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Direct Assessment of Student Learning Outcomes

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DIRECT ASSESSMENT OF STUDENT LEARNING OUTCOMES

INTRODUCTION

Assessment of learning outcomes for academic programs is an essential part of quality control and quality assurance. In the last three decades, the learning outcome assessment subject has been discussed on various platforms and became an essential part of the higher education system. A 2009 survey of higher education institutions noted that “the most common use of assessment data is related to accreditation” and “the two greatest needs to advance student learning outcomes assessment are greater involvement of faculty and more assessment expertise, resources and tools” [1]. A similar 2013 survey observed that “the prime driver of assessment remains the same: expectations of regional and program or specialized accrediting agencies” and “the range of tools and measures to assess student learning has expanded significantly” [2].

There are multiple examples of learning assessment studies from different perspectives, including program-level assessment systems [3-6], assessment tools [7-9], the effectiveness of assessment methods [10, 11], effect of technology and methods on assessment [12], and accreditation [13, 14]. However, the literature does not include any complete example that illustrates the definition of the outcomes, accreditation compliance, data collection and processing, and interpretation. The goal of this paper is to present two examples of the complete process within a construction education program accredited by the American Council for Construction Education. These examples were used in a successful reaccreditation of the program. The assessment process is rather intensive for construction degree programs because of the specific discipline requirements combined with institutional approaches and industry expectations.

ACCE currently defines 20 student learning outcomes for the four-year bachelor’s degree programs using multiple Bloom's Taxonomy levels. Each learning outcome must be assessed using at least two measurements, one of which must be a direct assessment. This paper includes two examples for direct assessment of student learning outcomes (SLO) at the highest and lowest taxonomy levels defined by ACCE. Assessment structures for "create construction project schedules" (SLO #5) and "understand the basic principles of structural behavior" (SLO #19) are described in detail, which are executed in two different construction classes.

The examples include detailed course structure, course learning objectives in relation to the student learning objectives, measurement criteria and metrics, and target definitions. The procedure to include the measurements in the program level assessment and the process's continuous nature are described. The examples provided in this paper can be replicated to address different ACCE or program level outcome requirements in other courses in a construction curriculum. The construction program at the University of San Antonio (UTSA) houses a 120-credit hour Bachelor of Science degree in Construction Science and Management that is accredited by ACCE.

ACCREDITATION STANDARDS AND ASSESSMENT REQUIREMENTS

Established in 1974, ACCE's mission is "to be a leading global advocate of quality construction education; and to promote, support, and accredit quality construction education programs." [15] The Council is recognized by the Council for Higher Education Accreditation as the accrediting agency for both 4-year bachelor's degree programs and two-year associate degree programs in construction, construction science, construction management, and construction technology. [16] Currently, there are 72 four-year bachelor's, five master's, and 13 associate degree programs accredited by ACCE [17].

ACCE lists the following learning outcomes for the bachelor degree programs in section 3.1.5 of the Standards and Criteria for the Accreditation of Bachelor's Degree Construction Education Programs (ACCE Document 103B) [18]:

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.

As noted in the same section, the learning outcomes utilizes verbs consistent with Bloom's Taxonomy at five different levels:

- **Create**: At the highest level, students are producing new ideas or products that integrate the knowledge they have gained. When students are involved in creating new artifacts, they are actively engaged in the subject matter.
- **Evaluate**: At this stage, students are asked to judge an idea. This may involve predicting, experimenting, critiquing, or making an argument from evidence.

- **Analyze**: Students begin to develop higher order thinking. They may be asked to compare and contrast or take a concept and break it into parts to explore the relationships present.
- **Apply**: At this level, students begin to put the information they are learning into context. Here they are able to integrate ideas across multiple situations, or utilize the content in a new way.
- **Understand**: At this level, students demonstrate that they understand the content by explaining, summarizing, classifying, or translating the given information.

