Lawrence Technological University

Assessment Report

Academic Years: 2019, 2020, 2021

University Assessment Committee

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Executive Summary of Assessment Report for 2019-2021

Assessment of student educational outcomes at Lawrence Technological University is the responsibility of the University Assessment Committee (UAC). The function of the UAC is to advise the Director of Assessment, to plan and carry out assessment of student learning in the academic programs of the University, and to disseminate results of assessment activities to the University and the general public. Committee membership typically accounts for the equivalent of three academic hours of service to the University.

The UAC is chaired by the Director of Assessment (who is a faculty member appointed by the Provost), one member from each academic department, and the Provost (*ex officio*), the Associate Provost and the Director of eLearning Services (as non-voting members).

While each UAC member conducts regular meetings with their respective academic department, the UAC meets occasionally during the academic year to discuss assessment methodology best practices in each program. These meetings help to ensure the vitality of assessment within individual programs. The UAC also meets for annual semester planning retreats. The UAC meets with all the University full time faculty, department chairs, program directors and College Deans during the annual University Assessment Day.

All UAC meeting minutes and associated assessment materials are stored on the university learning management system.

The UAC addresses the culture of assessment throughout the university programs by supporting assessment of (1) Undergraduate University Level Learning Outcomes encompassing the Lawrence Tech “Core Curriculum”, (2) Undergraduate Program Level Learning Outcomes encompassing each of the university undergraduate programs, and (3) Graduate Program Learning Outcomes encompassing each of the university’s graduate programs.

This report covers the academic years 2019, 2020, and 2021. It includes a comprehensive overview of assessment activities and findings across all programs during this three-year cycle. Each program report details assessment and loop-closing activities undertaken, as well as assessment plans for future academic years. As we transition to this three-year cycle, the present report contains annual reports from programs as they adapt their reporting to a longitudinal framework.

Assessment Committee Mission Statement

The University Faculty Handbook describes the role of the University Assessment Committee in section 6.2.8.

> *6.2.8. Assessment Committee*
>
> *The Assessment Committee coordinates policy and procedures related to both college and University assessment programs. The committee's principal responsibility is to promote improvements in learning through implementation of the University's plan for academic assessment.*
>
> *The committee is advisory to the Deans' Council, and its members and chairperson are appointed by the Provost.*

In order to clarify and to codify this institutional role, the University Assessment Committee adopts the following mission functions:

i. Advise the Director of Assessment and the Office of the Provost on matters related to the assessment of student learning.
ii. Design, coordinate and execute the University's assessment plan.
iii. Supervise and coordinate assessment activities within departments in order to ensure that all academic programs are comparably assessed and continuously improved as a result of assessment.
iv. Plan and execute University Assessment Day activities.
v. Revise the University Educational Learning Outcomes periodically.
vi. Facilitate communication about assessment initiatives and issues among departments, and between departments and the Office of the Provost.
vii. The University Assessment Committee's mission can be modified by the committee to ensure continuous improvement and ownership of assessment processes by faculty and administrators.

Assessment Committee Membership Rules

Membership Composition

The Assessment Committee is made up of the following individuals:

The Director of Assessment (Chair, faculty representative)
One faculty representative from each academic department.
The Provost, *ex officio* and non-voting
The Associate Provost, *ex officio* and non-voting
The Director of eLearning Services, *ex officio* and non-voting
One representative from any other academic program as the Dean of the appropriate College and/or Provost direct.

Chairperson

The Chairperson of the Assessment Committee is the University's Director of Assessment. He/she is a faculty member appointed by the Provost for a three-year term. The term can be extended if mutually agreed upon by the Chair and the Provost.

Committee Members

(1) Each department, and each other program designated by the Provost, names its own representative.
(2) Each department or unit representative serves for a term of three years. In the event of a vacancy during a term, the department or unit will name a representative to serve the unexpired part of the regular term.
(3) Continuous membership as a department or unit representative is limited to two regular terms plus up to two semesters' service in an unexpired term before the first regular term. A member who becomes ineligible because of this limit remains ineligible for three years unless the Provost decides that the department or unit lacks sufficient faculty for a normal rotation.
(4) Renewed terms start in August of each year.
(5) Members will serve 3 years in staggered terms.

The Chairperson will publish a schedule of expirations of terms in force at the time of adoption of these by-laws.

Rules of Order

(1) A two-thirds majority vote of the voting members of the Assessment Committee is required to change any of the membership rules once this proposal is approved.
(2) Robert's Rules of Order will be followed in other details that may not have been mentioned in the membership rules.

UAC Membership 2019-2021

Chair and Director of Assessment	Matthew Cole
College of Architecture and Design	
Architecture	Dan Faoro / Jason Yeom / Eric Ward
Art and Design	Steve Coy
College of Arts and Sciences	
Humanities, Social Sciences, and Communication	Jason Barrett
Mathematics and Computer Science	Chris Cartwright / Yelena Vaynberg
Natural Sciences	Changgong Zhou / Fauzia Siddiq
College of Engineering	
Biomedical Engineering	Eric Meyer
Civil Engineering	Filza Walters / Ahmed Al-Bayati
Electrical and Computer Engineering	Jinjun Xia
Engineering Technology	Jerry Cuper / Sabah Abro
Mechanical Engineering	Andrew Gerhart
College of Business and Information Technology	
BSBA, BSIT, MBA, MSIT	Matthew Cole
Ex-Officio Members	
Assistant Provost	James Jolly
eLearning Services	Lynn Miller-Wietecha

University Educational Goal

The University mission is to develop leaders through innovative and agile programs embracing theory and practice.

The University vision is to be a preeminent university producing leaders with an entrepreneurial spirit and global view.

The University provides a student-centered comprehensive educational experience with technologically focused professional programs.

The University's undergraduate and graduate learning outcomes foster students' intellectual development into knowledgeable professionals, critical thinkers, and ethical leaders.

Learning Outcomes

Undergraduate Learning Outcomes

The Lawrence Tech undergraduate learning outcomes are comprised of (1) University Level Learning Outcomes, and (2) Undergraduate Program Level Learning Outcomes. The Undergraduate University Level Learning Outcomes encompass a set of five learning outcomes of LTU's "general education" defined by the university core curriculum. The Undergraduate Program Level Learning Outcomes encompass an overarching set of five learning outcomes defined by each program.

Undergraduate University Level Learning Outcomes	Undergraduate Program Level Learning Outcomes
WRITTEN COMMUNICATION "LTU undergraduates who complete the core curriculum will demonstrate professional standards in written communication by mastering the fundamentals of writing mechanics and integrating evidence and analysis within a coherent structure."	TECHNOLOGY Refer to each program
ORAL COMMUNICATION "LTU undergraduates who complete the core curriculum will demonstrate effectiveness in oral communication through development of content clearly and articulately."	ETHICS Refer to each program
CRITICAL THINKING "LTU undergraduates who complete the core curriculum will demonstrate critical thinking skills in reading complex texts and analyzing arguments."	LEADERSHIP Refer to each program
QUANTITATIVE REASONING "LTU undergraduates who complete the core curriculum will demonstrate Quantitative Reasoning capabilities through applying mathematics and statistical methods to solves problems"	TEAMWORK Refer to each program
SCIENTIFIC ANALYSIS "LTU undergraduates who complete the core curriculum will demonstrate proficiency in principles of science and applying it to solve scientific problems."	VISUAL COMMUNICATION Refer to each program

Graduate Learning Outcomes

The Lawrence Tech Graduate Program learning outcomes encompass an overarching set of four learning outcomes defined by each program.

