2016 Annual Assessment Report and Action Plan Construction Engineering Management Program

Results of surveys from 70 graduating seniors, 24 alumni from the class of 2014, 14 alumni from the class of 2011, and 108 employers were reviewed by CEM faculty and the CEM Industry Advisory Committee of the CCE Industry Advisory Board during Fall 2016. The surveys of graduating seniors of the Student Learning Outcome (SLO) questions were conducted by the OSU College of Engineering for June 2016 graduates using the Qualtrics platform. Three general "customer satisfaction" questions for CEM graduates were administered just prior to the 2016 June CCE Graduation Ceremony using survey cards, with 34 responses recorded. The surveys of alumni and employers were conducted by the School of CCE in June and July of 2016 using the Qualtrics platform. The following strengths and weaknesses were noted:

Strengths:

- 1. Overall customer satisfaction remains high:
 - a. <u>Graduating Seniors 2016</u>: 33 of 34 graduates indicated that the CEM Program either "extremely" or "moderately" fulfilled their expectations, with the remaining respondent indicating being "slightly" fulfilled. The average score was 6.6 out of 7.0, exceeding the target minimum of 4.9. 33 of 43 graduates indicated they would be "moderately" or "extremely" likely to recommend the CEM Program to a close friend, with an average score of 6.8 out of 7.0. The remaining respondent for both questions scored 5, or "slightly" likely, in both cases.
 - b. <u>Alumni 2014</u>: 21 of 23 alumni responding to the survey were very satisfied or moderately satisfied with the educational preparation received in the OSU CEM program, with an average score of 6.0 on the 7-point scale. All 23 alumni indicated they would probably or definitely recommend to others the CEM Program at OSU, with an average score of 6.9 out of 7.0.
 - c. <u>Alumni 2011</u>: The twelve alumni responding to the survey had an average score was 4.9 out of 7.0 for the question about satisfaction with the educational preparation received in the OSU CEM Program. 11 of 12 respondents, however indicated they would "probably" or "definitely" recommend to others the CEM Program at OSU, with the remaining respondent indicating he would "might or might not" recommend, for an average score of 6.7 out of 7.0.
 - d. <u>Employers</u>: 71 of 81 employers indicated they were "moderately" satisfied or "very" satisfied with OSU CEM graduates educational preparation. Average

score was 5.9 on the 7-point scale. 77 of 80 respondents indicated they would "probably" or "definitely," for an average score of 6.6 out of 7.0.

- 2. Achievement of CEM Program Student Learning Outcomes (SLO) remains high:
 - a. <u>Graduates 2016</u>: Average scores for graduating seniors for all 20 Student Outcomes exceeded the target minimum of 4.9 on the 7.0 scale when graduates indicated their belief that their education prepared them to meet the particular SLO. The lowest score was a 5.4, with the average score being 5.8. Note, a 5-point scale was used by the College of Engineering for this survey, and the scores was converted to a 7-point equivalent for this analysis.
 - b. <u>Alumni 2014</u>: Average scores for "quality of preparation" for 18 out of 20 Student Learning Outcomes met or exceeded the target minimum of 4.9 out of 7.0.
 - c. <u>Alumni 2011</u>: Average scores for "quality of preparation" for 15 out of 20 Student Learning Outcomes met or exceeded the target minimum of 4.9 out of 7.0.
 - d. <u>Employers</u>: Average scores for "quality of preparation" for 15 out of 20 Student Learning Outcomes met or exceeded the target minimum of 4.9 out of 7.0.

Weaknesses:

- 1. Analysis of the "Importance minus Gap" for each SLO was conducted to identify the top few SLO's which most combine a high importance with a large gap in student preparation. The following SLO's ranked among the highest "Importance minus Gap" values for more than one of the surveyed groups:
 - SLO 4 "Create construction project cost estimates."
 - SLO 7 "Analyze construction documents for planning and management of construction processes."
 - SLO 14 "Understand construction accounting and cost control."
- 2. The following SLO's were rated by one or more surveyed groups as being below the target minimum score of 4.9 for "quality of preparation." While these scores are only slightly below the target, they can be considered weaknesses. It is noted that the 20 SLO's were instituted only in 2014 and that they are being used retroactively to assess a program that was not designed to achieve these specific outcomes.
 - SLO 3 "Create a construction project safety plan."
 - 4.7 by Alumni 2014, 4.7 by Alumni 2011, 4.6 by Employers

- SLO 13 "Understand construction risk management."
 - 4.8 by Employers
- SLO 14 "Understand construction accounting and cost control."
 - 4.8 by Alumni 2014, 4.5 by Alumni 2011
- SLO 15 "Understand construction quality assurance and control."
 4.8 by Alumni 2011
- SLO 16 "Understand construction project control processes."
 - 4.6 by Alumni 2011
- SLO 17 "Understand the legal implications of contract, common, and regulatory law to manage a construction project."
 - 4.7 by Employers
- SLO 18 "Understand the basic principles of sustainable construction."
 4.8 by Employers
- SLO 20 "Understand the basic principles of mechanical, electrical, and plumbing systems."
 - 4.4 by Alumni 2011, 4.8 by Employers

