

Clemson University
Nieri Family Department of Construction Science & Management (N_JCSM) - Undergraduate Program

2019-2020 Quality/Outcome Assessment Results

The Nieri Family Department of Construction Science and Management (N_JCSM) faculty and staff use information obtained through program and course-level assessment mechanisms and perception surveys to continuously evaluate and improve on the quality of the program curriculum and operations. Modifications are made only after careful consideration of data are obtained from all constituencies, including students, employers, alumni, advisory board members, and faculty. The continuous improvement plan employed by the N_JCSM undergraduate degree program is outlined below in Figure 1.

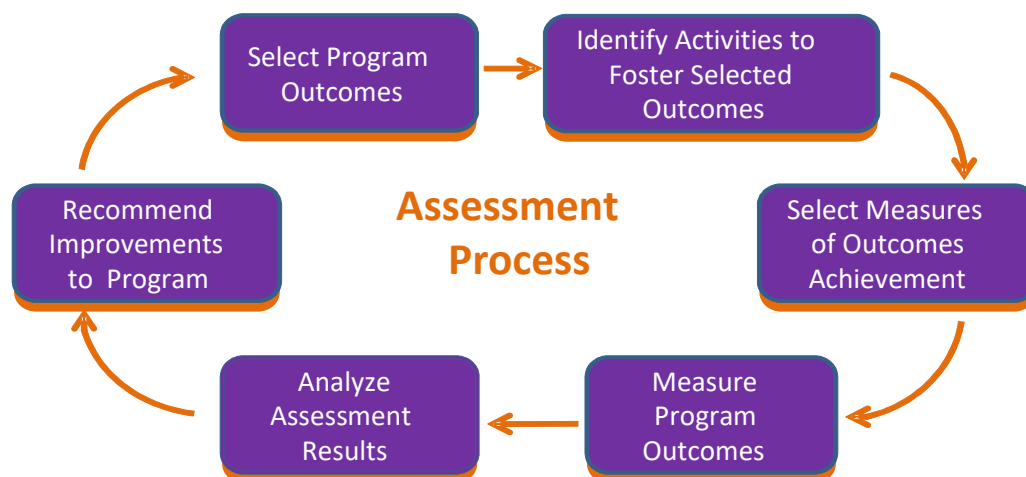


Figure 1. N_JCSM Undergraduate Degree Program Quality/Outcome Assessment Process

N_JCSM Undergraduate Degree Program Mission/Purpose - The mission of the Nieri Family Department of Construction Science and Management undergraduate CSM degree program is to offer a comprehensive program of education, scholarly and service activities, consistent with the Mission of Clemson University and the College of Architecture, Arts and Humanities, for the purpose of improving the quality of the construction industry and thus the built environment.

N_JCSM Undergraduate Degree Program Goals (G's)

- G 1: Excel in the education of undergraduate CSM majors through a vigorous program of academic learning designed to produce motivated, well-educated, responsible citizens with the management and technical skills requisite for leadership positions in the construction industry.
- G 2: Foster Clemson University's service mission by providing outreach activities for the construction industry and the public, both nationally and internationally.

G 3: Assist in attaining Clemson University's funded research goals by conducting and disseminating the results of research and development, and/or conducting educational courses for the construction industry.

N₇CSM Undergraduate Degree Program Objectives/Outcomes (PO's)

PO 1: Oral and written communication skills - Upon graduation, students will be able to demonstrate the ability to effectively communicate orally and in writing (G1).

PO 2: Practices of effective management - Upon graduation, students shall be able to describe practices of effective management of personnel, materials, equipment, costs and time (G1).

PO 3: Facilitate Advancement of Knowledge - Upon graduation students will facilitate advancement within the field of the management of construction processes by demonstration of ability to define problems and recognize solutions; further students will demonstrate an ability to apply creativity, team work and evaluation in their work (G1).