Graduate Program Learning Outcomes
ADVANCED KNOWLEDGE Refer to each program
ETHICS Refer to each program
COMMUNICATION Refer to each program
TECHNOLOGY Refer to each program

Undergraduate University Level Assessment Plan

Undergraduate University Level Assessment Outcomes	Assessment Strategy	Academic Unit	Courses and Metrics	Administration Timeline	Loop-Closing Timeline
WRITTEN COMMUNICATION "LTU undergraduates who complete the core curriculum will demonstrate professional standards in written communication by mastering the fundamentals of writing mechanics and integrating evidence and analysis within a coherent structure."	5-point course embedded rubric in three Written Communication performance indictors: Style (construct original arguments that they support with evidence), Grammar (produce prose that satisfies conventions of formal, academic writing), Citations (provide citations that fulfill discipline requirements)	HSSC Department	Minimum score of 3 on all performance indicators on final papers in COM1103, LLT1213, LLT1223, SSC2413, SSC2423	Annual Rotation A: COM1103 B: LLT1213/1223 C: SSC2413/2423	3-year cyle
ORAL COMMUNICATION "LTU undergraduates who complete the core curriculum will demonstrate effectiveness in oral communication through development of content clearly and articulately."	5-point course embedded rubric in three Oral Communication performance indicators: Structure (understand the conventions of effective nonverbal communication), Content (understand relevant rhetorical strategies), Delivery (deliver content clearly and articulately)	HSSC Department	Minimum score of 3 on all performance indicators on oral presentation in COM2103	Annual	3-year cyle
CRITICAL THINKING "LTU undergraduates who complete the core curriculum will demonstrate critical thinking skills in reading complex texts and analyzing arguments."	5-point course embedded rubric in three Critical Thinking performance indicators: Thesis (demonstrate an understanding of historical and aesthetic periods and their impact on human thought), Argument (construct arguments using primary and secondary sources), Course Materials (perform close reading of complex texts)	HSSC Department	Minimum score of 3 on all performance indicators on final papers in COM1103, LLT1213, LLT1223, SSC2413, SSC2423	Annual Rotation A: COM1103 B: LLT1213/1223 C: SSC2413/2423	3-year cyle
QUANTITATIVE REASONING "LTU undergraduates who complete the core curriculum will demonstrate Quantitative Reasoning capabilities through applying mathematics and statistical methods to solve problems."	Direct assessment of three performance indicators using final exam questions: PI-1, Apply arithmetic, algebraic, geometric, technological, or statistical methods to solve problems; PI-2, Represent mathematical concepts verbally, and, where appropriate, symbolically, visually, and numerically; and PI-3, Interpret mathematical models given verbally, or by formulas, graphs, tables, or schematics, and draw inferences from them.	Mathematics + Computer Sciences Department	Score on final exam problems $\geq$ 70% in MCS1074, MCS1414, MCS1424, and MCS1254	Annual	3-year cyle
SCIENTIFIC ANALYSIS "LTU undergraduates who complete the core curriculum will demonstrate proficiency in principles of science and applying it to solve scientific problems."	Direct assessment of two performance indicators using selected laboratory assignments: PI-1, Students will apply elements of the scientific method via observation and experimentation; and PI-2, Students will analyze natural sciences concepts and/or problems.	Natural Sciences Department	70% of students scoring 70% or better in BIO2321, PHY2221/2421, and PHY2231/2431	Annual	3-year cyle

Undergraduate Program Level Assessment Plan

Undergraduate Program Level Learning Outcomes	Assessment Strategy	Responsible Academic Unit	Courses and Metrics	Administration Timeline	Loop-Closing Timeline
TECHNOLOGY Refer to each program	To be developed and implemented by program	Program	To be determined by program	Annual	3-year cyle
ETHICS Refer to each program	To be developed and implemented by program	Program	To be determined by program	Annual	3-year cyle
LEADERSHIP Refer to each program	To be developed and implemented by program	Program	To be determined by program	Annual	3-year cyle
TEAMWORK Refer to each program	To be developed and implemented by program	Program	To be determined by program	Annual	3-year cyle
VISUAL COMMUNICATION Refer to each program	To be developed and implemented by program	Program	To be determined by program	Annual	3-year cyle

Graduate Program Assessment Plan

Graduate Learning Outcomes	Assessment Strategy	Responsible Academic Unit	Courses and Metrics	Administration Timeline	Loop-Closing Timeline
ADVANCED KNOWLEDGE Refer to each program	To be developed and implemented by program	Program	To be determined by program	Annual	3-year cyle
ETHICS Refer to each program	To be developed and implemented by program	Program	To be determined by program	Annual	3-year cyle
COMMUNICATION Refer to each program	To be developed and implemented by program	Program	To be determined by program	Annual	3-year cyle
TECHNOLOGY Refer to each program	To be developed and implemented by program	Program	To be determined by program	Annual	3-year cyle

Assessment Days 2019-2021

Lawrence Technological University's (LTU) Assessment Days are integral to LTU's commitment to continuous improvement, providing a forum for programs to present their assessment efforts, demonstrate how feedback loops lead to enhancements, and outline future assessment plans. This three-year period saw significant shifts in higher education, notably the global COVID-19 pandemic, which necessitated considerable adaptability in assessment practices.

2019 Assessment Day: Foundations and Collaborative Inquiry

On September 17, 2019, all faculty convened in the A210 Gallery for two interactive workshops: "Diversity" and "Question Formulation Technique (QFT) Workshop on Assessment." The "Diversity" workshop aimed to foster a culture of inclusion at LTU, while the "QFT" workshop provided continued support for a positive assessment culture.

Faculty, arranged in four-person teams, generated high-level questions in response to three prompts:

1. Assessment informs teaching.
2. Assessment informs accreditation.
3. Assessment informs accountability.

Discussions emphasized both the methodology and value of assessment. Methodological concerns included the need for alignment across course, program, and professional accreditation levels, awareness of stakeholders (faculty, students, society), and the selection of reliable and valid tools. Value concerns highlighted the critical need to "close the loop" by using assessment data for the continuous improvement of pedagogy, curriculum, and the university's mission.
Key insights from the faculty questions and discussions included:

- Assessment Informs Teaching: Defined as "closing the loop" and using data for continuous improvements in teaching. Effective assessment tools were identified as those connecting to course, program, and university mission objectives, utilizing both formative and summative measures, and incorporating diverse data like student evaluations, retention rates, graduation rates, and industry feedback. Assessment should occur continuously and involve faculty, advisory board members, and students. Validity was linked to appropriate tool usage and observed continuous improvement.
- Assessment Informs Accreditation: Faculty identified meeting mission-aligned assessment objectives and submitting reports to the HLC as key indicators. All stakeholders, from students to administration, were deemed responsible for participation. Criteria for accreditation aligned with HLC Standard 4: Teaching and Learning. The role of assessment was to provide evidence of meeting the university's mission and demonstrating continuous improvement.
- Assessment Informs Accountability: Assessment ensures relevance and upholds the university's mission. Accountability is measured through mechanisms like the Annual Performance Review Process (APPR), student retention, and job placement. The concept of "closing the loop" was again central to improving accountability. Accountability was viewed as a continuous process, defined by appropriate learning outcomes and assessment measures, and extending to HLC, LTU, professors, students, and society.