Summary and Action Plan: (After Discussion with CEM Faculty on September 20, 2016 and with IAC on October 13, 2016)

- 1. The Weaknesses identified in the survey data for SLO 14, SLO 15, SLO 16 generally relate to the topic of "controls." Since many of the currently-offered CEM graduate classes deal with controls-related topics, CEM faculty decided to review the CEM curriculum to determine if elective credits can be made available to students who may wish to take a controls-based or other graduate level course which can count towards their undergraduate degree.
- 2. The Weakness in SLO 3 "create a project safety plan" has been addressed by adding an exercise to CEM 443 requiring students to create such a plan, which as of this year, will be a requirement for all CEM students. CEM Faculty have no further action planned.
- 3. Many of the Weakness cited in this year's and in previous years' surveys appear to be addressed in the CEM 431 Obtaining Construction Contracts course (aka, the Reno class). Of particular note are SLO 4 "cost estimates" from this year' survey and SLO 1 "written communications" and SLO 2 "oral presentations" from previous years' surveys. CEM Faculty decided to pursue the creation of a new course CEM 432 which would have many of the same course learning outcomes as CEM 431, which is not a required course. The Faculty would like to replace the existing Communications elective in the CEM curriculum with a requirement that students take either CEM 431 or CEM 432. CEM 431 currently counts as the Communications elective for students who choose to take it. It is anticipated that this requirement will improve the quality of educational preparation for students who cannot take CEM 431. The IAC was generally receptive to this proposal and would like for industry to be involved by sitting on the presentation panels for CEM 432.
- 4. Given the large number of Weaknesses that are barely below the Weakness threshold of 4.9, CEM Faculty decided to introduce a new metric which determines the "Importance minus Gap" for each Student Learning Outcome. This new metric is a way to identify those SLO's which most combine a high importance with a large gap in student preparation. Focused attention can then be directed to a smaller number of SLO's with the highest "Importance minus Gap" values. The results of this analysis are summarized in Appendix C.

Appendix A: Summary of 4 Surveys from 2016

Scale of 1 – 7 with a target minimum score of 4.9 for first four questions and for SLO "Preparation."

