Quality Improvement Plan for
B.S. in Construction System Management

This Academic Quality Improvement Plan consists of the strategic plan, the assessment plan, and the assessment implementation plan with detailed guidelines and procedures for continuous quality improvement of the undergraduate B.S. in Construction Systems Management (CSM).

1. STRATEGIC PLAN FOR THE DEGREE PROGRAM

The degree program has developed the following strategic plan that enables the program to fulfill its mission.

STRATEGIC PLAN FOR THE CSM PROGRAM (2018-2020)

1. Increase the number of faculty teaching in the CSM program

2. Strengthen the recruitment efforts to increase the number of CSM students
    - *2.1. Strengthen the existing 2+2 programs*
    - *2.2. Increase the number of transfer students within OSU*

3. Increase the diversity of CSM students
    - *3.1. Recruit and retain an undergraduate student population that represents a diverse background of identities*

4. Continue to improve the program curriculum and align the academic program to the industry needs and standards
    - *4.1. Conduct periodical curriculum reviews*
    - *4.2. Incorporate advanced construction technologies that are critical to construction project delivery into classroom teaching*
    - *4.3. Enhance laboratory spaces and teaching facilities to meet the needs of construction education*
    - *4.4. Collaborate with national and local industry associations*
    - *4.5. Maintain ACCE accreditation for the program*

This strategic plan was updated in the fall of 2018 by the CSM faculty and staff. It has been reviewed by IAC. In the summer of 2017, a visioning exercise was conducted by the FABE faculty and staff in a retreat. The strategic growth areas proposed during this retreat were incorporated into the current strategic plan.

The Ohio State University adopted Responsibility-Based Budgeting (RBB) a number of years ago. In addition, the Board of Regents (controlling body of Ohio state universities and colleges) and the Ohio Legislature provide a tuition subsidy based on student credit hours taught. At the university-level state subsidy and tuition funds are distributed to

colleges based on a formula that considers the level and nature of courses taught in addition student credit hours. Within the CFAES the tuition and state subsidy funds are distributed to academic units using an allocation scheme that considers academic unit performance in addition to the previously identified factors. Within FABE these funds are used to pay the salaries or wages of faculty, staff and graduate TA's who are involved in attracting, advising and delivering instruction to undergraduate and graduate students enrolled in academic programs housed within the unit. Students also pay a Learning Technology Fee that comes back to the academic unit in the form of support for computing hardware and software, and other technologies (GPS surveying equipment, electrical/electronic teaching lab equipment, etc.). Every effort is made to balance the distribution of funds between academic programs within the unit, and when possible through the multiple use of existing resources (teaching and computer lab resources). External factors that influence the degree program are the economy, student enrollment, and Industry Advisory Council (IAC).

Our strategic plan considers both external and internal factors the influence the degree program. The plan is periodically reviewed and assessed. The latest plan was updated in the fall of 2018 by the CSM faculty and staff. It has been reviewed by IAC. In the summer of 2017, a visioning exercise was conducted by the FABE faculty and staff in a retreat. The strategic growth areas proposed during this retreat were incorporated into the current strategic plan.

2. ASSESSMENT PLAN FOR THE DEGREE PROGRAM

This comprehensive assessment plan guides the continuous improvement of our CSM program.

2.1 Mission Statement

The mission of the CSM program parallels the FABE department mission and is: *"To advance the science and technology applied to construction for improving the lives of people."*

2.2 Degree Program Objectives

Students who major in Construction Systems Management specialize in the management and operation of the business and technological aspects of the construction industry. CSM students develop managerial skills to prepare them for a career in coordinating and directing activities in a range of industry sectors including residential, commercial, and heavy (roads, bridges, and freeways) construction.

To ensure the success of CSM graduates while meeting the needs of the construction industry, we define the following specific program objectives:

- Maintain a proper size of the program
- Increase the diversity of student body

- Provide extra-curricular opportunities for students
- Provide students with experiential learning/internship experience
- Achieve a high job placement rate for CSM graduates
- Maintain proper accreditation for the program

2.3 Degree Program Learning Outcomes

Program Educational Objectives

The program leading to a B.S. degree in Construction Systems Management guides, nurtures, and informs students to become alumni who are able to:

1. Plan and manage the construction of buildings and other infrastructure, and associated systems that meet all functional, safety, environmental, legal and economic requirements.

2. Follow the business principles and ethical practices necessary to build and maintain a viable company serving the construction industry.

3. Function effectively both as a team member and leader interacting successfully with clients, owners, government officials, the general public, and construction industry professionals from diverse ethnic and cultural backgrounds.

4. Become an accomplished professional in the construction industry who continuously updates his or her technical and management skills and serves relevant industry associations and organizations.

5. Contribute technical and management expertise to the improvement of local communities through active participation in community activities, organizations and charities.

Our degree program has three program learning goals, each of which contains a set of supporting/contributing outcomes adopted from the 20 ACCE SLOs. The description of these goals and outcomes is as follows:

Program Learning Goals

GOAL 1.0 Apply the professional, interpersonal and communication expertise and professional ethics essential for employment and advancement in the construction industry

Outcome 1.1 Create written communications appropriate to the construction discipline {ACCE SLO #1}

Outcome 1.2 Create oral presentations appropriate to the construction discipline {ACCE SLO #2}

Outcome 1.3 Analyze professional decisions based on ethical principles {ACCE SLO #6}

GOAL 2.0 Apply and integrate the appropriate construction methods, skills, and techniques for planning and managing construction projects

Outcome 2.1 Create a construction project safety plan {ACCE SLO #3}

Outcome 2.2 Create construction project cost estimates {ACCE SLO #4}

Outcome 2.3 Create construction project schedules {ACCE SLO #5}

Outcome 2.4 Analyze construction documents for planning and management of construction processes {ACCE SLO #7}

Outcome 2.5 Analyze methods, materials, and equipment used to construct projects {ACCE SLO #8}

Outcome 2.6 Apply construction management skills as a member of a multi-disciplinary team {ACCE SLO #9}

Outcome 2.7 Apply electronic-based technology to manage the construction process {ACCE SLO #10}

Outcome 2.8 Apply basic surveying techniques for construction layout and control {ACCE SLO #11}

Goal 3.0 Understand the concepts, knowledge, and principles of building subsystems, construction disciplines, and business management

Outcome 3.1 Understand different methods of project delivery and the roles and responsibilities of all constituencies involved in the design and construction process {ACCE SLO #12}

Outcome 3.2 Understand construction risk management {ACCE SLO #13}

Outcome 3.3 Understand construction accounting and cost control {ACCE SLO #14}

Outcome 3.4 Understand construction quality assurance and control {ACCE SLO #15}

Outcome 3.5 Understand construction project control processes {ACCE SLO #16}

Outcome 3.6 Understand the legal implications of contract, common, and regulatory law to manage a construction project {ACCE SLO #17}

Outcome 3.7 Understand the basic principles of sustainable construction {ACCE SLO #18}

Outcome 3.8 Understand the basic principles of structural behavior {ACCE SLO #19}

Outcome 3.9 Understand the basic principles of mechanical, electrical and piping system {ACCE SLO #20}

These program learning goals were defined during our initial ACCE accreditation process in 2014, but with different supporting outcomes. With the shift made by ACCE and OSU towards the outcome-based assessment, the CSM faculty,

instructors, and the Director for Teaching, learning and Assessment in our college worked together to review and revise the original document to meet the new requirements of ACCE and the university. The revision was then circulated among IAC members to seek their feedback.