2020 Assessment Day: Adapting to Unprecedented Challenges

Due to the COVID-19 pandemic, there was no all-faculty Assessment Day in 2020. Instead, each UAC member worked virtually with their respective academic programs to facilitate ongoing assessment activities. This decentralized approach allowed programs to adapt their assessment strategies to the rapidly changing educational landscape, including the shift to remote and hybrid learning. Despite the challenges, programs continued to engage in their assessment cycles, focusing on collecting data and planning for improvements under new operational constraints.

2021 Assessment Day: Embracing Authentic Assessment

On September 21, 2021, Assessment Day was held virtually via Zoom, with a primary focus on Authentic Assessment. The session emphasized that an authentic assignment requires students to apply learned knowledge to new situations, demanding judgment in selecting relevant information and skills. These assignments often tackle "messy, complex real-world situations" and their inherent constraints. This focus underscored a move towards assessment methods that better reflect real-world professional demands and promote deeper learning outcomes, especially valuable as the university navigated the lingering effects of the pandemic and considered lasting changes to educational delivery.

Overarching Impact and Future Direction:

The Assessment Days from 2019 to 2021 highlight LTU's adaptive assessment culture. The 2019 session solidified foundational understandings of assessment's role in teaching, accreditation, and accountability. The adjustments in 2020 showcased the university's resilience and capacity for virtual collaboration in unprecedented circumstances. Finally, the 2021 focus on authentic assessment indicated a forward-looking approach to assessment, aiming to enhance the relevance and impact of student learning. The transition to a three-year reporting cycle will now allow for a more comprehensive and longitudinal analysis of program effectiveness and continuous improvement efforts. As we transition to this three-year cycle, the present report contains annual reports from programs as they adapt their reporting to a longitudinal framework.

Annual Assessment Reports 2019-2021

Core Curriculum

1. Assessment Plan and Summary

The Core Curriculum is the set of classes that all Lawrence Technological University undergraduates take, no matter what their major. Built around a strongly interactive engagement with literature, history, philosophy, mathematics, science, and the arts, the Core also emphasizes shared intellectual experiences within a community of learning through reading, directed discussions, group presentations, and problem-solving teamwork. Assessment of the Core is undertaken by three departments in the College of Arts of Sciences: Humanities, Social Sciences, and Communication (HSSC), Mathematics + Computer Sciences (MCS), and Natural Sciences (NS).

The Core Curriculum assessment plan is designed to assess the Undergraduate University Level learning outcomes of LTU's "general education" core curriculum program: Written Communication, Oral Communication, Critical Thinking, Quantitative Reasoning, and Scientific Analysis. As shown in Table 1, the assessment plan for each outcome is described in terms of: assessment strategy, responsible academic unit, courses and metrics, administration timeline, and loop-closing timeline.

HSSC is responsible for assessing Written Communication, Oral Communication, and Critical Thinking; MCS is responsible for assessing Quantitative Reasoning; and NS is responsible for assessing Scientific Analysis. Assessment occurs in the following courses:

A. HSSC
COM1103: College Composition
COM2103: Technical and Professional Communication
SSC2413: Foundations of the American Experience
SSC2423: Development of the American Experience
LLT1213: World Masterpieces 1
LLT1223: World Masterpieces 2

These six HSSC core curriculum courses have been selected for assessment of the core curriculum because they are required of all LTU undergraduates who start as freshman, and are required by many students who transfer to LTU before the third year, regardless of the major program of study.

B. MCS
MCS1074: Precalculus
MCS1254: Geometry in Art
MCS1414: Calculus 1
MCS1424: Calculus 2

These four MCS core curriculum courses have been selected for assessment of the core curriculum because they are required of all LTU undergraduates who start as freshman, and are required by many students who transfer to LTU before the third year, regardless of the major program of study.

C. NS
BIO2321: Microbiology Laboratory
PHY2221: College Physics 1 Lab

PHY2421: University Physics 1 Lab
PHY2231: College Physics 2 Lab
PHY2431: University Physics 2 Lab

These five laboratory core curriculum courses have been selected for the following reasons:

(1) The four physics lab courses enroll more than 400 students on average annually. Though they do not cover every single student, they cover the majority of programs on campus, and provide a fairly large sample size for meaningful assessment.
(2) The new nursing program enrolls a large number of students, who do not take any physics courses. Therefore, Microbiology Lab, a required course for nursing students, was selected for assessment of the nursing student population. In Microbiology Lab, students characterize unknown bacteria using various diagnostic tests and we assess their scientific experimentation and analysis using rubrics during these activities.
(3) Lab courses are a perfect platform to assess students' scientific analysis skills because they need to actively apply observation and experimentation to solve various real-world problems in every lab session. This is particularly true for the physics lab courses. Students work on two lab activities in each lab session: "Exploration" and "Application." In the Exploration, students need to explore various experimentation methods without the aid of detailed experimental procedures; in the Application, students are asked to apply their previous learning from the Exploration to an open-ended problem.

Table 1: Assessment Plan for the Core Curriculum

Undergraduate University Level Assessment Outcomes	Assessment Strategy	Academic Unit	Courses and Metrics	Administration Timeline	Loop-Closing Timeline
WRITTEN COMMUNICATION "LTU undergraduates who complete the core curriculum will demonstrate professional standards in written communication by mastering the fundamentals of writing mechanics and integrating evidence and analysis within a coherent structure."	5-point course embedded rubric on three Written Communication performance indictors: Style (construct original arguments that they support with evidence), Grammar (produce prose that satisfies conventions of formal, academic writing), Citations (provide citations that fulfill discipline requirements)	HSSC Department	Minimum score of 3 on all performance indicators on final papers in LLT1213/HUM1213 LLT1223/HUM1223	Annual	3-Year Cycle
ORAL COMMUNICATION "LTU undergraduates who complete the core curriculum will demonstrate effectiveness in oral communication through development of content clearly and articulately."	5-point course embedded rubric on three Oral Communication performance indicators: Structure (understand the conventions of effective nonverbal communication), Content (understand relevant rhetorical strategies), Delivery (deliver content clearly and articulately)	HSSC Department	Minimum score of 3 on all performance indicators on oral presentation i COM2103	Annual	3-Year Cycle
CRITICAL THINKING "LTU undergraduates who complete the core curriculum will demonstrate critical thinking skills in reading complex texts and analyzing arguments."	5-point course embedded rubric on three Critical Thinking performance indicators: Thesis (demonstrate an understanding of historical and aesthetic periods and their impact on human thought), Argument (construct arguments using primary and secondary sources), Course Materials (perform close reading of complex texts)	HSSC Department	Minimum score of 3 on all performance indicators on final papers in SSC2413/SSC2xx3 SSC2423/LLT2xx3	Annual	3-Year Cycle
QUANTITATIVE REASONING "LTU undergraduates who complete the core curriculum will demonstrate Quantitative Reasoning capabilities through applying mathematics and statistical methods to solve problems."	Direct assessment of three performance indicators using final exam questions: PI-1, Apply arithmetic, algebraic, geometric, technological, or statistical methods to solve problems; PI-2, Represent mathematical concepts verbally, and, where appropriate, symbolically, visually, and numerically; and PI-3, Interpret mathematical models given verbally, or by formulas, graphs, tables, or schematics, and draw inferences from them.	Mathematics + Computer Sciences Department	Score on final exam problems $\geq 70\%$ in MCS1074, MCS1414, MCS1424, and MCS1254	Annual	3-Year Cycle
SCIENTIFIC ANALYSIS "LTU undergraduates who complete the core curriculum will demonstrate proficiency in principles of science and applying it to solve scientific problems."	Direct assessment of two performance indicators using selected laboratory assignments: PI-1, Students will apply elements of the scientific method via observation and experimentation; and PI-2, Students will analyze natural sciences concepts and/or problems.	Natural Sciences Department	70% of students scoring 70% or better in BIO2321, PHY2221/2421, and PHY2231/2431	Annual	3-Year Cycle