Section 3.1.6 of the ACCE Document 103B provides the following seven components to ensure the inclusion and proper assessment of the student learning outcomes:

> 3.1.6.1 Provide an index, cross-tab, curriculum map, or other form of summary relating courses used to meet the 50 semester hours (75 quarter hours) construction core requirements to the Student Learning Outcomes.
>
> 3.1.6.2 Provide a syllabus for each course used to support the Student Learning Outcomes. Syllabi for the courses taught by the program shall include the following:
>
> o Course Learning Outcomes in relation to the Student Learning Outcomes,
> o Instructional methods,
> o Topical outline,
> o Method of assessment of Course Learning Outcomes, and
> o Grade performance criteria.
>
> 3.1.6.3 Evaluate each Student Learning Outcome by a minimum of two assessment methods, at least one of which must be direct, and provide a table identifying the specific assessment methods used for each Student Learning Outcome. Note: If student teams or group projects are used for assessment, there must also be a process in this team/group environment to assess individual student learning.
>
> 3.1.6.4 Produce evidence in the form of assessment tools, any associated grading rubrics, and one example of graded student work to prove adequacy of the assessment tool in evaluating individual students' ability to meet each Student Learning Outcome. Programs using third-party certifications shall provide comprehensive results for each Student Learning Outcome where such assessment is applied.
>
> 3.1.6.5 Provide evidence that the results obtained from the formal assessment of the Student Learning Outcomes have been included as part of the quality improvement plan.
>
> 3.1.6.6 Provide a report of the methods of assessment for each Student Learning Outcome, and the most recently reported evaluation of the results, resulting actions, and a follow-up of these actions on student performance including the dates of each of these.

These components require careful identification and mapping of the assessment methods and tools throughout the curriculum. To complete and document these components in an organized manner, faculty members are expected to identify the learning objectives appropriate for their

courses and couple them with specific assessment methods ahead of time. At this planning stage, special attention is required for direct assessment methods. Surveys, end-of-course evaluations, interviews, and institutional research data are noted as possible indirect data collection methods. The direct data collection tools include licensure/certification, embedded testing or quizzes, embedded assignments, pre/post-tests, employer's/internship supervisor's direct evaluations of students' performance, observation of student performing a task, and capstone projects.

DIRECT MEASUREMENT METHODOLOGY

ACCE standards map a relatively straightforward procedure to establish, measure, and assess the student learning outcomes to be a part of a continuous quality improvement plan. For the direct assessments of an SLO using the "embedded testing/assignment data collection" method, the procedure can be summarized as:

1. Identify the course content related to the SLO subject matter
2. Establish Course Learning Outcomes (CLO) for the course
3. Establish an assessment instrument for each CLO and collect measurement data
4. Link CLOs to specific SLOs
5. Assess the result for each CLO/SLO (may require results from multiple courses/measurements)
6. Develop an action plan to address the needs and required modifications
7. Implement the modifications in the next cycle

It is important to note that a holistic view is required for a complete review of the curriculum and the list of SLOs, which would include direct and indirect measurements. This paper provides two examples of the direct measurement procedure.

LEARNING OUTCOME DEFINITIONS

The first example for the direct SLO assessment addresses SLO #5 – create construction project schedules. The UTSA's construction curriculum utilized the project assignments (embedded assignments) in a required course for this SLO: CSM 4523 – Project Planning and Scheduling. The CLOs and SLOs for the CSM 4523 course were listed as:

- **Course Learning Objectives for CSM 4523**
  - **CLO.1** Apply fundamental construction scheduling methods. (SLO.5, SLO.10)
  - **CLO.2** Create resource and cost loaded schedules using industry standard software. (SLO.5, SLO.10)
  - **CLO.3** Create schedule updates to reflect project conditions & progress using industry standard software. (SLO.5, SLO.10)
  - **CLO.4** Analyze construction specifications related to planning and scheduling. (SLO.7)

- **ACCE Student Learning Objectives for CSM 4523**
  - **SLO.5** Create construction project schedules.

- **SLO.7** Analyze construction documents for planning and management of construction processes.
- **SLO.10** Apply electronic-based technology to manage the construction process.

The second example for the direct SLO assessment addresses SLO #19 – understand the basic principles of structural behavior. The UTSA's construction curriculum utilized exam questions (embedded testing) in a required course for this SLO: CSM 3143 – Structures I. The CLOs and SLOs for the CSM 3143 course were listed as:

- **Course Learning Objectives for CSM 3143**
  - **CLO.1** Analyze fundamental relationships between structural elements and forces/equilibrium/moments. (SLO.19)
  - **CLO.2** Analyze stress, strain, and material deformation properties. (SLO.19)
  - **CLO.3** Understand quality assurance by design based on stress, strain, and material deformation properties. (SLO.15)

- **ACCE Student Learning Objectives for CSM 3143**
  - **SLO.15** Understand construction quality assurance and control.
  - **SLO.19** Understand the basic principles of structural behavior.