2.4 Assessment Tools

The assessment for the degree Program Objectives is a collection of annual data that is compared to a threshold. The assessment tools used to measure degree program objectives are specified below:

- Maintain a proper size of the program
  - Report the total number of students enrolled in the program during the fall semester.
- Increase the diversity of student body
  - Report % of women and minority students enrolled in the program during the fall semester.
- Provide extra-curricular opportunities for students
  - Report % of students having extra-curricular activities based on the Exit Survey results
- Provide students with experiential learning/internship experience
  - Report % of students with one or more internships based on the Exit Survey results
- Achieve a high job placement rate for CSM graduates
  - Report the 6-month post-graduation placement rate
- Maintain proper accreditation for the program
  - Report the ACCE accreditation status

The assessment tools for each of the 20 Student Learning Outcomes include at least one direct measure and one indirect measure. These measures are summarized in the following table. The detailed description of the direct assessment methods and the used grading rubrics are presented in the Appendix I of this Quality Improvement Plan. The Exit Survey instrument (including the survey questions used as the indirect assessment methods for the 20 ACCE Student Learning Outcomes) is shown on the FABE website (https://fabe.osu.edu/about-us/accreditation).

Construction Systems Management – Bachelor of Science {CONSYM-BS}

Academic Program Learning Outcomes Assessment Plan

Assessment Contact: Gonul Kaletunc.1 | Qian Chen.1399
Department Chair: Scott Shearer.95

Program Learning **Goals** *Broad descriptive statements of what students are to be able to do, know, and care about upon the completion of the program*	Supporting/Contributing **Outcomes** *Detailed descriptions of what a student must be able to do to reach a goal under the specific conditions*	**Methods** – Means/Measures *The method or means by which the quality of student learning for each goal and associated outcome will be measured and assessed*			**Type** *DA denotes direct assessment and IA denotes indirect assessment*	**Criteria** *The standards the program will use to evaluate the quality of student learning for each goal and associated outcome*
			Course or program requirement	*Embedded course assignment, exam, exercise, or activity to serve as authentic assessment method / the perception, opinion, or attitude of students or others*		
1.0 Apply the professional, interpersonal and communication expertise and professional ethics essential for employment and advancement in the construction industry	1.1 **Create** written communications appropriate to the construction discipline *{ACCE SLO #1}*	1.1.1	CSM4605	Combined grade for four writing assignments	DA	**A**
		1.1.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	**B**
	1.2 **Create** oral presentations appropriate to the construction discipline *{ACCE SLO #2}*	1.2.1	CSM 4605	Final presentation	DA	**A**
		1.2.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	**B**
	1.3 **Analyze** professional decisions based on ethical principles *{ACCE SLO #6}*	1.3.1	CSM 4605	One ethics essay writing assignment	DA	**A**
		1.3.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	**B**

Goals	Outcomes	Methods			Type	Criteria
2.0 Apply and integrate the appropriate construction methods, skills, and techniques for planning and managing construction projects	2.1 **Create** a construction project safety plan *{ACCE SLO #3}*	2.1.1	CSM2600	Safety Plan assignment	DA	A
		2.1.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	2.2 **Create** construction project cost estimates *{ACCE SLO #4}*	2.2.1	CSM 3450	Take-home exam for an estimating project	DA	A
		2.2.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	2.3 **Create** construction project schedules *{ACCE SLO #5}*	2.3.1	CSM 3451	A schedule lab based on an actual project	DA	A
		2.3.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	2.4 **Analyze** construction documents for planning and management of construction processes *{ACCE SLO #7}*	2.4.1	CSM 3450	Homework on structural steel take-off	DA	A
		2.4.2	CSM 3451	Exam on determining construction activities and sequences based on an actual project	DA	A
		2.4.3	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	2.5 **Analyze** methods, materials, and equipment used to construct projects *{ACCE SLO #8}*	2.5.1	CSM 3450	Take-home exam for an estimating project	DA	A
		2.5.2	CSM 4660	Exam based on given project documents and site visit	DA	A
		2.5.3	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	2.6 **Apply** construction management skills as a member of a multi-disciplinary team *{ACCE SLO #9}*	2.6.1	CSM 4900	Under development	DA	A
		2.6.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	2.7 **Apply** electronic-based technology to manage the construction process *{ACCE SLO #10}*	2.7.1	CSM 4641	Average grade for two homework assignments using electronic-based technology to create site utilization plan and request for change order	DA	A
		2.7.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	2.8 **Apply** basic surveying techniques for construction layout and control *{ACCE SLO #11}*	2.8.1	CSM 2440	Lab assignment to set up a layout for a simple structure using the Total Station	DA	A
		2.8.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B

3.0 Understand the concepts, knowledge, and principles of building subsystems, construction discipline, and business management	3.1 **Understand** different methods of project delivery and the roles and responsibilities of all constituencies involved in the design and construction process *{ACCE SLO #12}*	3.1.1	CSM 4642	17 selected questions in the midterm	DA	A
		3.1.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	3.2 **Understand** construction risk management *{ACCE SLO #13}*	3.2.1	CSM 4642	Average grade for midterm and final	DA	A
		3.2.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	3.3 **Understand** construction accounting and cost control *{ACCE SLO #14}*	3.3.1	CSM 4900	A homework assignment related to applying cost code and type to estimated costs	DA	A
		3.3.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	3.4 **Understand** construction quality assurance and control *{ACCE SLO #15}*	3.4.1	CSM 4641	A homework assignment to create a quality control plan based on given construction documents	DA	A
		3.4.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	3.5 **Understand** construction project control processes *{ACCE SLO #16}*	3.5.1	CSM 4641	A homework assignment to create bid packages from a set of contract specifications	DA	A
		3.5.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	3.6 **Understand** the legal implications of contract, common, and regulatory law to manage a construction project *{ACCE SLO #17}*	3.6.1	CSM 4642	Average grade for midterm and final	DA	A
		3.6.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	3.7 **Understand** the basic principles of sustainable construction *{ACCE SLO #18}*	3.7.1	CSM 4900	A homework assignment about sustainable construction	DA	A
		3.7.2	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	B
	3.8	3.8.1	CSM 3545	Average grade of three midterms	DA	A

	Understand the basic principles of structural behavior *{ACCE SLO #19}*	3.8.2	CSM 3546	Average grade of three midterms	DA	**A**
		3.8.3	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	**B**
	3.9 Understand the basic principles of mechanical, electrical and piping system *{ACCE SLO #20}*	3.9.1	CSM 2310	Average grade of two midterms	DA	**A**
		3.9.2	CSM 2345	Average grade of three midterms	DA	**A**
		3.9.3	Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	IA	**B**

EXAMPLE identified "criteria"

Indicate the standards the program will use to evaluate the quality of student learning for each goal and associated outcome. Programs are to indicate both the minimum criteria required to assert a learning outcome (and thus collectively with other outcomes the associated goal) was achieved, and criteria of excellence the program is striving toward.