PO 4: Professional Ethics - Upon graduation, students will demonstrate an understanding of professional ethics (G1).

PO 5: The undergraduate program will retain its accreditation by the American Council for Construction Education (G1 & G2).

PO 6: Faculty will have papers published in peer-reviewed publications (G2 & G3).

N₇CSM Undergraduate Degree Program Student Learning Outcomes (20 ACCE SLO's):

SLO 1: Create written communications appropriate to the construction discipline

SLO 2: Create oral presentations appropriate to the construction discipline

SLO 3: Create a construction project safety plan

SLO 4: Create construction project cost estimates

SLO 5: Create construction project schedules

SLO 6: Analyze professional decisions based on ethical principles

SLO 7: Analyze construction documents for planning and management of construction processes

SLO 8: Analyze methods, materials and equipment used to construct projects

SLO 9: Apply construction management skills as an effective member of a multi-disciplinary team

SLO 10: Apply electronic-based technology to manage construction projects

SLO 11: Apply basic surveying techniques for construction layout and control

SLO 12: Understand different methods of project delivery and the roles and responsibilities of all constituents involved in the design and construction process

SLO 13: Understand construction risk management

SLO 14: Understand construction accounting and cost control

SLO 15: Understand construction quality assurance and control

SLO 16: Understand construction project control processes

SLO 17: Understand the legal implications of contract, common and regulatory law to manage a construction project

SLO 18: Understand the basic principles of sustainable construction

SLO 19: Understand the basic principles of structural behavior

SLO 20: Understand the basic principles of mechanical, electrical and plumbing systems

Table 1 Correlations between N_JCSM Goals, Program Outcomes, and Student Learning Outcomes

N _J CSM Undergraduate Degree Program Goals (G 1-G 3)	N _J CSM Undergraduate Degree Program Objectives/Outcomes (PO 1- PO 6)	N _J CSM Undergraduate Degree Program Student Learning Outcomes (SLO 1-SLO 20)	Other N _J CSM Undergraduate Degree Program Requirements/ Activities
G 1 – Excellent Undergraduate CSM Education	PO 1 – Effective Communication Skills	SLO 1 & SLO 2	1) Required 800 hours of Construction Industry Internship/ Experiential Learning; and 2) Completion of the National AIC AC Examination prior to graduation clearance.
	PO 2 – Effective Construction Management Skills	SLO 12 – SLO 20	
	PO 3 – Facilitate Advancement of Construction Management Knowledge	SLO 3 - 5 & SLO 7 -11	
	PO 4 – Professional Ethics	SLO 6	
G 1, G 2 & G 3	PO 5 – Maintain Program National Accreditation	SLO 1 – SLO 20	ACCE Accreditation
G 2 - Industry Outreach & G 3 - Research	PO 6 – Faculty Publications		1) Annual Clemson Construction Symposium; 2) Annual CSM Alumni Golf Tournament; and 3) Faculty Publications.

Constituencies: N_JCSM Students , Faculty, Industry Advisory Board Members, Alumni, and Employers.

Targets: At least 70% achieve/respond \geq 70% on all noted measures.

Frequency of Data Collection: Student performance data from N_JCSM department courses and the AIC AC Exam are collected and assessed annually; N_JCSM Alumni and Employer survey data are collected every three years, and assessed on a three year cycle (i.e. Fall 2018 and again in Fall 2021).

Frequency of Comprehensive N_JCSM Program Assessment: N_JCSM Program Assessment is conducted on a three year cycle, (i.e. Fall 2018 and again in Fall 2021).

Measures: See Figure 2, and the following pages for specific ACCE Student Learning Outcomes (SLO’s), as measured and assessed annually.