Although SLO #19 is defined at the "understand" level in ACCE standards, the CLO.1 and CLO.2 for the CSM 3143 course aims for the "analyze" level. An assessment at a higher level addresses the standard defined at a lower level.

Copies of the course syllabus for CSM 4523 and 3143 courses are included in Appendix A. In these syllabi, the CLOs and SLOs are identified on the first page and linked to measurement instruments in the course outline (second page). Although these courses aim to address more than one SLO, this paper focuses on SLOs #5 and #19.

DIRECT DATA COLLECTION PROCEDURE

CSM 4523 course includes two project assignments in addition to the exams, quizzes, and homeworks. These projects are completed using two different software packages (Primavera and Microsoft Project). The first project is a cast-in-place concrete box culvert project. The students are provided with plans, specifications, quantities, unit prices, and labor performance rates.

The project is completed in three milestones: 1. schedule development, 2. initial schedule report, and 3. project update report. Students receive feedback (and a score) for each milestone, and the third milestone scores are used in the assessment of SLO #5. The second project is structured similarly and consists of the construction of a triple cast-in-place concrete box culvert. Each student receives a different unit price set to ensure the delivery of the course objectives. Tables 1 and 2 show the tables used in scoring and student feedback. Although the last milestone scores are used for the SLO assessment, the scores provided for each milestone are designed to control the individual CLOs and the quality of the feedback provided to the students. In CSM 3143 course, the direct data collection method relies on embedded questions in Midterm Exam II and Final Exam. Figure 1 shows a sample question as it was presented in the exam.

			Project #1 - Primavera	Poss. Points	Student Name		
					M 1	M 2	M3
CLO.1	LOGIC	CONSIDERATIONS	- Crew Limitations	3	3	3	3
			- Form Limitations	3	3	3	3
			- Curing Limitations	3	3	3	3
			- Calendars	2	2	2	2
			- Project Cost	3	3	3	3
CLO.2	INITIAL SCHEDULE	PROJECT SCOPE	- Project Description	2		2	2
			- Work Calendar	2		2	2
			- Management Plan	2		2	2
			- Performance Reporting System	1		1	1
			- Assumptions - Spec No	1		1	1
			- Cost Calculations	1		1	1
			- Gantt Chart, Data Table	4		4	4
		REPORTS	- Schedule Report	2		2	2
			- 2 Week Lookahead Report	2		2	2
			- Detailed Resource Report	2		2	2
CLO.3	UPDATE	UPDATE	- Project scope summary update	4			4
			- Logic Update	4			4
			- Gantt Chart w ith multiple bars	2			2
			- Earned Value Report	2			2
			- Resource Graph 1 and disscussion	2			2
			- Resource Graph 2 and disscussion	2			2
		ANAL YSIS	- Pareto Rule	2			2
			- Mobilization	2			2
	Format	FRM	- PDF/XPS	0	0	0	0
			- XER	0	0	0	0
				MILESTONE TOTAL	14	33	53
				PROJECT TOTAL	100		

Table 1. Score Table for CSM 4523 – Project 1

			Project #2 - Microsoft Project	Poss. Points	Student Name		
					M 1	M 2	M3
CLO.1	LOGIC	CONSIDERATIONS	- Crew Limitations	4	4	4	4
			- Form Limitations	4	4	4	4
			- Curing Limitations	4	4	4	4
			- Calendars	4	4	4	4
			- Project Cost	4	4	4	4
CLO2	INITIAL SCHEDULE	PROJECT SCOPE	- Project Description	1		1	1
			- Work Calendar	1		1	1
			- Management Plan	1		1	1
			- Performance Reporting System	1		1	1
			- Assumptions - Spec No	1		1	1
			- Cost Calculations	1		1	1
			- Gantt Chart, Data Table	4		4	4
		REP	- Schedule Report	2		2	2
			- Resource Report	2		2	2
CLO.3	UPDATE	UPDATE	- Project scope summary update	1			1
			- Logic Update	2			2
			- Gantt Chart w ith multiple bars	2			2
			- Earned Value Report	1			1
			- 2-w eek Lookahead Filter	2			2
		ANAL YSIS	- Resource Graph Set 1 and dissc.	2			2
			- Resource Graph Set 2 and dissc.	2			2
	Format	FRM	- PDF/XPS	0	0	0	0
			- MPP	0	0	0	0
				MILESTONE TOTAL	20	34	46
				PROJECT TOTAL	100		

