leonardo Bedoya-Valencia, 16 December 2014

From 16 Dec 2014 department meeting minutes:

Outcome e (EN problems, Bedoya), The evaluation process is working well and our students are doing fine on this outcome. We have assessment in courses both majors take and in courses taken only by BSIE and others taken only by BSE. At lower level courses, students solve problems, then add formulation in later courses, and identification of problems in even later courses, especially the senior project courses.

Assessment and evaluation of outcome (j)

(j) a knowledge of contemporary issues

Report given to the faculty at the 16 Dec 2014 department meeting:

Outcome j: a knowledge of contemporary issues				
Course	Semester	Goal met?	Notes	
EN 343	Fa11	Yes	Pick and track a stock	Both
EN 343	Fa12	Yes	Pick and track a stock	Both
EN 343	Sp14			
EN 487/488	Sp11	Yes	All three projects discussed contemporary issues, such as jobs and the environment	
EN 487/488	Sp12			
EN 487/488	Sp13	Yes	All reports discussed contemporary issues, mostly sustainability	Both
EN 487/488	Sp14	Yes	All reports discussed contemporary issues, mostly sustainability	Both

The assessment process uses EN 343 and EN 488 for BSE and BSIE students. The process is working well. The senior design project is really the best place to determine if students have a knowledge of contemporary issues since the assessment is done in the context of an engineering design project.

The outcome is being achieved. All EN 488 projects since the last review of this outcome have included discussion of contemporary issues.

No changes need to be made, but we should discuss contemporary issues about which students should have knowledge.

Jane M. Fraser, 16 Dec 2014

From 16 Dec 2014 department meeting minutes:

> Outcome j (contemporary issues, Fraser). Contemporary issues about which students should have knowledge: policy behavior; health care; how robotics and workers working together achieve high efficiency in US manufacturing; sustainability, which includes everything; energy and fracking; effects of cheap gasoline; AI is the death of humanity (Hawking); earthquake in China. Faculty should occasionally

start class with “did you read about this in the news?” We should bring articles to class. Engineers need knowledge of contemporary issues, even those not directly related to engineering.

II. Follow-up (closing the loop) on results and activities from previous assessment cycles. In this section, please describe actions taken during this cycle that were based on, or implemented to address, the results of assessment from previous cycles.

A. What SLO(s) did you address? Please include the outcome(s) verbatim from the assessment plan.	B. When was this SLO last assessed? Please indicate the semester and year.	C. What were the recommendations for change from the previous assessment?	D. Were the recommendations for change acted upon? If not, why?	E. What were the results of the changes? If the changes were not effective, what are the next steps or the new recommendations?

No changes were made during 2014-15 in the engineering programs.

Changes were implemented in individual courses in response to assessments in those courses. For example, in EN 211, in response to assessment in Fall 2013, the pace of instruction was slowed in Fall 2014; the faculty member commented "Slower pace of instruction helped students to soak the idea but overall performance of the class was not better than last year." He intends to urge students to use the department tutoring service. As another example, in response to earlier assessment in EN 460, "The instructor arranged a couple of lecture sessions in a computer lab this semester so that the students could practice in-class exercises during the lecture sections. It seems helpful although it did take a considerably amount of lecture time. Accordingly, less design problems were covered in class this time. The instructor will continue working on this approach and try to manage it in a more balanced way."

Such changes are part of our ABET assessment and evaluation cycle and take place frequently. More such changes are documented in the notebooks in Technology 274.