2. Report on 2019-2021 Academic Year and Action Plan (Loop Closing)

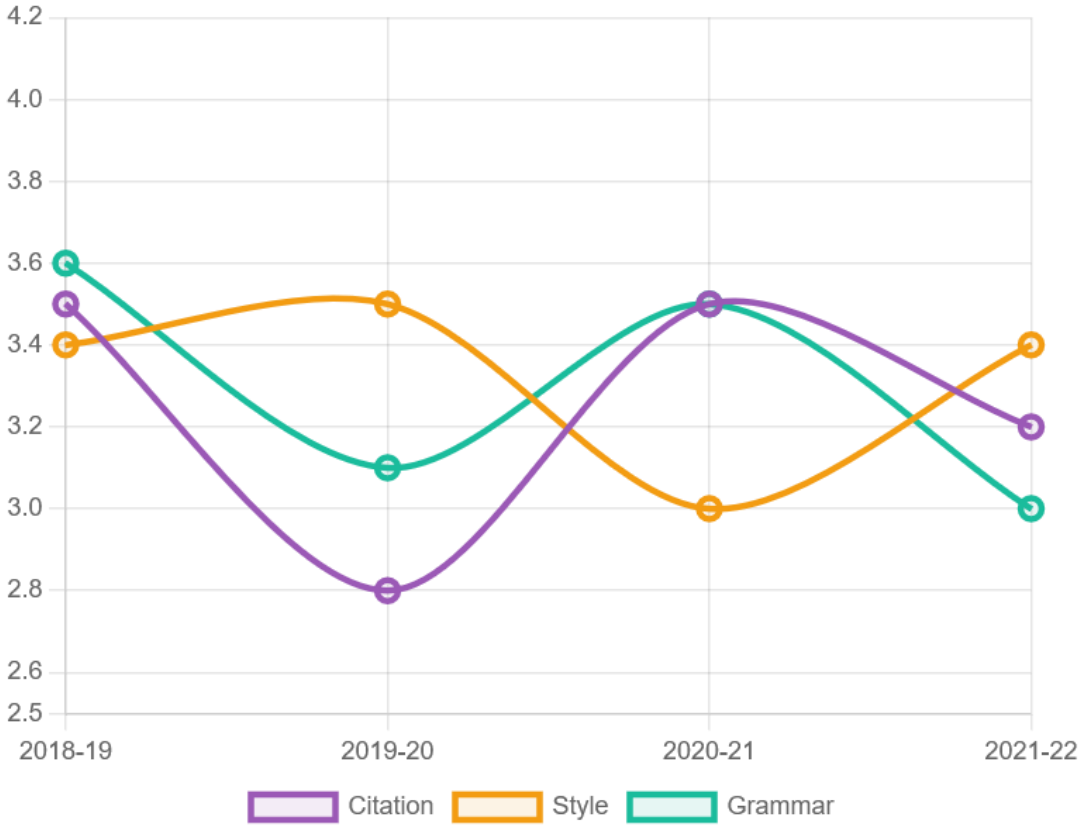
A. Written Communication

(1) Learning Objective: "LTU undergraduates who complete the core curriculum will demonstrate professional standards in written communication by mastering the fundamentals of writing mechanics and integrating evidence and analysis within a coherent structure."

(2) Assessment: 5-point course embedded rubric on three Written Communication performance indictors: *Style* (construct original arguments that they support with evidence), *Grammar* (produce prose that satisfies conventions of formal, academic writing), *Citations* (provide citations that fulfill discipline requirements). Assessment of final papers in multiple sections of LLT1213/1223. Longitudinal assessments have been obtained from 2019-2021 academic years (see Figure 1).

(3) Evaluation: Mean scores for 2019-2021: *Style* = 3.3, *Grammar* = 3.3, *Citations* = 3.25.

Figure 1: Longitudinal Assessment Data for Written Communication



(4) Issue: Mean scores on each performance indictor exceeded minimum criterion score (3.0).

(5) Actions: Continue to assess each semester and utilize Canvas for data management of course embedded rubric, and continue analyzing longitudinal assessment data of written communication.

(6) Responsibility: Jason Barrett

(7) University/College Support for Objective: University eLearning Services to implement integration of course embedded rubrics in Canvas. College of Arts and Sciences to support HSSC department's role in the assessment of Written Communication.