Table 2. Score Table for CSM 4523 – Project 2

Direct Assessment #1 - CLO.1 (SLO.19)

Midterm Exam II - Question 1. Determine the internal reaction forces and plot the shear force and moment diagrams. (20 pts)

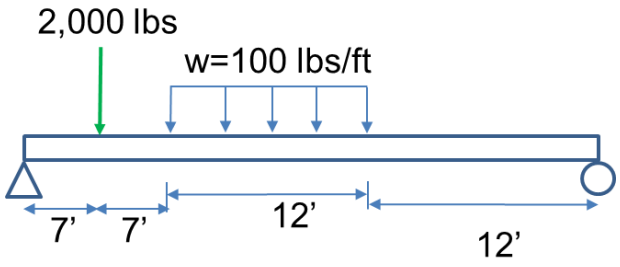

Figure 1. Sample Question for CSM 3143 – Midterm Exam II

ASSESSMENT OF INDIVIDUAL STUDENT PERFORMANCE

In 2017, the department's faculty members approved 80/80 criteria for assessing the course and student learning outcomes, aiming at an 80% or better performance from the 80% of the students on each learning outcome. It is important to note that this is a high target and is expected to fail for specific outcomes. Considering the 70% performance expectation to receive a passing grade in each course, students may receive a passing grade for the course while failing an individual assessment criterion at the 80% level. The link between the course learning objectives and the SLOs for CSM 4523 and CSM 3143 courses are summarized as:

SLO. 5

Direct Assessment #1: CLO.1, CLO.2, CLO.3 – Project 1 – Milestone 3
Direct Assessment #2: CLO.1, CLO.2, CLO.3 – Project 2 – Milestone 3

Performance Criteria: At least 80 % of the students will earn an 80% or better in the average of the direct assessments.

SLO. 19

Direct Assessment #1: CLO.1 – Midterm Exam II Q1, Midterm Exam II Q3
Direct Assessment #2: CLO.2 – Midterm Exam II Q4, Final Exam Q1

Performance Criteria: At least 80 % of the students will earn an 80% or better in the average of the direct assessments.

Based on the CLO and SLO links described above, the individual student scores are measured and assessed for the 80/80 criteria. Tables 3 and 4 show the individual student performance and analysis for the CSM 4523 and CSM 3143 courses.

		Assessment Instrument					
		Direct Assessment #1			Direct Assessment #2		
		Project 1			Project 2		
		CLO #1	CLO #2	CLO #3	CLO #1	CLO #2	CLO #3
Individual Student Assessment Scores	1	14	19	20	20	14	10
	2	14	19	20	20	14	10
	3	14	19	16	20	14	10
	4	14	19	20	20	14	12
	5	14	19	16	20	14	10
	6	14	19	19	20	14	12
	7	14	19	20	20	14	10
	8	14	19	16	20	14	10
	9	14	19	18	20	14	9
	10	14	19	18	20	14	8
	11	14	19	18	20	14	10
	12	14	19	20	20	14	12
	13	14	19	14	20	14	6
	14	14	19	18	18	14	3
	15	0	0	0	20	14	8
	16	14	19	14	20	14	10
	17	14	19	20	20	14	10
	18	14	19	18	20	14	10
	19	14	19	20	20	14	12
	20	14	19	20	20	14	12
	21	14	19	14	20	14	10
	22	14	19	20	20	14	8
	23	14	19	14	20	14	10
	24	14	19	20	20	14	10
	25	14	19	14	20	14	12
	26	14	19	20	20	14	8
	27	14	19	20	20	14	12
	28	14	19	20	20	14	10
	29	0	0	0	20	14	10
	30	14	19	20	20	14	10
	31	14	19	18	20	14	10
	32	14	0	0	0	0	0
	33	14	19	16	20	14	11
	Possible	14	19	20	20	14	12
	80% Score	11.2	15.2	16	16	11.2	9.6
	# of Students	33	33	33	33	33	33
	# of Students 80%+	31	30	25	32	32	25
	% of Students 80%+	94%	91%	76%	97%	97%	76%
	Assessment Avg	**87%**			**90%**		
	Avg of Assessment	**88%**					