A	Minimal acceptable criterion for this supporting outcome method is 75% of students scoring 70% or higher on the identified assessment tasks for the measurement of achievement for this outcome. When 90% of the students obtain scores of 90% or higher on the selected assessment associated assignment, the performance standard constituting programmatic excellence for this learning outcome measure will be attained.
B	This indirect measure will serve as an indicator of attainment of this learning goal's supporting outcome. Specifically, minimal acceptable criterion for the identified supporting learning outcome is when the students graduating from the program rate at least 3.5 on average based on scale of 1 to 5 on the question that asks how a student feels that he/she was prepared to accomplish this learning outcome. When the average rating is 4.5 or above, the performance standard constituting programmatic excellence for this learning outcome will be attained.

In addition, we developed a curriculum map (shown below) that clearly relates Course Learning Outcomes to the 20 ACCE Student Learning Outcomes. The map also shows which courses have course learning outcome supporting ACCE SLOs and which courses provide direct assessment for ACCE SLOs. This map had gone through multiple revisions during the development of assessment tools. At present, the relationship between the Course Learning Outcomes of CSM 2210 Graphics Presentation I and ACCE SLOs has not been identified since this course had been taught externally until Sp 2019. Once the course content becomes stable and the CSM instructor who will continue teaching this course is determined, this map will be updated based on the feedback of the instructor. We anticipate that this curriculum map will be reviewed annually by CSM faculty and instructors in the future to ensure that it still accurately reflects what content is covered by each course. If a different instructor is assigned to teach a required CSM course, a face-to-face meeting will be held between the instructor and the CSM Co-coordinator to review this map and the existing course syllabus. This will help the individual understand how his or her course learning outcomes relate to the program's assessment plan and ensure that the course can continuously provide support or assessment for the related ACCE SLO(s).

ACCE Student Learning Outcomes (SLOs) and Assessment Measures in CSM Required Courses (Revision: 5/22/2019)

Student Learning Outcomes (SLOs)	CSM 2205 Intro to Constr. Manage. (M. Ware)	CSM 2210 Graphics Presentation I (D. Schafer)	CSM 2240 Matl & Methods I (L. Heckendorn)	CSM 2241 Matl & Methods II (J. Suchy)	CSM 2305 Professional Dev. I (A. Britt)	CSM 2310 Elec. & Lighting (J. Suchy)	CSM 2345 Mech. Systems (Q. Chen)	CSM 2440 Survey & Site Dev. (D. Schafer)	CSM 2600 Constr. Safety (J. Eaves)	CSM 3450 Estimating (P. Sutton)	CSM 3451 Scheduling (P. Sutton)	CSM 3545 Structures for CM I (M. Brown)	CSM 3456 Structures for CM II (M. Brown)	CSM 3191 Intership (M. Ware)	CSM 4605 Professional Dev. II (A. Pruneau)	CSM 4641 Constr. Proj. Manage. (M. Banta)	CSM 4642 Constr. Contract & Doc. (M. Scott)	CSM 4660 Heavy Constr. Manage. (P. Sutton)	CSM 4900 Capstone (M. Ware)	Exit Survey
1. Create written communications appropriate to the construction discipline		Taught externally before and just moved into the FABE dept.		I	I		I		R						DA	R	R		R	IA
2. Create oral presentations appropriate to the construction discipline	I				I		R							R	DA					IA
3. Create a construction project safety plan			I						DA										R	IA
4. Create construction project cost estimates			I	I		I	I	I		DA						R	R		R	IA
5. Create construction project schedules	I		I								DA					R			R	IA
6. Analyze professional decisions based on ethical principles									I		I	I	I		DA	R	R			IA
7. Analyze construction documents for planning and management of construction processes			I					I		DA	DA	R	R			R	R	R	R	IA
8. Analyze methods, materials, and equipment used to construct projects	I		I	I		I	I			DA	R	R	R					DA	R	IA
9. Apply construction management skills as a member of a multi-disciplinary team											I	I	I				R		DA	IA
10. Apply electronic-based technology to manage the construction process										I	I					DA				IA
11. Apply basic surveying techniques for construction layout and control								DA										R		IA
12. Understand different methods of project delivery and the roles and responsibilities of all constituencies involved in the design and construction process	I										I					R	DA		R	IA
13. Understand construction risk management			I						R							R	DA			IA
14. Understand construction accounting and cost control	I									R	R					R			DA	IA
15. Understand construction quality assurance and control			I	I		I	I					R	R			DA			R	IA
16. Understand construction project control processes				I				I		I	I					DA	R			IA
17. Understand the legal implications of contract, common, and regulatory law to manage a construction project	I					I	I	I				I				R	DA		R	IA
18. Understand the basic principles of sustainable construction				I		I	I	I											DA	IA
19. Understand the basic principles of structural behavior			I	I				R				DA	DA							IA
20. Understand the basic principles of mechanical, electrical and piping systems						DA	DA			R									R	IA

Note:

Introduction (I): The concpets were introduced to the students.

Reinforcement (R): The concepts introduced by lower-level courses are reinforced in the course, so students can have better understanding or are able to apply the knowledge.

Direct Asessment (DA): Evidence of student learning is in the form of a student product or performance that can be evalauted; e.g., licensure or certification, embedded testing or quizzes, assignment, pre-post-tests, and capstone projects

Indirect Assessment (IA): The perception, opinion, or attitude of students (or others); e.g., student surveys, alumni surveys, employer surveys, end-of-course evaluations, interviews, job placement data, enrollment in higher degree programs

The assessment data for the Student Learning Outcomes are collected annually. Since all the required CSM courses and the senior exit survey are offered in both spring and fall semesters, each SLO is expected to be measured twice a year. For ACCE assessment purpose, the collected SLO assessment data are analyzed in every three years, so the trends and necessary actions/changes can be determined.