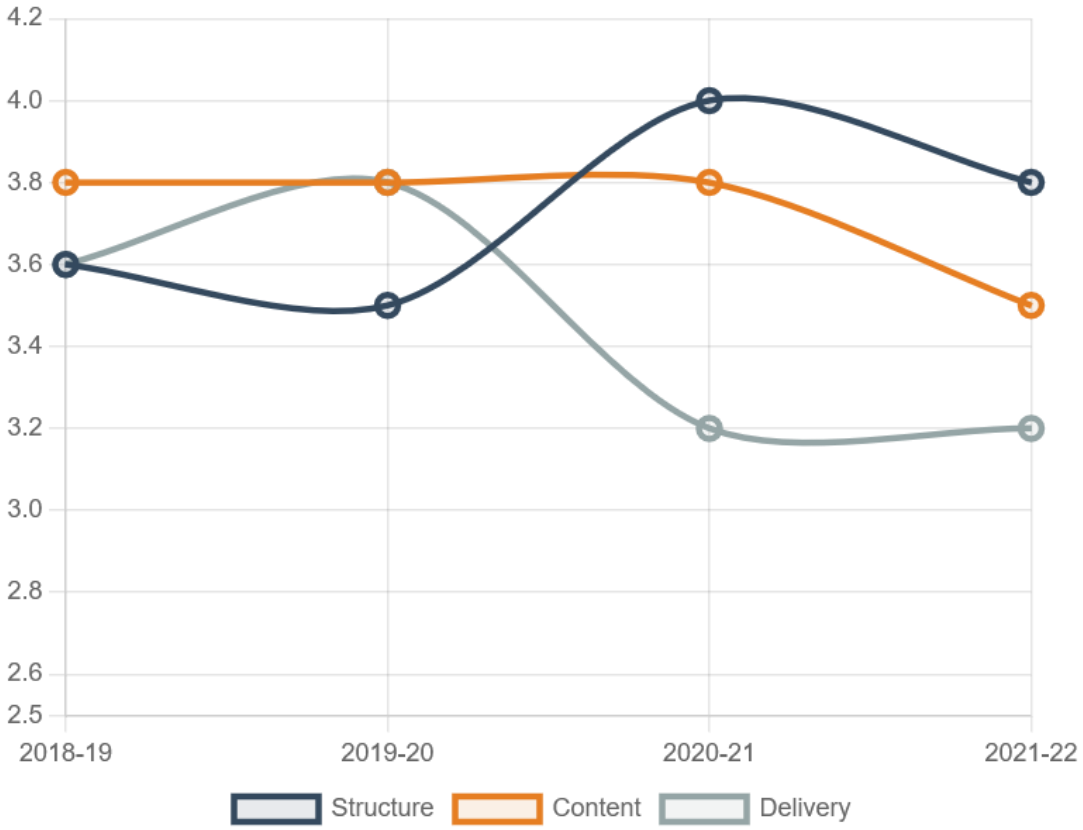
B. Oral Communication

(1) Learning Objective: "LTU undergraduates who complete the core curriculum will demonstrate effectiveness in oral communication through development of content clearly and articulately."

(2) Assessment: 5-point course embedded rubric on three Oral Communication performance indicators: *Structure* (understand the conventions of effective nonverbal communication), *Content* (understand relevant rhetorical strategies), *Delivery* (deliver content clearly and articulately). Assessment of oral presentations in multiple sections of COM2103. Longitudinal assessments have been obtained from 2019-2021 academic years (see Figure 2).

(3) Evaluation: Mean scores for 2019-2021: *Structure* = 3.7, *Content* = 3.7, *Delivery* = 3.5.

Figure 2: Longitudinal Assessment Data for Oral Communication



(4) Issue: Mean scores on each performance indictor exceeded minimum criterion score (3.0).

(5) Actions: Continue to assess each semester, utilize Canvas for data management of course embedded rubric, and continue analyzing longitudinal assessment data of oral communication.

(6) Responsibility: Julia Kiernan

(7) University/College Support for Objective: University eLearning Services to implement integration of course embedded rubrics in Canvas. College of Arts and Sciences to support HSSC department's role in the assessment of Oral Communication.

C. Critical Thinking

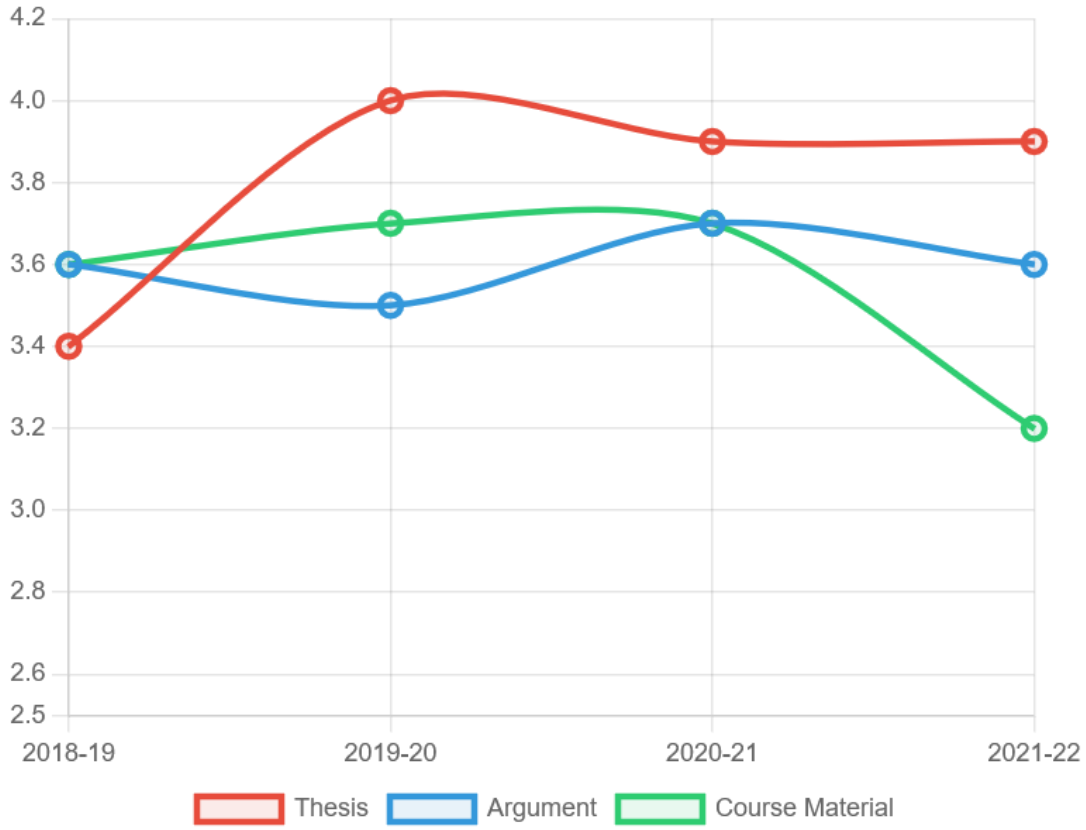
(1) Learning Objective: "LTU undergraduates who complete the core curriculum will demonstrate critical thinking skills in reading complex texts and analyzing arguments."

(2) Assessment: 5-point course embedded rubric on three Critical Thinking performance indicators: *Thesis* (demonstrate an understanding of historical and aesthetic periods and their impact on human

thought), *Argument* (construct arguments using primary and secondary sources), *Course Materials* (perform close reading of complex texts). Assessment of 90 final papers occurred in 10 sections of COM1103.

(3) Evaluation: Mean scores for 2018-2019: *Thesis* = 3.4, *Argument* = 3.6, *Course Materials* = 3.2. Longitudinal assessments have been obtained from 2008-2018 academic years (see Figure 3).

Figure 3: Longitudinal Assessment Data for Critical Thinking



(4) Issue: Mean scores on each performance indictor exceeded minimum criterion score (3.0).

(5) Actions: Continue to assess each semester and utilize Canvas for data management of course embedded rubric, and continue analyzing longitudinal assessment data of critical thinking.

(6) Responsibility: Jason Barrett

(7) University/College Support for Objective: University eLearning Services to implement integration of course embedded rubrics in Canvas. College of Arts and Sciences to support HSSC department's role in the assessment of Critical Thinking.