Table 3. Individual Student Performance and SLO #5 Assessment for CSM 4523

		Assessment Instrument			
		DA #1		DA #2	
		E2 Q1	E2 Q3	E2 Q4	Final Q1
		CLO #1	CLO #1	CLO #2	CLO #2
	1	0	15	10	25
	2	10	10	10	25
	3	20	15	10	24
	4	19	15	10	25
	5	0	5	10	25
	6	20	15	10	24
	7	20	15	10	23
	8	0	15	10	24
	9	20	15	10	25
	10	20	0	10	22
	11	15	5	5	23
	...				
	39	20	15	10	19
	40	0	0	5	25
	41	20	15	10	23
	42	15	15	10	24
	43	20	15	10	24
	44	20	10	10	25
	45	0	15	10	24
	46	20	15	10	25
	47	0	15	10	20
	48	20	15	10	24
	49	15	0	10	25
	50	15	15	10	24
	51	20	15	10	
Possible		20	15	10	25
80% Score		16	12	8	20
# of Students		51	51	51	50
# of Students 80%+		28	42	42	47
% of Students 80%+		55%	82%	82%	94%
Assessment Avg		**69%**		**88%**	
Avg of Assessment		**78%**			

Table 4. Individual Student Performance and SLO #19 Assessment for CSM 3143

As presented in Table 3, the SLO #5 assessment depends on measuring three individual CLO scores from two projects. In other words, the process uses two individual direct assessment measures using two embedded assessment tools. In the example presented in this paper, there were 33 individual student scores for both projects. The CLO measurements average resulted in 88% for CLO #5, which satisfies the 80/80 criteria. However, a 76% score was observed for CLO #3, which focuses on the update procedures. In that section of the project assignment (for both projects), a delay was introduced as a part of the monthly project update, and the impact of the delay was required to be presented. With this observation, an emphasis on this issue was noted as an action item for the course's next offering.

For SLO #19, the individual student assessments average resulted in a 78% value that did not meet the 80/80 criteria. A low score of 58% was observed in the Midterm Exam II Question #1, associated with CLO#1. This was a reaction force and moment diagram question that can be considered a transition subject from the physics courses to structural behavior. Special attention to and review of the fundamental physics concepts was noted as an action item for this CLO in the next cycle. It should be noted here that the faculty member graded this question with minimal latitude for partial credit. The majority of the credits were either full (or close to full) points or zero. There were 51 students at Midterm Exam II and 50 at the Final Exam (one student did not take the final exam).

It should be noted that the construction program successfully completed a reaccreditation visit using the SLO assessment structure demonstrated in this paper. Although ACCE does not comment on individual SLO assessment procedures, SLO #5 and #19's continuous assessment processes and documentation were not noted as a concern or weakness.

SUMMARY AND CONCLUSIONS

This paper consists of two examples of direct measurement for ACCE Student Learning Outcomes. The procedures for a high level (create) and low level (understand) outcome are presented, providing a step-by-step approach, including developing the CLOs, links to SLOs, measurement instruments, analysis, and assessment cycle. In addition, it is essential to note the following five observations for the overall process:

- ***The process should be planned ahead of the course offering***. Both CLOs and SLOs should be identified/mapped for the course as early as possible, including the course content and measurement instruments' timing and structure.
- ***The assessment items should be as simple as possible.*** Assessment and documentation are time-consuming processes. One of the dangers of the process is creating an excessive structure that takes away the time and effort from the teaching and learning efforts. The utility of existing assignments and test questions should be explored for assessment purposes, which may be a great starting point.
- ***The assessment items should be meaningful.*** While aiming for a simple and practical assessment item, it is imperative to create meaningful measurements. Unless the observed items inform the teaching and learning process, it is challenging to interpret the results and create action items.