In addition to these assessment tools, IAC Educational Subcommittee will conduct a curriculum/syllabi review as well as an IAC Member Survey in every three years. The review and survey results and their recommendations will be provided to the CSM program for continuous improvement. The survey instrument can be found at https://fabe.osu.edu/about-us/accreditation.

2.5 Performance Criteria

The performance criteria for meeting the degree Program Objectives are:

- The total number of students enrolled in the program is no less than 300.
- Maintain around 10% women and minority students, respectively, for the program.
- Provide extra-curricular opportunities for 50% of students.
- Have 100% of students to obtain experiential learning/internship experience and at least 60% of students having two or more internships.
- Over 95% of CSM graduates secure a job within 6 months of graduation.
- Maintain accreditation by American Council for Construction Education (ACCE).

The performance criteria for each Student Learning Outcome is listed below. Performance Criterion A is used for direct assessment measures while Performance Criterion B is used for indirect assessment measures.

A	Minimal acceptable criterion for this supporting outcome method is 75% of students scoring 70% or higher on the identified assessment tasks for the measurement of achievement for this outcome. When 90% of the students obtain scores of 90% or higher on the selected assessment associated assignment, the performance standard constituting programmatic excellence for this learning outcome measure will be attained.
B	This indirect measure will serve as an indicator of attainment of this learning goal's supporting outcome. Specifically, minimal acceptable criterion for the identified supporting learning outcome is when the students graduating from the program rate at least 3.5 on average based on scale of 1 to 5 on the question that asks how a student feels that he/she was prepared to accomplish this learning outcome. When the average rating is 4.5 or above, the performance standard constituting programmatic excellence for this learning outcome will be attained.

2.6 Evaluation Methodology

The unit's Academic Affairs Committee, faculty leadership of the B.S. in Construction Systems Management program of the Department of Food, Agricultural, and Biological Engineering, and course instructors review the program, its supporting coursework, and the related assessment findings annually, on an ongoing basis, to formulate recommendations for incremental programmatic change. With the goal of improving learning, instruction and curriculum, indicators from a summary report of the findings will be used to plan the incorporation of needed modifications. Accumulative findings for all program goals based on the contributing outcomes will be used as the cornerstone in the programmatic assessment review cycle (every three years), providing essential information for making strategic adjustments to this academic program, assuring continuous quality improvement.

The department chair will collate the SLO assessment data, degree program objectives data, and proposed actions/changes for review at both an autumn faculty and IAC meeting. Improvements, corrective actions, and changes will be recorded and reflected in future assessment reports.

3 DEGREE PROGRAM ASSESSMENT IMPLEMENTATION PLAN

The data collection for measures used to assess the Degree Program Objectives will be conducted annually and the data will be compared with individual thresholds to determine whether the program meets or does not meet the designated performance criteria in each academic year and any action(s) need to be taken. The following table will be used to report the collected data, assessment results, and resulting action(s).

Academic Year: _____

Program objectives	Measures	Performance criteria	Data reported	Meet criteria?	Action(s)
Maintain a proper size of the program	The total number of students enrolled in the program during the fall semester	The total number of students enrolled in the program is no less than 300			
Increase the diversity of student body	% of women and minority students enrolled in the program during the fall semester	Maintain 10% women and minority students, respectively, for the program			
Provide extra-curricular opportunities for students	% of students having extra-curricular activities based on the Exit Survey results	Providing extra-curricular opportunities for 50% of students			
Provide students with experiential learning/internship experience	% of students with one or more internships based on the Exit Survey results	Have 100% of students to obtain experiential learning/internship experience and at least 60% of students having two or more internships			
Achieve a high job placement rate for CSM graduates	The 6-month post-graduation placement rate	Over 95% of CSM graduates secure a job within 6 months of graduation			
Maintain proper accreditation for the program	The ACCE accreditation status	Maintain accreditation by ACCE			

In adherence to the ACCE accreditation requirements, this program will collect and analyze the assessment data for all the direct and indirect measures of ACCE SLOs annually and go through a more comprehensive outcome assessment review in every three years. The annual assessment data will be collected in each May. The CSM Co-Coordinator will send emails (with attached blank forms) to faculty, instructors, student advisors, and other related personnel within or outside of the department to request assessment data. If necessary, face-to-face meetings will be arranged to clarify questions related to what specific data is needed and in which format this data needs to be prepared. Then the received date will be sorted, compiled, formatted, and saved to a shared Buckeye Box folder. By mid-May, the SLO data will be submitted to CFAES' Office for Teaching, Learning, and Assessment.

Per our college's assessment requirement, the degree program collects and assesses the SLO measurement data and reports the results to CFAES annually and conducts a comprehensive program assessment in every six years. By complying with ACCE accreditation requirements, the program can also meet the assessment requirements from OSU and CFAES. The tabular format shown on the next page will be used to report the collected data, assessment results, and resulting action(s) for each individual SLO. The three-year accumulating data will be displayed in the same table, so the trend(s) can be easily identified during the program review.

The program has established the following standard procedures to continuously review and update the assessment plan: During the first year of implementation of a new (or re-envisioned) program assessment plan, focused attention will be given to refining the measures used for assessing achievement; to assure alignment of identified assignments with outcomes. In the following year (year two), focused efforts exploring and reexamining appropriate measures for alignment with specific program learning outcomes will occur along with data collection and reporting. During the third year of the program's comprehensive assessment plan revision cycle, in addition to collecting and reporting data for all program learning goals, the program will conduct faculty facilitated student, alumni, and/or stakeholder focus groups and/or surveys to aid in assessing success of learning outcomes, learning goals, and the program.

The unit's Academic Affairs Committee, faculty leadership of the B.S. in Construction Systems Management program of the Department of Food, Agricultural, and Biological Engineering, and course instructors will review the accumulated findings from the assessment review cycle; appraise the achievement and success of the program; examine alignment of program learning goals and outcomes; and produce a summary of recommendations for program modifications and enhancement. The report will be submitted to the department's Academic Affairs Committee. The efforts of the team's comprehensive review of the individual Program Assessment Plan in "year three" will produce a "re-envisioned" plan.

Example: SLO #1 Create written communications appropriate to the construction discipline

Where assessed	Assessment items	Performance criteria	2016-17	2017-18	2018-19
CSM4605 Professional Development II	Combined grade for four writing assignments	75% of students scoring 70% or higher			
Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	Average score 3.5 or higher on a scale of 1-5			
		Meet criteria?			
		Action(s)			

Example: SLO #2 Create oral presentations appropriate to the construction discipline

Where assessed	Assessment items	Performance criteria	2016-17	2017-18	2018-19
CSM4605 Professional Development II	Final presentation	75% of students scoring 70% or higher			
Exit Survey	Question on how a student feels that he/she was prepared to accomplish this SLO	Average score 3.5 or higher on a scale of 1-5			
		Meet criteria?			
		Action(s)			

Appendix I ACCE SLOs and Direct Assessment Methods

STUDENT LEARNING OUTCOME #1

Create written communications appropriate to the construction discipline

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 4605 Professional Development II
Semester: Autumn/Spring
Instructor: Andrea Pruneau

Student Work Assessed

This SLO will be assessed via three writing assignments including writing a clear, correct, and persuasive business letter, creating a resume, and write an ethics essay. In some semesters, one additional writing assignment may be given. In such cases, this assignment will also be included in the assessment.