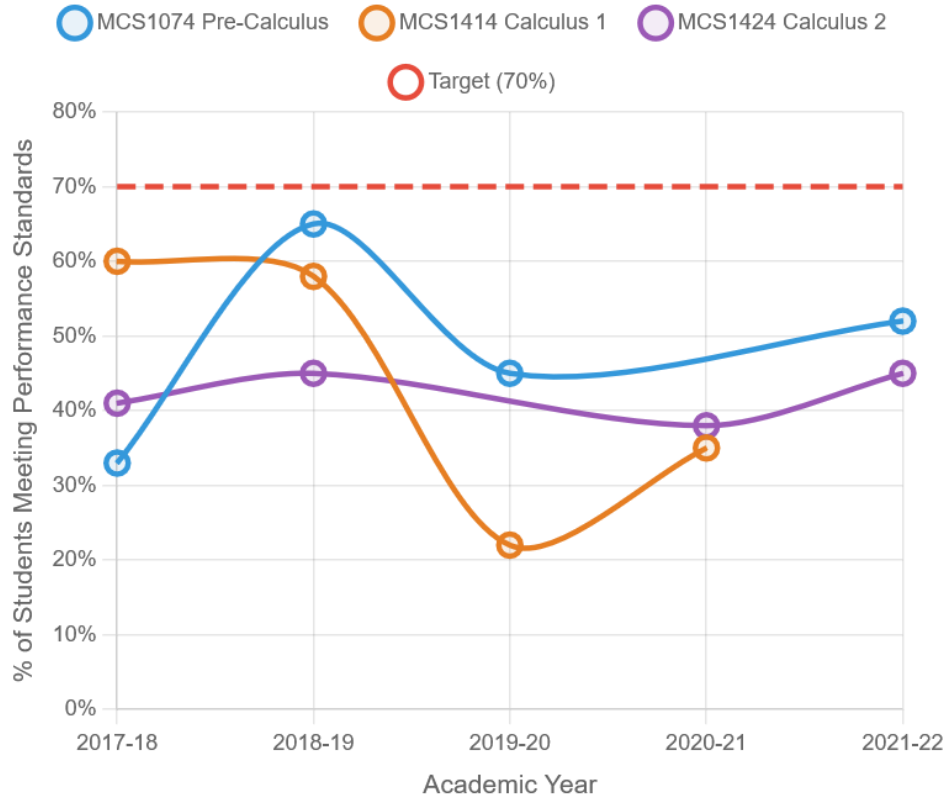
D. Quantitative Reasoning

(1) Learning Objective: "LTU undergraduates who complete the core curriculum will demonstrate Quantitative Reasoning capabilities through applying mathematics and statistical methods to solve problems."

(2) Assessment: Direct assessment of three performance indicators using final exam questions: *PI-1*, Apply arithmetic, algebraic, geometric, technological, or statistical methods to solve problems; *PI-2*, Represent mathematical concepts verbally, and, where appropriate, symbolically, visually, and numerically; and *PI-3*, Interpret mathematical models given verbally, or by formulas, graphs, tables, or schematics, and draw inferences from them. Assessment occurred in MCS1074, MCS1414, and MCS1424.

(3) Evaluation: Mean scores in MCS1074, MCS1414, and MCS1424. Longitudinal assessments shown in Figure 4.

Figure 4: Longitudinal Assessment Data for Quantitative Reasoning



(4) Issue: Assessment data reveals systemic underperformance across all mathematics courses, with no course achieving the established target of 70% of students scoring 70% or better on Final Exam assessments. Multi-year longitudinal analysis demonstrates persistent performance gaps, with MCS1414 showing particularly concerning decline from approximately 60% achievement in 2017-2018 to 22% section-level target achievement in 2019-2020. Several contributing factors require investigation to address performance deficiencies:

i. Assessment Consistency Issues: Significant variation exists in examination rigor and grading standards across instructors. The absence of standardized final examinations results in differential difficulty levels and inconsistent evaluation criteria, compromising data reliability and comparative analysis capabilities.

ii. Instructional Variability: Notable performance disparities occur between sections of identical courses, even when taught by the same instructor within the same semester. This suggests complex interactions between instructional delivery, student preparation levels, and section-specific dynamics that warrant systematic analysis.

iii. External Impact Factors: The 2019-2020 academic year demonstrated substantial performance decline, particularly in MCS1414, likely attributable to COVID-19 pandemic disruptions including transition to online delivery, modified assessment protocols, and reduced proctoring capabilities.

iv. Systemic Questions: Current data cannot definitively distinguish between instructional quality impacts versus student preparedness differentials as primary performance drivers. This fundamental attribution challenge impedes targeted intervention development and requires enhanced assessment methodology to isolate causal factors effectively.

(5) Actions: Systematic improvement initiatives are required across the Mathematics core curriculum to address persistent underperformance. Root cause analysis must identify primary drivers of substandard Final Exam performance, including examination rigor appropriateness, student engagement levels, and instructional effectiveness. Comparative analysis of MCS1414 Final Exam questions reveals substantial difficulty variation across sections. Sections achieving the 70% benchmark utilized significantly less rigorous assessments than non-achieving sections, indicating that apparent success reflects reduced academic standards rather than genuine proficiency attainment. Similar assessment inconsistencies likely affect MCS1074 Pre-Calculus performance trends. The apparent improvement from 2017-2018 to 2018-2019 requires verification to determine whether observed gains reflect actual student achievement or reduced examination standards. More analysis is required at the performance indicator level to determine if these differing levels reflect the ability of students versus different pedagogical techniques. Continue with longitudinal evaluation of assessment data.

(6) Responsibility: MCS1074-Bashkim Zendeli; MCS1414,1424-Chris Cartwright; MCS1254-Yelena Vaynberg

(7) University/College Support for Objective: University assessment committee to provide feedback and discussion. College of Arts and Sciences to support MCS department's role in the assessment of Quantitative Reasoning.

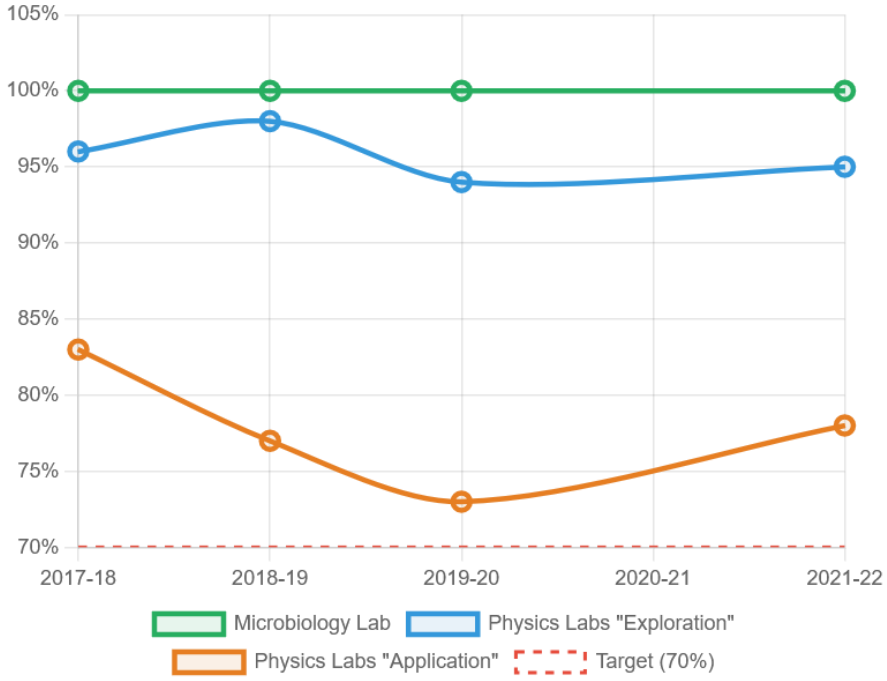
E. Scientific Analysis

(1) Learning Objective: "LTU undergraduates who complete the core curriculum will demonstrate proficiency in principles of science and applying it to solve scientific problems."