- ***The process must be continuous and consistent.*** This issue is loudly emphasized in any assessment and accreditation process; however, when there are inconsistencies in course offerings or different faculty members teach the same course, it increases the likelihood of producing incomparable results for each cycle. It may be a smart policy for the programs to establish a standardized system to avoid confusion.
- ***The number of SLOs must be controlled for each course.*** It is very tempting to assign multiple SLOs to the same course to simplify the workload. However, it is difficult to produce multiple data points in a single course. Except for written/oral communications, computer applications, and ethics, isolating the SLO to individual courses may yield more meaningful and manageable results.

Assessment is a critical part of continuous improvement and includes multiple direct and indirect data sources. This paper's direct assessment examples can be replicated to address different ACCE or program level requirements in other courses in a construction curriculum.

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APPENDIX A

CSM 4523 – PROJECT PLANNING AND SCHEDULING

SECTIONS 901 - 12:00PM - 1:15 PM TR (MNT 4.410)

INSTRUCTOR: XXXXXXXXXXXXXXXXXXXXXXXXXXX

OFFICE MNT 4.400 **PHONE:** 458.3099 **EMAIL:** XXXXXXXXXXXXXXXXX

OFFICE HRS: 1:30 pm – 3:00pm TR or by appointment

PREREQUISITE: CSM 4513.

CATALOG COURSE DESCRIPTION: (3-0) 3 hours credit. Continuation of CSM 4513 with emphasis on scheduling and project delivery methods utilizing applicable software. (Formerly ARC 4623. Credit cannot be earned for both CSM 4523 and ARC 4623.)

COURSE LEARNING OUTCOMES: A student completing CSM4523 will be able to:

- **CLO.1** Apply fundamental construction scheduling methods. (SLO.5, SLO.10)
- **CLO.2** Create resource and cost loaded schedules using industry standard software. (SLO.5, SLO.10)
- **CLO.3** Create schedule updates to reflect project conditions & progress using industry standard software. (SLO.5, SLO.10)
- **CLO.4** Analyze construction specifications related to planning and scheduling. (SLO.7)

ACCE STUDENT LEARNING OUTCOMES:

- **SLO.5** Create construction project schedules.
- **SLO.7** Analyze construction documents for planning and management of construction processes.
- **SLO.10** Apply electronic-based technology to manage the construction process.

COURSE POLICIES:

1. No late homework or make-up exams (excuses for such are defined by the university rules and regulations).
2. Students are encouraged to attend their classes. If absence is necessary, instructors are to be notified before the fact, if possible.
3. Each and every student is entitled to as much consultation time as may be required. To preserve the privilege of obtaining individual assistance, each student is expected to attend class regularly.
4. In-class participation and questions are encouraged. They may positively influence grading decisions in borderline cases.
5. All cell phones must be off, not vibrate, but off while in class. All cell phones will be inside back packs or otherwise stored away from the student during all examinations.
6. All students are required to have a University network account to access the computers and Blackboard.

COURSE MATERIAL & RESOURCES: **Course Materials:**

- All handouts and homework assignments will be delivered through Blackboard.
- All project information and pricing criteria will be delivered through Blackboard.

XXXXXXX CREED: The XXXXXXXXXXXX is a community of scholars where integrity, excellence, inclusiveness, respect, collaboration, and innovation are fostered. As a XXXXXXXXXXX, I will:

- Uphold the highest standards of academic and personal integrity by practicing and expecting fair and ethical conduct;
- Respect and accept individual differences, recognizing the inherent dignity of each person;
- Contribute to campus life and the larger community through my active engagement; and
- Support the fearless exploration of dreams and ideas in the advancement of ingenuity, creativity, and discovery.

Guided by these principles now and forever, I am a XXXXXXXXXXXXXX!

XXXXX COMMON INFORMATION: Information related to XXXX Policies and services regarding disabilities, dishonesty, counseling, and tutoring can be found at: http://XXX.XXX.XXX/XXXXXX

GRADE POLICY :

Midterm Exam I	15%
Midterm Exam II	15%
Final Exam	20%
Homeworks	15%
Project 1	15%
Project 2	15%
Quizzes	5%

GRADE SCALE :