BCSM 2019-2020 Outcome Assessment Results

Courses / ACCE SLO's	1. Create written communications appropriate to the construction discipline.	2. Create oral presentations appropriate to the construction discipline.	3. Create a construction project safety plan.	4. Create construction project cost estimates.	5. Create construction project schedules	6. Analyze professional decisions based on ethical principles.	7. Analyze construction documents for planning and management of construction processes.	8. Analyze methods, materials, and equipment used to construct projects.	9. Apply construction management skills as a member of a multidisciplinary team.	10. Apply electronic-based technology to manage the construction process.	11. Apply basic surveying techniques for construction layout and control.	12. Understand different methods of project delivery and the roles and responsibilities of all constituencies involved in the design and construction process.	13. Understand construction risk management.	14. Understand construction accounting and cost control.	15. Understand construction quality assurance and control.	16. Understand construction project control processes.	17. Understand the legal implications of contract, common, and regulatory law to manage a construction project.	18. Understand the basic principles of sustainable construction.	19. Understand the basic principles of structural behavior.	20. Understand the basic principles of mechanical, electrical and piping systems.	
CSM 1000																					
CSM 2010																				90%	
CSM 2030																					
CSM 2040	88%																				
CSM 2050																					
CSM 2060									New	New											
CSM 3040																					
CSM 3050																					
CSM 3060										89%											
CSM 3070									95%										96%		
CSM 3510																					
CSM 3520					85%																
CSM 3530				86%						96%	93%	82%	96%	96%	93%						
CSM 4110			100%																		
CSM 4500	87%	100%	85%	94%	46%	95%	97%	91%	95%	83%	76%	93%	80%	66%	79%	85%	75%	90%	82%	81%	
CSM 4530															100%	100%					
CSM 4540		81%																			
CSM 4610																					
AC Exam	94%	87%	85%	81%	85%	89%	87%	77%	90%	81%	73%	77%	92%	83%	85%	98%	92%	62%	87%	39%	
LEED G.A. Exam																					

Direct Assessment: Indirect Assessment: Supplemental Data:

Figure 2. 2019-2020 ACCE Student Learning Outcomes and Associated Assessment Measures & Results.

Quality Assessment Results for 2019-2020

Student Learning Outcomes/Objectives, Measures and Achievement Targets:

1. Create written communications appropriate to the construction discipline (ACCE SLO #1/PO 1).

Direct Measure: Student performance on specific written assignments in CSM 2040 and/or CSM 4110 using a standard rubric.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 2040 - Contract Documents - Direct Measure	93%	96%	---	88%
CSM 4110 - Safety in Building Construction - Direct	---	---	100%	---
CSM 4500 - Construction Internship - Indirect (Post)	---	95%	86%	86%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21.

2. Create oral presentations appropriate to the construction discipline (ACCE SLO #2/PO 1).

Direct Measures: Student performance on oral presentations in CSM 4500 & CSM 4540 using a standard rubric.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 4500 - Construction Internship - Direct Meas.	---	---	84%	100%
CSM 4540 - Construction Capstone - Direct Meas.	92%	88%	100%	81%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21.

3. Create a construction project safety plan (ACCE SLO #3/PO 3).

Direct Measure: Student performance on specific course assignments in CSM 4110 using a standard rubric.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 4110 - Safety in Construction - Direct Measure	100%	86%	100%	100%
CSM 4500 - Construction Internship - Indirect (Post)	---	---	64%	85%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21.

4. Create construction project cost estimates (ACCE SLO #4/PO 3).

Direct Measure: Student performance on specific course assignments in CSM 3530 using a standard rubric.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 3530 - Construction Estimating II - Direct	79%	86%	89%	86%
CSM 4500 - Construction Internship - Indirect (Post)	---	---	94%	94%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21.

5. Create construction project schedules (ACCE SLO #5/PO 3).

Direct Measure: Student performance on a specific course assignment in CSM 3520 using a standard rubric.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 3520 - Construction Scheduling - Direct	75%	88%	100%	85%
CSM 4500 - Construction Internship - Indirect (Post)	---	---	62%	46%

Notes: Indirect perception targets not met in 2018-19 – Introduced New Faculty in 2019-20.