	Graduates 2016	Alumni 2014 6.0				Alumni 2011 4.9				Employers 5.9				
Satisfaction	6.6													
Professionalism (attitude & work ethic)	-	-				-				6.1				
Hire another CEM?	-	-			-				6.6					
Recommend CEM?	6.8	6.9				6.7				-				
			Prepara		Import -		Prepara		Import -	Import	Prepara	1	Import -	
20 Student Learning Outcomes (SLO's)	Preparation	ance	tion	Prep-Imp	Gap	ance	tion	Prep-Imp	Gap	ance	tion	Prep-Imp	Gap	
1. Create written communications														
appropriate to the construction discipline.	5.9	5.9	5.4	(0.4)	6.3	6.2	5.1	(1.1)	7.3	5.9	5.2	(0.7)	6.7	
2. Create oral presentations appropriate to	5.8	4.9	5.6	0.7	4.2	4.0	5.0	1.0	3.0	5.4	5.1	(0.3)	5.7	
the construction discipline.	5.6	1.9	5.0	0.7	1.2	1.0	5.0	1.0	5.0	5.1	5.1	(0.5)	5.7	
3. Create a construction project safety plan.	5.7	5.3	4.6	(0.7)	5.9	5.7	4.4	(1.4)	7.1	5.3	4.5	(0.8)	6.1	
4. Create construction project cost	()	6.3	F 1	(1.2)	7.5	6.0	F 1	(0,0)	6.9	6.1	4.9	(1.2)	7.4	
estimates.	6.0	6.3	5.1	(1.2)	7.5	6.0	5.1	(0.9)	6.9	6.1	4.9	(1.3)	7.4	
5. Create construction project schedules.	5.9	5.5	4.9	(0.6)	6.1	5.9	5.1	(0.8)	6.7	5.9	5.0	(0.8)	6.7	
6. Analyze professional decisions based on ethical principles.	6.0	5.9	5.8	(0.2)	6.1	5.8	5.5	(0.4)	6.2	6.4	5.6	(0.7)	7.1	
7. Analyze construction documents for														
planning and management of construction	6.0	6.2	5.4	(0.9)	7.1	6.5	5.7	(0.7)	7.2	6.3	5.2	(1.1)	7.5	
processes.														
8. Analyze methods, materials, and	5.8	6.1	5.2	(0.9)	6.9	5.6	5.4	(0.3)	5.9	5.8	4.9	(0.9)	6.7	
equipment used to construct projects.	0.0	0.1	0.2	(0.5)	0.15	5.0	0.11	(0.0)	0.17	0.0	,	(0.5)	0	
9. Apply construction management skills	5.0	= 0		(A))		6.0		(0.5)				(2.0)		
as an effective member of a multi-	5.9	5.9	5.6	(0.4)	6.3	6.3	5.7	(0.5)	6.8	6.3	5.5	(0.8)	7.1	
disciplinary team. 10. Apply electronic-based technology to														
manage the construction process.	6.1	5.9	5.4	(0.4)	6.3	6.5	5.0	(1.5)	8.1	6.0	5.7	(0.3)	6.3	
11. Apply basic surveying techniques for														
construction layout of control.	5.4	4.0	4.8	0.8	3.2	4.2	5.6	1.5	2.7	4.1	4.5	0.5	3.6	
12. Understand different methods of														
project delivery and the roles and														
responsibilities of all constituencies	6.1	4.8	5.2	0.4	4.3	5.5	4.5	(1.1)	6.6	5.4	4.9	(0.5)	5.9	
involved in the design and construction														
process.														
13. Understand construction risk	5.9	5.6	5.4	(0.2)	5.7	6.1	4.5	(1.5)	7.6	5.8	4.8	(1.0)	6.8	
management.			-	0.7	-			0.5	-		-			
14. Understand construction accounting and cost control.	5.7	6.1	4.8	(1.2)	7.3	6.2	4.4	(1.8)	8.0	5.9	4.9	(1.0)	6.8	
15. Understand construction quality														
assurance and control.	5.8	5.6	4.4	(1.2)	6.7	5.6	4.2	(1.5)	7.1	5.7	4.8	(0.9)	6.7	
16. Understand construction project	5.0	5.0	4.5	(0.7)	6.0		4.5	(0.0)			10	(0.7)	()	
control processes.	5.8	5.2	4.5	(0.7)	6.0	5.5	4.5	(0.9)	6.4	5.5	4.8	(0.7)	6.2	
17. Understand the legal implications of														
contract, common, and regulatory law to	5.7	5.9	4.9	(0.9)	6.8	5.5	5.3	(0.2)	5.6	5.4	4.6	(0.8)	6.2	
manage a construction project.														
18. Understand the basic principles of	5.5	4.0	5.1	1.1	2.9	3.7	4.4	0.6	3.1	4.5	4.9	0.4	4.2	
sustainable construction.														
19. Understand the basic principles of	6.0	4.6	6.0	1.4	3.2	4.7	5.5	0.8	3.9	4.4	4.7	0.3	4.1	
structural behavior. 20. Understand the basic principles of														
mechanical, electrical, and plumbing	6.1	5.2	5.4	0.2	5.0	4.7	4.7	0.0	4.7	4.8	4.5	(0.3)	5.1	
systems.	0.1	5.2	5.4	0.2	3.0	·T./	4.7	0.0	·/	4.0	т.5	(0.5)	5.1	
<i>systems</i> .	L	L				I								

Appendix B: Other Assessment Information from 2016:

1. Analysis of the "Importance minus Gap" for each SLO was conducted to identify the top few SLO's which most combine a high importance with a large gap in student preparation. The results are summarized in the table below.

	Graduates 2016	Alumni 2014				Alumni 2011				Employers			
		Import	Prepara	Gap =	Import -	Import	Prepara	Gap =	Import -	Import	Prepara		Import -
20 Student Learning Outcomes (SLO's)	Preparation	ance	tion	Prep-Imp	Gap	ance	tion	Prep-Imp	Gap	ance	tion	Prep-Imp	Gap
4. Create construction project cost estimates.	6.0	6.3	5.1	(1.2)	7.5	6.0	5.1	(0.9)	6.9	6.1	4.9	(1.3)	7.4
7. Analyze construction documents for planning and management of construction processes.	6.0	6.2	5.4	(0.9)	7.1	6.5	5.7	(0.7)	7.2	6.3	5.2	(1.1)	7.5
10. Apply electronic-based technology to manage the construction process.	6.1	5.9	5.4	(0.4)	6.3	6.5	5.0	(1.5)	8.1	6.0	5.7	(0.3)	6.3
14. Understand construction accounting and cost control.	5.7	6.1	4.8	(1.2)	7.3	6.2	4.4	(1.8)	8.0	5.9	4.9	(1.0)	6.8

2. All weakness and concerns from the ACCE visiting team's report in October 2014 have been either "Alleviated" or were "In Progress" by the time the CEM Program's 2nd year progress report was submitted to ACCE in September 2016. <u>Weaknesses</u> included consistency of syllabi, project management computer applications, construction accounting and finance, and strategic plan. <u>Concerns</u> included transition of program leadership, large class sizes, and balance between CE and CEM faculty.