A	≥ 90
B	80 – 89.9999
C	70 – 79.9999
D	60 – 69.9999
F	≤ 59.9999

Figure 2. CSM 4523 Course Syllabus – Page 1

CSM4523 – PROJECT PLANNING AND SCHEDULING
Course Outline and Assignments

No	Date	Topic	Assignments	Assessment
1	Aug 22	Introduction, Course Requirements, Ethics, Principles of Construction		
2	Aug 24	Construction Planning and Scheduling – Terminology and Principles		
3	Aug 29	Activities , Tasks and Production – Gantt Charts and Precedence Diagrams	HW1	
4	Aug 31	CPM and Network Calculations		
		September 4 – Labor Day Holiday		
5	Sep 5	CPM and Network Calculations		
6	Sep 7	CPM and Network Calculations – Float Interpretation		
7	Sep 12	CPM and Network Calculations – Network Crashing	HW2	
8	Sep 14	**Primavera P6** – Gantt Charts and Precedence Diagrams	P1 - Milestone 1	
9	Sep 19	**Primavera P6** – CPM and Network Presentations		
10	Sep 21	**Primavera P6** – CPM and Network Presentations	P1 - Milestone 2	
11	Sep 26	**Primavera P6** – CPM and Network Presentations		
12	Sep 28	**Primavera P6** – Project Controls, Communications and Reporting		
13		*October 3 – Midterm Exam I*		
14	Oct 5	**Primavera P6** – Project Controls, Communications and Reporting	P1 - Milestone 3	CLO.1, CLO.2, CLO.3 (SLO.5, SLO.10)
15	Oct 10	Project Updates and Controls		
16	Oct 12	Cost Control Principles and Delays		
17	Oct 17	Project Cost Control Principles and Delay		
18	Oct 19	Project Cost Control Principles and Delay		
19	Oct 24	Construction Planning and Productivity	HW3	
20	Oct 26	**MS Project** – Gantt Charts and Precedence Diagrams	P2 - Milestone 1	
21	Oct 31	**MS Project** – CPM and Network Presentations		
22		*November 2 – Midterm Exam II*		
23	Nov 7	**MS Project** – CPM and Network Presentations	P2 - Milestone 2	
24	Nov 9	**MS Project** – Project Controls, Communications and Reporting	HW4	
25	Nov 14	**MS Project** – Project Controls, Communications and Reporting		
26	Nov 16	**MS Project** – Project Controls, Communications and Reporting	P2 - Milestone 3	CLO.1, CLO.2, CLO.3 (SLO.5, SLO.10)
27	Nov 21	Construction Scheduling Specifications and Compliance		
		November 23-24 – Thanksgiving Holiday		
28	Nov 28	Construction Scheduling Specifications and Compliance	HW5	
29	Nov 30	Construction Scheduling – Case Studies and Final Exam Review		
30		*December 5 – Final Exam*		*CLO.4 (SLO.7)*

This Syllabus is provided for informational purposes regarding the anticipated course content and schedule. It is based on the most recent information available as of the date of its issuance. It is as accurate and complete as is possible at this time. The instructors reserve the right to make any changes deemed necessary and/or appropriate. An effort will be made to communicate any syllabus changes in a timely manner. Students are responsible for being aware of these changes.

Figure 3. CSM 4523 Course Syllabus – Page 2

CSM 3143 – STRUCTURES I

SECTION 901 – 12:00 PM – 1:15 PM MW (MNT 4.410)
SECTION 902 – 9:00 AM – 10:15 PM MW (MNT 4.410)