Rubric Used for Assessment

Letter is worth 50 points

Resume: 100 points

Ethics Essay: 100 points

- Format including basic components of a letter: heading, date, inside address, greeting, body, complimentary close, and signature
- No typographical errors, clear sentences, correct word choice, proper use of punctuation
- Clear, convincing arguments, concise language
- Well-written and articulated message

STUDENT LEARNING OUTCOME #2

Create oral presentations appropriate to the construction discipline

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 4605 Professional Development II
Semester: Autumn/Spring
Instructor: Andrea Pruneau

Student Work Assessed

The SLO will be assessed via an oral presentation at the end of the semester. Each student is asked to identify an area of interest related to the construction industry and develop a presentation that demonstrates and articulates the information.

Rubric Used for Assessment

Final Presentation – 150 points

- Quality of Visual Aids: 15 points
- Timely Submission of Appropriate Topic: 10 points
- Time Management for Duration of Presentation: 15 points
- Evaluation of Other Student Presentations: 15 points
- Quality of Delivery of Presentation: 100 points

Organization - logical presentation of ideas, objectives/goals are clearly stated, methods are appropriate for achieving goals, results are clearly presented, thoughts and ideas flow in a logical manner

Delivery – good oral presentation and delivery, exhibits good body language, maintains good eye contact with audience, good diction, good articulation

Knowledge of Material - familiarity with subject matter, exhibits knowledge of subject matter, answers questions correctly and with confidence

Visual Aids - quality of graphics, presentation materials, handouts, etc.

STUDENT LEARNING OUTCOME #3

Create a construction project safety plan

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 2600 Construction Safety
Semester: Autumn/Spring
Instructor: Jenna Eaves

Student Work Assessed

The safety plan course project is used to assess this SLO. There is no set format for a Safety Plan. Students have full creative range on how to organize the plan. Below are items that need to be included but don't need to be in a specific order or format.

- **Describe your company and project scenario throughout the plan**
  What is your company name and what do they do?
  Where is the work being performed? (office building/hospital/school)
  New Construction/Renovation
  Identify Competent Person/Foreman
  Explanation of the scope of work
  Tools to be Used
  Fully explain the associated hazards/dangers associated with the tasks
  Hazards avoidance – What's the plan to perform all tasks safely?
  Use of PPE (safety glasses, gloves, hard hat, etc.)
  In case of Emergency (call, radio…who?)

Rubric Used for Assessment

Topics to include (100 points in total)
Cover/Title Page
Introduction on your company (10 pts)
Project Scope (10 pts)
Emergency Info (20 pts)
- Evacuation Points
- Site Alert Methods

Training Requirements (20 pts)

- For specific tasks & Site wide
- Why are the training requirements in place

Risks (20 pts)

- Broken down by task
- 4 task minimum

PPE required (For what tasks & why) (20 pts)

- For specific tasks & site wide
- Why is the PPE required

STUDENT LEARNING OUTCOME #4

Create construction project cost estimates

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 3450 Estimating
Semester: Autumn/Spring
Instructor: Philip Sutton

Student Work Assessed

- The students studied a complete set of plans and specifications for BSLC, an 11,177 sf place of worship. We visited the completed construction site. We analyzed this project in detail.
- For this homework assignment, takeoff and price the concrete footings.

Rubric Used for Assessment

- Takeoff accuracy – take away 10% for every 10% deviation from the actual estimate.
- Pricing accuracy – take away 10% for every 10% deviation from the actual price.

STUDENT LEARNING OUTCOME #5

Create construction project schedules

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 3451 Scheduling
Semester: Autumn/Spring
Instructor: Philip Sutton

Student Work Assessed

- Given a complete set of plans and specifications for the 802,390 sf warehouse, "Rick West 1," create a complete construction schedule.

Rubric Used for Assessment

- Complete list of Divisions – 10% off for each division missing
- Activities, "Parent/Child relationships," – 2% off for each activity missing
- Sequence of work – 2% off for each item with errant sequence
- Duration – 2% off for each duration which is errant beyond 10%

STUDENT LEARNING OUTCOME #6

Analyze professional decisions based on ethical principles

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 4605 Professional Development II
Semester: Autumn/Spring
Instructor: Andrea Pruneau

Student Work Assessed

This SLO will be assessed via a writing assignment: Write a clear and persuasive essay regarding an ethics issue in construction

Rubric Used for Assessment

Ethics Essay – 100 points

- Clearly identify the ethical issue
- Demonstrate an understanding of the challenge of the issue
- Articulate possible solutions or avoidance of the conflict or challenge
- Utilize proper writing protocols: no typographical errors, clearly written sentences, correct word choice, proper use of punctuation
- Well written and articulated message

STUDENT LEARNING OUTCOME #7

Analyze construction documents for planning and management of construction processes

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 3450 Estimating
Semester: Autumn/Spring
Instructor: Philip Sutton

Student Work Assessed

- The students studied a complete set of plans and specifications for BSLC, an 11,177 sf place of worship. We visited the completed construction site. We analyzed this project in detail.
- For this homework assignment, takeoff and price the concrete footings.

Rubric Used for Assessment

- Takeoff accuracy – take away 10% for every 10% deviation from the actual estimate.
- Pricing accuracy – take away 10% for every 10% deviation from the actual price

STUDENT LEARNING OUTCOME #7

Analyze construction documents for planning and management of construction processes

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 3450 Scheduling
Semester: Autumn/Spring
Instructor: Philip Sutton

Student Work Assessed

- The students studied a complete set of plans and specifications for Truro Twp Fire Dept., a 16,409 sf fire department. We visited the construction site as the project was in progress. We analyzed this project in detail.
- For this exam, the students determined each construction activity needed for this project, and then placed them in the order of construction.

Rubric Used for Assessment

- Identify all 14 divisions of work – deduct 10% for each one omitted or added.
- Identify the appropriate "child" activities for each division of work – deduct 2% for each one omitted or added.
- Accurate sequencing of Parent/Child activities – deduct 2% for each "child" activity listed out of sequence.