6. Analyze professional decisions based on ethical principles (ACCE SLO #6/PO 4).

Direct Measure: Student performance on the AIC AC certification examination.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 4500 - Construction Internship - Indirect (Post)	78%	95%	90%	95%
AC Exam - Direct Measure for SLO #6	94%	91%	76%	89%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21.

7. Analyze construction documents for planning and management of construction processes (ACCE SLO #7/PO 3).

Direct Measure: Student performance on the AIC AC certification examination.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 4500 - Construction Internship - Indirect (Post)	---	---	96%	97%
AC Exam - Direct Measure for SLO #7	88%	91%	74%	87%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21.

8. Analyze methods, materials and equipment used to construct projects (ACCE SLO #8/PO 3).

Direct Measure: Student performance on the AIC AC certification examination.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 4500 - Construction Internship - Indirect (Post)	---	---	92%	91%
AC Exam - Direct Measure for SLO #8	82%	79%	74%	77%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21.

9. Apply construction management skills as an effective member of a multi-disciplinary team (ACCE SLO #9/PO 3).

Direct Measures: Student performance on design-build charrette assignments in CSM 3060 and/or CSM 3070, using a standard rubric.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 2060 – Const. Science Laboratory - Direct	---	---	---	<i>New</i>
CSM 3070 - Sustainability in Construction - Direct	---	---	<i>New</i>	95%
CSM 4500 - Construction Internship - Indirect	---	95%	88%	95%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21. New Direct Assessment Measure to be Added to CSM 2060.

10. Apply electronic-based technology to manage construction projects (ACCE SLO #10/PO 3).

Direct Measures: Student performance on specific course assignments in CSM 3060 and/or CSM 3530, using a standard rubric.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 3060 - Emerging Technologies - Direct	76%	96%	85%	89%
CSM 3530 - Construction Estimating II - Direct	79%	93%	89%	96%
CSM 4500 - Construction Internship - Indirect (Post)	---	---	82%	83%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21.

11. Apply basic surveying techniques for construction layout and control (ACCE SLO #11/PO 3).

Direct Measure: Student performance on specific course assignments in AGM 2210 using a standard rubric.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
AGM 2210 - Surveying - Hammond (AGM) - Direct	100%	99%	100%	---
CSM 2060 – Const. Science Laboratory - Direct	---	---	---	<i>New</i>
CSM 4500 - Construction Internship - Indirect (Post)	---	---	63%	76%

Notes: Targets generally met in 2019-20 – Continue to Monitor Student Performance in 2020-21. New Direct Assessment Measure to be Added to CSM 2060.

12. Understand different methods of project delivery and the roles and responsibilities of all constituents involved in the design and construction process (ACCE SLO #12 /PO 2).

Direct Measure: Student performance on the AIC AC certification examination.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 4500 - Construction Internship - Indirect (Post)	---	---	92%	93%
AC Exam - Direct Measure for SLO #12	62%	78%	54%	77%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21.

13. Understand construction risk management (ACCE SLO #13/PO 2).

Direct Measure: Student performance on the AIC AC certification examination.

Indirect Measures: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 4530 - Project Management - Direct	77%	100%	---	---
CSM 4500 - Construction Internship - Indirect (Post)	---	---	86%	80%
AC Exam - Direct Measure for SLO #13	92%	91%	59%	92%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21.

14. Understand construction accounting and cost control (ACCE SLO #14/PO 2).

Direct Measure: Student performance on the AIC AC certification examination.

Indirect Measures: Student perception surveys in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 4500 - Construction Internship - Indirect	---	---	84%	66%
AC Exam - Direct Measure for SLO #14	76%	79%	72%	83%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance/ Student Perceptions in 2020-21.

15. Understand construction quality assurance and control (ACCE SLO #15/PO 2).

Direct Measure: Student performance on the AIC AC certification examination.