(2) Assessment: Direct assessment of two performance indicators using selected laboratory assignments: *PI-1*, Students will apply elements of the scientific method via observation and experimentation; and *PI-2*, Students will analyze natural sciences concepts and/or problems. Assessment of laboratory assignments occurred in a random sample of BIO2321 (Microbiology Lab) and PHY2221/2421/2231/2431 (College/University Physics 1 and 2 Labs) courses for the 2018-2019 academic year.

(3) Evaluation: 100% of students (N = 26) in BIO2321 scored $\geqslant$ 80% on laboratory assignments measuring PI-1 and 2. 95.1% of students (N = 263) in PHY2221/2421/2231/2431 scored $\geqslant$ 70% on laboratory assignments measuring PI-1. 77.9% of students (N =263) in PHY2221/2421/2231/2431 scored $\geqslant$ 70% on laboratory assignments measuring PI-2. Longitudinal assessments shown in Figure 5.

Figure 5: Longitudinal Assessment Data for Scientific Analysis



(4) Issue: Criterion score of 70% of students scoring 70% or better in BIO2321, PHY2221/2421, and PHY2231/2431 was met. However, many of the physics lab sections were taught by adjunct faculty members and assessment participation is inconsistent. Some but not all adjunct faculty members reported the results from their session. Even though each year, there were still adequate data points to paint a valid assessment picture, it is desirable to have 100% participation and to foster the assessment culture. Need to increase participation of all sections in providing assessment data.
(5) Actions: Longitudinal analysis of assessment data.
(6) Responsibility: NS Department
(7) University/College Support for Objective: College of Arts and Sciences to support NS department's role in the assessment of Scientific Analysis.

3. Assessment Plan for 2022-2025

A. Written Communication

(1) Transition assessment from LLT1213 to HUM1213 (Engaging Ancient Texts) and LLT1223 to HUM1223 (Engaging Modern Texts) using assessment plan shown Table 1.
(2) Analyze and close-the-loop on longitudinal data, breaking data down by course.
(3) Integrate assessment in Canvas

B. Oral Communication

(1) Conduct assessment in COM2103 using assessment plan shown Table 1.
(2) Analyze and close-the-loop on longitudinal data.
(3) Integrate assessment in Canvas

C. Critical Thinking

(1) Transition assessment from SSC2413 to SSC2xx3 (Introductory Social Sciences Elective) and SSC2423 to LLT2xx3 (Introductory Language and Literary Studies Elective) using assessment plan shown Table 1.

(2) Analyze and close-the-loop on longitudinal data, breaking data by course.
(3) Integrate assessment in Canvas

D. Quantitative Reasoning

(1) Balance assessment of quantitative reasoning across courses by assessing a minimum of two math courses per semester using assessment plan shown Table 1.
(2) Analyze and close-the-loop on longitudinal data.

E. Scientific Analysis

(1) Conduct assessment in all sections of BIO2321, PHY2221/2421 and PHY2231/2431 using assessment plan shown Table 1.
(2) Analyze and close-the-loop on longitudinal data.

College of Architecture and Design
BS in Architecture/Master of Architecture

1. Assessment Plan and Summary

The educational outcomes of the BS in Architecture/Master of Architecture (BS/MArch) degree program are listed below (see Table 1). LTU undergraduate and graduate program-level learning outcomes are mapped onto specific NAAB 2020 Conditions of Accreditation criteria (referred to as Program Criteria (PCs) or Student Criteria (SCs)) that parallel the intent of the LTU criteria. The entirety of the 2020 NAAB PCs and SCs are no longer listed in the LTU report (as had been previously done), since the majority are not applicable to the LTU criteria.

In the "Assessment Strategy" and "Metrics/Indicators" columns, a summary of the updated CoAD Assessment approach is outlined: The same approach to generating and evaluating data is used uniformly for all Learning Objectives and across all courses, and is reviewed and updated on a faculty-led yearly cycle (hence subsequent learning objectives are listed "Same as above"). A subset of a much larger body of yearly-updated self-assessment data required by the new procedures of the NAAB 2020 Conditions are not included in this report.

Table 1A: Assessment Plan for the MArch Program (Undergraduate Courses)

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ETHICS	CoAD's MArch Program has defined its supporting Learning Outcomes based on the NAAB 2020 Conditions of Accreditation "Program Criteria" and "Student Criteria" (plus additional NAAB topical sub-criteria). For LTU Undergraduate Ethics: NAAB CoAD SC.2E, Professional Conduct (I scaffolding level) (Typical: Since several courses at various levels contribute to each Learning Outcome above, Bloom's taxonomy information for course-specific Learning Objectives is included under Assessment Strategy details in the Appendix materials.)	For each CoAD Learning Outcome, CoAD has developed a set of scaffolded performance criteria. Level appropriate and course-relevant criteria are distributed to each course in a Canvas Assessment Rubric each semester. Each student is evaluated on each criterion, as "Exceeding Expectations", Meeting Expectations" or "Not Meeting Expectations". Data from all three semesters is compiled into a yearly summary (numeric and graphic) of percentages of Exceeding, Meeting, and Not Meeting for each performance criterion. Performance criteria are reviewed annually to support improvements where needed.	CoAD has established benchmarks for the desired combined percentage of students Meeting/Exceeding Expectations, for each performance criterion (again level-appropriate and course-relevant). A faculty member "Interpreter", designated for each Learning Outcome, evaluates the yearly summary data against the benchmarks, along with commentary from faculty teaching the courses, and reports to the Chair. These reports form the basis of LTU CoAD Assessment Reports. Benchmarks are reviewed annually to support improvements where needed.
LEADERSHIP	Same as above. For LTU Undergraduate Leadership: NAAB CoAD PC.6, Leadership & Collaboration	Same as above.	Same as above.
TEAMWORK	Same as above. For LTU Undergraduate Teamwork: NAAB CoAD PC.6, Leadership & Collaboration	Same as above.	Same as above.
TECHNOLOGY	Same as above. For LTU Undergraduate Technology: NAAB CoAD SC.4A-G: Structural Systems, Environmental Systems, Building Envelope Systems, Materials & Assemblies, Building Services Systems, Building Costs, and Technical Documentation	Same as above.	Same as above.
VISUAL COMMUNICATION	Same as above. For LTU Undergraduate Visual Communication: NAAB CoAD PC.2B Communication & Representation (I & R scaffolding levels)	Same as above.	Same as above.

Table 1B: Assessment Plan for the MArch Program (Graduate Courses)

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ADVANCED KNOWLEDGE	Same as for Undergraduate Program above. For LTU Graduate Advanced Knowledge: NAAB CoAD PC.5A Research (Methods)	Same as for Undergraduate Program.	Same as for Undergraduate Program.
COMMUNICATION	Same as above. For LTU Graduate Communication: NAAB CoAD PC.5A Research (Communication)	Same as for Undergraduate Program.	Same as for Undergraduate Program.
ETHICS	For LTU Graduate Ethics: NAAB CoAD SC.2E, Professional Conduct (R & E scaffolding level)	Same as for Undergraduate Program.	Same as for Undergraduate Program.
TECHNOLOGY	Same as above. For LTU Graduate Technology: NAAB CoAD PC.2B Communication & Representation (E scaffolding level)	Same as for Undergraduate Program.	Same as for Undergraduate Program.