STUDENT LEARNING OUTCOME #8

Analyze methods, materials, and equipment used to construct projects

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 3450 Estimating
Semester: Autumn/Spring
Instructor: Philip Sutton

Student Work Assessed

- The students studied a complete set of plans and specifications for BSLC, an 11,177 sf place of worship. We visited the completed construction site. We analyzed this project in detail.
- For this homework assignment, takeoff and price the concrete footings.

Rubric Used for Assessment

- Takeoff accuracy – take away 10% for every 10% deviation from the actual estimate.
- Pricing accuracy – take away 10% for every 10% deviation from the actual price.

STUDENT LEARNING OUTCOME #8

Analyze methods, materials, and equipment used to construct projects

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 4660 Heavy Construction Management
Semester: Autumn/Spring
Instructor: Philip Sutton

Student Work Assessed

- The students were given a set of plans, specifications, and a jobsite visit for the "Creative Campus Phase 2" project, which was under construction. This roadway reconstruction project was approximately 1,500 lf in length.
- Their assignment was to answer questions pertaining to material, equipment, and crews pertaining to this project.

Rubric Used for Assessment

- There were 10 specific questions pertaining to material, equipment, and crews.
- Each question is worth 10%.

STUDENT LEARNING OUTCOME #9

Apply construction management skills as a member of a multi-disciplinary team

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 4900 Capstone
Semester: Autumn/Spring
Instructor: Mac Ware

Student Work Assessed

To be developed.

Rubric Used for Assessment

To be developed.

STUDENT LEARNING OUTCOME #10

Apply electronic-based technology to manage the construction process

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 4641 Construction Project Management
Semester: Autumn/Spring
Instructor: Mark Banta

Student Work Assessed

- The SLO will be assessed using two homework assignments.
- Utilize Blue Beam or Adobe Acrobat to create a Site Utilization Plan for a specific construction project using the construction documents for that project to plan the project and help manage risk.
- Create a Request for Change Order from a differing site condition scenario provided to the students using a RFCO Excel file.

Rubric Used for Assessment

Site Utilization Plan Homework is worth 50 points

- Correct formatting: 10 points
- Capturing all required information: 20 points
- Applying logic in communicating all required information: 20 Points

Request for Change Order Homework is worth 50 points

- Correct formatting: 10 points
- Capturing all required information: 20 points
- Clearly communicating the information: 20 points

STUDENT LEARNING OUTCOME #11

Apply basic surveying techniques for construction layout and control

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 2440 Survey and Site Development
Semester: Autumn/Spring
Instructor: Dr. Don Schafer

Student Work Assessed

The SLO will be assessed by lab pre-work and field work performance: Layout of a small structure with the Total Station using the Radial Method

Rubric Used for Assessment

This Lab is worth 100 points, it consists of office work and field work.

Grading Rubric
Laboratory: Layout of a small structure with the Total Station – Radial Method (**100 points total**)

General – Field book
Field book grading rubric (if items applicable; items must be in correct position on page): **40 points**

1. Activity added to the table of contents **(5 points)**
2. Title the lab **(5 points)**
3. Provide the time, date, and weather **(5 points)**
4. Provide identification information (rod person/instrument person) **(5 points)**
5. Add to the legend any symbols used **(5 points)**
6. Sketches (complete & representative, line work is acceptable, standard drafting technique) (**5 points)**
7. Lettering (standard lettering techniques & legible, single cross-out if mistake (no erasures) **(5 points)**
8. Calculations **(5 points**)

Field work grading rubric (by observation of instructor) (**60 points**)

1. Total Station set up in an efficient and correct manner over point **(10 points)**
2. Inputs entered (temperature, humidity, feet to meter) (**10 points)**
3. Correct procedure to locate points on structure (**20 points**)

4. Check and correction with cloth tape (**10 points**)
5. Point F located by “3-4-5” method **(10 points)**

STUDENT LEARNING OUTCOME #12

Understand different methods of project delivery and the roles and responsibilities of all constituencies involved in the design and construction process

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 4642 Construction Control - Contracts and Documents
Semester: Autumn/Spring
Instructor: Mark Scott

Student Work Assessed

This SLO is directly assessed through a series of questions in exam 1.

Rubric Used for Assessment

Exam 1 is worth 200 points. There are 17 questions related to this SLO. These questions include matching, multiple choice (A-D possibilities) and occasionally fill in the blank or short answer, accounting for 54 points. Please see the highlighted items in the sample of student work.

STUDENT LEARNING OUTCOME #13

Understand construction risk management

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 4642 Construction Control - Contracts and Documents
Semester: Autumn/Spring
Instructor: Mark Scott

Student Work Assessed

- The SLO will be assessed via exams.
- The student has to correctly answer various types of questions in Exam 1 and Exam 2.
- Contracts are 100% risk based and almost all questions developed in this course's assessments have a premise of understanding risk.

Rubric Used for Assessment

Exam 1 is worth 200 points.

- 64 questions are asked to assess this learning outcome.
- The questions are multiple choice, matching and some fill in the blank.

Exam 2 is worth 250 points.

- 98 questions are asked to assess this learning outcome.
- The questions are multiple choice and matching.

The exams are averaged together and count for 45% of the student's final grade.

STUDENT LEARNING OUTCOME #14

Understand construction accounting and cost control

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 4900 Capstone
Semester: Autumn/Spring
Instructor: Mac Ware

Student Work Assessed

- The Cost Code homework is used to satisfy the SLO #14.
- The students refer back to the estimating homework and utilizing the cost code and cost type format, given to each student, they are responsible to combine and categorize the estimated costs into the accounting cost code and cost type systems, to be given to the accounting department.

Rubric Used for Assessment

Homework is worth 10 points

- The homework instructions ask the students to combine the self-perform costs into a subcontractor cost line item, by adding in worker's compensation, subcontractor overhead and fee to create a simulated sub bid.
- They are graded on the exercise of combining the costs described above and the level of effort represented in the work product. It is noted that this assignment is late in the students last semester; consequently, some of the students see that they will pass this class and decide not to perform this exercise.
- If the students show evidence of substantial effort, even if the numbers don't quite line up, they receive 6 out of 10. The balance of the grade is based on accuracy and if the total of the exercise matches the bid, earlier submitted.

STUDENT LEARNING OUTCOME #15

Understand construction quality assurance and control

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 4641 Construction Project Management
Semester: Autumn/Spring
Instructor: Mark Banta

Student Work Assessed

- The SLO will be assessed using a homework assignment.
- Homework Assignment: Write a Quality Control Plan and a Pre-Installation Meeting Agenda for one of three Scopes of Work for which Plans and Specifications are provided.