Indirect Measures: Student perception surveys in CSM 4500 and/or CSM 4530.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 4500 - Construction Internship - Indirect (Post)	---	---	86%	79%
CSM 4530 - Const. Project Management - Direct	92%	78%	94%	100%
AC Exam - Direct Measure for SLO #15	72%	64%	68%	85%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance/ Student Perceptions in 2020-21.

16. Understand construction project control processes (ACCE SLO #16/PO 2).

Direct Measure: Student performance on the AIC AC certification examination.

Indirect Measures: Student perception surveys in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 4500 - Construction Internship - Indirect (Post)	---	---	86%	85%
CSM 4530 - Const. Project Management - Indirect	92%	98%	100%	100%
AC Exam - Direct Measure for SLO #16	92%	93%	93%	98%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21.

17. Understand the legal implications of contract, common and regulatory law to manage a construction project (ACCE SLO #17/PO 2).

Direct Measure: Student performance on the AIC AC certification examination.

Indirect Measures: Student perception surveys in CSM 4500 and/or CSM 2040.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 4500 - Construction Internship - Indirect (Post)	---	---	73%	75%
AC Exam - Direct Measure for SLO #17	74%	79%	80%	92%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance/ Student Perceptions in 2020-21.

18. Understand the basic principles of sustainable construction (ACCE SLO #18/PO 2).

Direct Measures: Student performance on the AIC AC certification examination, and LEED Green Associate Exam.

Indirect Measures: Student perception surveys in CSM 4500 and/or CSM 3070.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 3070 - Sustainability - Direct Measure	---	---	New	96%
CSM 4500 - Construction Internship - Indirect (Post)	---	---	94%	90%
AC Exam - Direct Measure for SLO #18	46%	50%	47%	62%
LEED Green Associate Exam - Direct Measure	---	---	50%	---

*Notes: Direct **Target not met in 2019-20** – Specific AIC AC Exam Content Review to be Scheduled with Students in the CSM 4500 course going forward.*

19. Understand the basic principles of structural behavior (ACCE SLO #19/PO 2).

Direct Measure: Student performance on the AIC AC certification examination.

Indirect Measures: Student perception surveys in CSM 4500 and/or CSM 2010.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 2010 - Structures I - Direct Measure	98%	92%	---	90%
CSM 4500 - Construction Internship - Indirect (Post)	---	---	68%	82%
AC Exam - Direct Measure for SLO #19	66%	62%	88%	87%

Notes: Targets met in 2019-20 – Continue to Monitor Student Performance in 2020-21.

20. Understand the basic principles of mechanical, electrical and plumbing systems (ACCE SLO #20/PO 2).

Direct Measure: Student performance on the AIC AC certification examination.

Indirect Measure: Student perception survey in CSM 4500.

Courses/Measures:	2016-17	2017-18	2018-19	2019-20
CSM 4500 - Construction Internship - Indirect (Post)	---	---	88%	81%
AC Exam - Direct Measure for SLO #20	86%	72%	36%	39%

*Notes: Direct **Target not met in 2019-20** – Specific AIC AC Exam Content Review to be Scheduled with Students in the CSM 4500 course going forward.*

21. CSM Program Learning Outcome (PO 1-4).

Direct Measure: Overall student performance on the AIC AC certification examination.

Indirect Measures: Alumni, Employer and Graduating Senior Perception Surveys.

Program Measures:	2016-17	2017-18	2018-19	2019-20
Alumni Survey - Indirect Measure	---	91%	---	---
Intern Employer Survey - Indirect Meas.	---	100%	---	---
Alumni Employer Survey - Indirect	---	100%	---	---
Senior Exit Interview Survey - Indirect	---	---	100%	100%
AC Exam - Direct Measure	86%	88%	80%	71%

Notes: Targets met in 2019-20 – Specific AIC AC Exam Content Review to be Scheduled with Students in the CSM 4500 course going forward.

May 8, 2020