INSTRUCTOR:	XXXXXXXXXXXXXXXX
OFFICE	MNT 4.400 **PHONE:** 458.3099 **EMAIL:** XXXXXXXXXXX
OFFICE HRS:	9:30 am – 1:00 pm T or by appointment
PREREQUISITE:	PHY 1603/1943 and enrollment as a Construction Science and Management Major
CATALOG COURSE DESCRIPTION:	(3-0) 3 hours credit. Introduction to the physical principles that govern classical statics and strengths of materials through the design of concrete, timber, and steel components of structures.
COURSE LEARNING OUTCOMES:	A student completing CSM 3143 will be able to: **CLO.1** Analyze fundamental relationships between structural elements and forces/equilibrium/moments. (SLO.19) **CLO.2** Analyze stress, strain, and material deformation properties. (SLO.19) **CLO.3** Understand quality assurance by design based on stress, strain, and material deformation properties. (SLO.15)
ACCE STUDENT LEARNING OUTCOMES:	**SLO.15** Understand construction quality assurance and control. **SLO.19** Understand the basic principles of structural behavior.
COURSE POLICIES:	**1.** No late homework or make-up exams (excuses for such are defined by the university rules and regulations). **2.** Students are encouraged to attend their classes. If absence is necessary, instructors are to be notified before the fact, if possible. **3.** Each and every student is entitled to as much consultation time as may be required. To preserve the privilege of obtaining individual assistance, each student is expected to attend class regularly. **4.** In-class participation and questions are encouraged. They may positively influence grading decisions in borderline cases. **5.** All cell phones must be off, not vibrate, but off while in class. All cell phones will be inside back packs or otherwise stored away from the student during all examinations. **6.** All students are required to have a University network account to access the computers and Blackboard.
COURSE MATERIAL & RESOURCES:	**Course Materials:** • All handouts and homework assignments will be delivered through Blackboard.
XXXXXXX CREED:	The XXXXXXXXXXXX is a community of scholars where integrity, excellence, inclusiveness, respect, collaboration, and innovation are fostered. As a XXXXXXXXXXX, I will: • Uphold the highest standards of academic and personal integrity by practicing and expecting fair and ethical conduct; • Respect and accept individual differences, recognizing the inherent dignity of each person; • Contribute to campus life and the larger community through my active engagement; and • Support the fearless exploration of dreams and ideas in the advancement of ingenuity, creativity, and discovery. Guided by these principles now and forever, I am a XXXXXXXXXXXXXX!
XXXX COMMON INFORMATION:	Information related to XXXX Policies and services regarding disabilities, dishonesty, counseling, and tutoring can be found at: http://XXX.XXX.XXX/XXXXXX

GRADE POLICY :			**GRADE SCALE** :		
	Midterm Exam I	24%		**A**	≥ 90
	Midterm Exam II	24%		**B**	80 – 89.9999
	Final Exam	24%		**C**	70 – 79.9999
	Homeworks	18%		**D**	60 – 69.9999
	Quizzes	10%		**F**	≤ 59.9999

Figure 4. CSM 3143 Course Syllabus – Page 1

CSM 3143 – STRUCTURES I
Course Outline and Assignments

NO	DATE	TOPIC	ASSIGNMENTS	ASSESSMENT
1	Aug 23	Introduction and Course Requirements		
2	Aug 28	Fundamentals of Forces and Structures		
3	Aug 30	Equilibrium, Forces, and Moments		
		September 4 – Labor Day Holiday		
4	Sep 6	Structural Components and Behavior	HW1	
5	Sep 11	Structural Components and Behavior		
6	Sep 13	Structural Assemblies and Systems		
7	Sep 18	Structural Assemblies and Systems	HW2	
8	Sep 20	Structural Assemblies and Systems		
9	Sep 25	Fundamentals of Forces and Structures - Midterm Exam Review		
10		*September 27 – Midterm Exam I*		
11	Oct 2	Stress, Strain, Deformation		
12	Oct 4	Stress, Strain, Deformation		
13	Oct 9	Stress, Strain, Deformation		
14	Oct 11	Stress, Strain, Deformation		
15	Oct 16	Stress, Strain, Deformation	HW3	
16	Oct 18	Shear Forces and Stress		
17	Oct 23	Shear Forces and Stress		
18	Oct 25	Shear Forces and Stress		
19	Oct 30	Shear Forces and Stress	HW4	
20	Nov 1	Stress, Strain, Deformation, Shear Forces - Midterm Exam Review		
21		*November 6 – Midterm Exam II*		*CLO.1, CLO.2 (SLO.19)*
22	Nov 8	Stress, Strain, Deformation, Shear Forces		
23	Nov 13	Stress and Deformation of Beams		
24	Nov 15	Beam and Column Systems	HW5	
25	Nov 20	Beam and Column Systems		
26	Nov 22	Beam and Column Systems		
		November 23-26 – Thanksgiving Holiday		
27	Nov 27	Beam and Column Systems		
28	Nov 29	Foundation Systems		
29	Dec 4	Foundation Systems – Final Exam Review		
30		*December 6 – Final Exam*		*CLO.1, CLO.2, CLO.3 (SLO.15,19)*

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Figure 5. CSM 3143 Course Syllabus – Page 2