Rubric Used for Assessment

Write a Quality Control Plan and a Pre-Installation Meeting Agenda for one of three Scopes of Work for which Plans and Specifications are provided. Homework is worth 50 points

- Correct formatting: 10 points
- Capturing all required information: 20 points
- Clearly communicating the information: 20 points

STUDENT LEARNING OUTCOME #16

Understand construction project control processes

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 4641 Construction Project Management
Semester: Autumn/Spring
Instructor: Mark Banta

Student Work Assessed

- The SLO will be assessed using a homework assignment.
- Homework Assignment: Evaluate a specific set of Plans and Specifications as provided and break that Scope of Work into Bid Packages.

Rubric Used for Assessment

- Write a Quality Control Plan and a Pre-Installation Meeting Agenda for one of three Scopes of Work for which Plans and Specifications are provided. Homework is worth 50 points
- Correct formatting: 10 points
- Capturing all required information: 20 points
- Clearly communicating the information: 20 points

STUDENT LEARNING OUTCOME #17

Understand the legal implications of contract, common, and regulatory law to manage a construction project

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 4642 Construction Control - Contracts and Documents
Semester: Autumn/Spring
Instructor: Mark Scott

Student Work Assessed

- The SLO will be assessed via exams.
- The student has to correctly answer various types of questions in Exam 1 and Exam 2.
- Contracts illustrate the mechanism that bind legal implications of agreements. All questions in Exams 1 and 2 have some legal implications of contract, common or regulatory law.

Rubric Used for Assessment

Exam 1 is worth 200 points.

- 64 questions are asked to assess this learning outcome.
- The questions are multiple choice, matching and some fill in the blank.

Exam 2 is worth 250 points.

- 98 questions are asked to assess this learning outcome.
- The questions are multiple choice and matching.

The exams are averaged together and count for 45% of the student's final grade.

STUDENT LEARNING OUTCOME #18

Understand the basic principles of sustainable construction

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CM 4900 Capstone
Semester: Autumn/Spring
Instructor: Mac Ware

Student Work Assessed

- The students are shown a power point regarding "Introduction to Green Buildings and LEED for Building Contractors." Discussion is encouraged during the PPT presentation.
- The students are then asked to answer 10 questions regarding sustainable construction in their homework.

Rubric Used for Assessment

The homework is worth 10 points

- Students are asked to research and answer a series of 10 questions.
- Each question is worth 1 of the 10 points available.

STUDENT LEARNING OUTCOME #19

Understand the basic principles of structural behavior

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 3545 Structures for Construction Managers I
Semester: Autumn/Spring
Instructor: Michael Brown

Student Work Assessed

- This SLO encompasses a large portion of the intent within both of the 'structures' courses that our CSM students take (CSM 3545 & CSM 3546). Thus, most of the assignments and assessments involved in CSM 3545 would fulfill the requirement of a 'direct assessment' of SLO #19. Any given homework or lab assignment could be used, but these individual assignments would be rather focused, and some students may not have completed the assignment fully, or may not have turned it in altogether, providing gaps in the student data.

- In the interest of providing the broadest measure of student learning and ensuring full data collection of student performance (students rarely miss an exam), this SLO will be assessed through the use of a calculated 'average' midterm exam score of each student.

- There were three (3) exams throughout the term (not including the Final Exam), and each exam is worth 10% of the final course grade; thus, the three combined are worth a total of 30%, which is the largest single 'component' within the weighted course grade.

- Exam #1 consists of assessing the student's knowledge of basic static equilibrium and strength of material concepts. This exam is typically very difficult for most students, as the format is in the form of one long multi-step problem statement, which requires critical thinking, and the ability to apply the proper principles and formulas on their own to solve the problems.

- Exam #2 consists of assessing the student's knowledge of the types and sources of loads on structures, the types of structural systems that create stable structures, the concept of load path and tributary area, as well as extrapolating the load path from a set of 2D

construction drawings. Design methodologies and load combinations are also relevant topics on this exam.

- Exam #3 consists of assessing the student's knowledge of wood as a structural material and its proper ASD design methodologies. Most students perform much better on this third midterm, because it applies the first two midterm concepts again with the specific context of individual wood structural members.

Rubric Used for Assessment

Exam #1 is worth a total of 39 points, with a possible 44 points to be earned, due to a bonus question. The exam was 'curved' 4 points to account for global student misunderstandings, and common mistakes (all students received an additional 4 points to their original exam scores).

- **Format:** A single "real-life" problem statement, which ultimately poses 11 total questions to be solved, all in the context of the same problem statement.
- Most of the problems require mathematical solutions, analysis, and proper application of formulas.
- There are a few 'qualitative' concept-based questions mixed throughout.
- Each problem is worth between 2 - 6 points, with partial credit being provided for partial work and steps that are correct.
- Full credit on a problem requires the right steps to be taken, the proper formulas applied, a mathematically correct solution, and proper units being applied.
- A solution key is attached herewith for more specific information.

Exam #2 is worth a total of 62 points, with a possible 71 points to be earned, due to a bonus question. The exam was 'curved' 5 points to account for global student misunderstandings, and common mistakes (all students received an additional 5 points to their original exam scores).

- **Format:** This exam consists of three independent parts or sections, with a total of 17 questions to be solved overall. Each section has a set of questions that are related to a common problem statement.
- The first section of the exam is 8 questions and is strictly a qualitative analysis of structural systems and requires no math or additional 'proof' work. These questions are each worth 2 points.
- Most of the problems in the second and third sections require mathematical solutions, analysis, and proper application of formulas.
- Each problem is worth between 2 - 8 points, with partial credit being provided for partial work and steps that are correct.
- Full credit on a problem requires the right steps to be taken, the proper formulas applied, a mathematically correct solution, and proper units being applied.
- A solution key is attached herewith for more specific information.

Exam #3 is worth a total of 47 points, with a possible 47 points to be earned (no bonus questions). The exam was 'curved' 2.5 points to account for global student misunderstandings, and common mistakes (all students received an additional 2.5 points to their original exam scores).

- **Format:** This exam consists of 4 completely independent multi-step problems dealing with different aspect of structural wood member design and evaluation for appropriate adequacy.
- Most of the problems require mathematical solutions, analysis, and proper application of formulas.
- Problems 1, 2, 3, and 4 are worth 13 pts., 22 pts., 5 pts., and 7 pts., respectively, with partial credit being provided for partial work and steps that are correct.
- Full credit on a problem requires the right steps to be taken, the proper formulas applied, a mathematically correct solution, and proper units being applied.
- A solution key is attached herewith for more specific information.

STUDENT LEARNING OUTCOME #19

Understand the basic principles of structural behavior

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 3546 Structures for Construction Managers II
Semester: Autumn/Spring
Instructor: Michael Brown

Student Work Assessed

- This SLO encompasses a large portion of the intent within both of the 'structures' courses that our CSM students take (CSM 3545 & CSM 3546). Thus, most of the assignments and assessments involved in CSM 3546 would fulfill the requirement of a 'direct assessment' of SLO #19. Any given homework or lab assignment could be used, but these individual assignments would be rather focused, and some students may not have completed the assignment fully, or may not have turned it in altogether, providing gaps in the student data.

- In the interest of providing the broadest measure of student learning and ensuring full data collection of student performance (students rarely miss an exam); this SLO will be assessed through the use of a calculated 'average' midterm exam score of each student.

- There were three (3) exams throughout the term (not including the Final Exam), and each exam is worth 10% of the final course grade; thus, the three combined are worth a total of 30%, which is the largest single 'component' within the weighted course grade.

- Exam #1 consists of assessing the student's knowledge of structural steel design and analysis concepts. This exam is typically very difficult for most students, as the format is in the form of two long multi-step problem statements, which requires critical thinking, and the ability to apply the proper principles and formulas on their own while dealing with complex member cross-sections.

- Exam #2 consists of assessing the student's knowledge of steel column design, as well as basic concrete material theory, and singly-reinforced concrete beam design methodology. Failure mechanisms are evaluated in concrete reinforced beams as well.

- Exam #3 consists of assessing the student's knowledge of concrete shear design principles, as well as foundation design theory and application.

Rubric Used for Assessment

Exam #1 is worth a total of 50 points, with a possible 62 points to be earned, due to two bonus questions. The exam was 'curved' 5.5 points to account for global student misunderstandings, and common mistakes (all students received an additional 5.5 points to their original exam scores).

- **Format:** This exam consists of two main sections, which ultimately poses 6 total questions to be solved. Problem #1 is a long multi-step problem statements with many parts that are interrelated to one another. Problems #2 - #6 are all in the context of the same problem statement and partial framing plan.
- Most of the problems require mathematical solutions, analysis, and proper application of formulas.
- There are a few 'qualitative' concept-based questions mixed throughout.
- Problem #1 is worth 26 points total, with each component worth between 2 - 8 points, with partial credit being provided for partial work and steps that are correct. Problems #2 - #6 are worth between 4 - 8 points each.
- Full credit on a problem requires the right steps to be taken, the proper formulas applied, a mathematically correct solution, and proper units being applied.
- A solution key is attached herewith for more specific information.

Exam #2 is worth a total of 65 points, with a possible 6 points to be earned, due to an extra credit point. The exam was 'curved' 2 points to account for global student misunderstandings, and common mistakes (all students received an additional 2 points to their original exam scores).

- **Format:** This exam consists of six (6) independent parts or sections, with a total of 21 questions to be solved overall. Each section has a set of questions that are related to a common problem statement.
- The second and third sections of the exam is a total of 9 questions, and is strictly a qualitative analysis of conceptual understanding with fill-in-the-blank and short answer responses. These questions are each worth 1-2 points each.
- Most of the problems in remaining sections of the exam require mathematical solutions, analysis, and proper application of formulas.
- Each problem is worth between 2 - 7 points, with partial credit being provided for partial work and steps that are correct.
- Full credit on a problem requires the right steps to be taken, the proper formulas applied, a mathematically correct solution, and proper units being applied.
- A solution key is attached herewith for more specific information.

Exam #3 is worth a total of 50 points, with a possible 51 points to be earned, due to an extra credit point. The exam was 'curved' 4 points to account for global student misunderstandings, and common mistakes (all students received an additional 4 points to their original exam scores).

- **Format:** This exam consists of 3 completely independent sections dealing with different aspects of concrete reinforced member design and shallow foundation analysis and design procedures. There are 17 problems in total on the exam.
- The first section (Problems 1 - 7) is fill-in-the-blank conceptual problems, each worth 1 point.
- The second section (Problems 8 - 13) is conceptual short answer problems, each worth 1 - 2 points.
- All of the problems in the third section (Problems 14 – 17) require mathematical solutions, analysis, and proper application of formulas, with each problem being worth between 5 - 7 points, with partial credit being provided for partial work and steps that are correct.
- Full credit on a problem requires the right steps to be taken, the proper formulas applied, a mathematically correct solution, and proper units being applied.
- A solution key is attached herewith for more specific information.

STUDENT LEARNING OUTCOME #20

Understand the basic principles of mechanical, electrical and piping systems

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CSM 2310 Electrical and Lighting Systems for Buildings
Semester: Autumn/Spring
Instructor: Jeff Suchy

Student Work Assessed

Midterm 1:

- Basic electrical terminology and theory
- Electrical safety principles
- Electrical circuits and calculations
- Calculations including voltage, current, resistance, power and energy.
- Applied problem solving

Midterm 2:

- Basic electrical terminology and theory (cont.)
- Electrical lighting terminology and design
- Electrical circuits and switch logic
- Interpretation of National Electric Code and design principles
- Reading electrical drawings
- Electrical services, panels and calculations
- Voltage drop and sizing conductors

Rubric Used for Assessment

NA – Grading keys used.

STUDENT LEARNING OUTCOME #20

Understand the basic principles of mechanical, electrical and piping systems

Performance Criteria

75% of students earn at least 70%

Where Assessed

Course: CM 2345 Mechanical Systems for Buildings
Semester: Autumn/Spring
Instructor: Qian (Victoria) Chen

Student Work Assessed

The SLO is assessed via two midterms and one final. The contents covered by these midterms are described below:

- ***Midterm I***: This midterm covers course contents consisting of basic thermal, environmental, and comfort concepts, heat transfer through building assemblies, building science, and heating load computations for buildings. The exam questions test students' ability to
    - Explain related concepts
    - Understand the properties of air-water vapor mixtures and read the Psychrometric Chart
    - Calculate thermal resistance values based on selected building assemblies
    - Compute heat loss through transmission, infiltration and/or ventilation
    - Estimate heating load and energy costs based on the selected heating equipment
- ***Midterm II***: This midterm covers course contents including sensible and latent cooling loads, cooling load computations, and various types of HVAC equipment and components used in buildings. The exam questions test students' ability to
    - Explain related concepts
    - Calculate cooling loads associated with building assemblies and infiltration
    - Find flow rate, pressure loss and size of air duct
- ***Final Exam***: The final exam covers plumbing fundamentals, building water supply and waste water disposal, stormwater drainage systems, and fire protection. The exam questions test students' ability to
    - Explain related concepts
    - Identify water pressure for water supply systems
    - Find friction loss in plumbing pipes

- Understand the slope requirements for sewer pipe
- Calculate Water Supply Fixture Unit and find flow rate and pipe size
- Calculate Drainage Fixture Unit (DFU) and find the right size for fixture branches, waste stack and vent stack.

Rubric Used for Assessment

Each of the midterms and the final exam are worth 100 points, accounting for 30% of students' final grade. The detailed grading rubric can be seen in the attached answer keys.

Appendix II Senior Exit Survey