Table 2: Curriculum Map for the BS Arch/M.Arch

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**		Undergraduate: ETHICS	Undergraduate: LEADERSHIP	Undergraduate: TEAMWORK	Undergraduate: TECHNOLOGY	Undergraduate: VISUAL	Graduate: ADVANCED KNOWLEDGE	Graduate: COMMUNICATION	Graduate: ETHICS	Graduate: TECHNOLOGY
Intro to Design	DES1022		**I**	**I**						
Intro to Vis. Comm.	ARC1213					**I**				(I)
Design Principles	DES1213	(Not used for LTU Assessment)								
Visual Communication	ARC1223					**I**				(I)
Design Methodologies	DES1223						(I)	(I)		
Hist. of Designed Envir. 1	ARC3613	(Not used for LTU Assessment)								
Info. Modeling & Sim.	ARC2813				**I**					
Integrated Design 1	ARC2116	(Not used for LTU Assessment)								
Hist. of Designed Envir. 2	ARC3623	(Not used for LTU Assessment)								
Prototyping & Fabrication	ARC3823	(Not used for LTU Assessment)								
Integrated Design 2	ARC2126					**R**				(R)
Construction Systems 1	ARC2313				**I**					
Basic Structures	ARC2513				**I**					
Integrated Design 3	ARC3116				**I**					
20th Cen. Architecture	ARC4183	(Not used for LTU Assessment)								
Construction Systems 2	ARC2323				**R**					
Intermediate Structures	ARC3513				**R**					
Integrated Design 4	ARC3126	(Not used for LTU Assessment)								
Design Leadership	DES4112	**I**	**I**	**I**					(I)	
Integrated Design 5	ARC4116		**R**	**R**						
Advanced Structures	ARC4543				**E**					
HVAC & Water Systems	ARC3423				**E**					
Acous., Elect., Illum. Sys.	ARC4443				**E**					
Comprehensive Design	ARC4126	(Not used for LTU Assessment)								
Research Methods	ARC5013						**R**	**R**		
Critical Practice	ARC5804		(E)	(E)						
Design Theory	ARC5643	(R)							**R**	
Adv. Design Studio 1	ARC5814					(E)	**E**	**E**		**E**
Thesis 1	ARC6514					(E)	**E**	**E**		**E**
Professional Practice	ARC5913	(E)							**E**	
Ecological Issues	ARC5423	(Not used for LTU Assessment)								
Adv. Design Studio 2	ARC5824					(E)	**E**	**E**		**E**
Thesis 2	ARC6524					(E)	**E**	**E**		**E**

2. Report on 2019-2021 Academic Years and Action Plan (Loop-Closing)

This report synthesizes the assessment activities and loop-closing efforts of the Architecture program at Lawrence Technological University for the academic years 2019, 2020, and 2021. It details the courses assessed, learning outcomes targeted, findings, and subsequent actions taken to enhance student learning and program effectiveness.

I. Courses Assessed and Faculty Coordinators (2019-2021)

The following courses were assessed during this period, with reports submitted by their respective faculty coordinators:

- Prof. Eric Ward, Construction & Professional Practice Coordinator:
  - Construction Systems 1 (ARC2313 & ARC5313)
  - Construction Systems 2 (ARC5323 & ARC 2323)
  - Professional Practice (ARC5913)
- Prof. Dale Allen Gyure, History Coordinator:
  - History of the Designed Environment II (ARC 3623)
  - Twentieth Century Architecture & Theory (ARC 4813)
- Prof. Anirban Adhya, ID4 Coordinator:
  - Integrated Design Four/ ID4 (ARC3126)
- Prof. Aaron Jones, ID2 Coordinator:
  - Integrated Design Two/ ID2 (ARC2126)
- Prof. Daniel Faoro, Comprehensive Design Coordinator:
  - Comprehensive Design Studio (ARC4126)
  - Comprehensive Design Lab (ARC4126)

II. Learning Outcomes, Assessment, Findings, and Loop-Closing Actions

The report details assessment for various learning outcomes, categorized by LTU University-Level, UG Program-Level, and NAAB (National Architectural Accrediting Board) criteria. A common set of report categories (Issues, Actions, Responsibility, & Support) are summarized for entire courses after listing their specific learning outcomes.

Summary of Key Learning Outcomes Assessed and Actions Taken:

A. Construction Systems 1 (ARC2313 - Fa2019) & Construction Systems 2 (ARC5313 - Sp2020, ARC2323 - Sp2020)

- LTU UG Program-Level “Technology” (B.4 Technical Documentation as "methods"):
  - Assessment: Rubric-based evaluation of student performance on technical documentation in CS1 (Fall 2019) and CS2 (Spring 2020).
  - Targets: 80% of students scoring 3 or higher (on a 4-point scale) on the Rubric, and an overall course average of 3 or higher.
  - Results/Findings: (Specific data points for each course/semester would typically be inserted here from the original full report). The general trend indicates a need to reinforce technical documentation skills.
  - Issues:

        - Lack of consistent student performance on Rubric B.4 for both courses.
        - Some students are not fully applying concepts or demonstrating understanding of technical aspects.
        - Inconsistent assessment tool usage or interpretation across sections/instructors was noted as a potential factor influencing results.
    - Actions (Loop Closing):
        - Reinforce the importance of consistent use of Rubric B.4 for technical documentation.
        - Implement targeted review sessions or supplemental materials for struggling students.
        - Encourage more consistent faculty-led in-class assessments for student performance verification.
        - Consider minor adjustments to course content or delivery to strengthen understanding of technical documentation principles.
- NAAB Criteria: B.4 Technical Documentation (as "technical documentation"):
    - Assessment: Rubric-based evaluation.
    - Targets: (Specific targets would be here)
    - Results/Findings: (Specific data points here)
    - Issues: Similar issues to the LTU "Technology" outcome, focusing specifically on NAAB requirements for technical documentation.
    - Actions (Loop Closing): Emphasis on direct correlation between assignments and NAAB B.4 expectations, potentially incorporating more complex technical drawing exercises.

B. Professional Practice (ARC5913 - Sp2020)

- LTU UG Program-Level “Professional Practice” (C.1 Leadership, C.2 Legal Responsibilities):
    - Assessment: Rubric-based evaluation of student performance on professional practice aspects (e.g., project management, ethical considerations, legal frameworks).
    - Targets: (Specific targets would be here)
    - Results/Findings: (Specific data points here)
    - Issues:
        - Varying levels of understanding regarding legal and ethical responsibilities in practice.
        - Some students need more exposure to real-world scenarios in professional practice.
    - Actions (Loop Closing):
        - Integrate more case studies and discussions on ethical dilemmas and legal precedents.
        - Invite guest speakers from architectural firms to share practical insights.
        - Enhance assignments to simulate real-world professional decision-making.

C. History of the Designed Environment II (ARC 3623 - Fa2019) & Twentieth Century Architecture & Theory (ARC 4813 - Sp2020)

- LTU UG Program-Level “Critical Thinking” (A.1 Critical Thinking, A.2 Problem Solving):
    - Assessment: Rubric-based evaluation of essays, research papers, and analytical assignments.
    - Targets: (Specific targets would be here)

    - Results/Findings: (Specific data points here)
    - Issues:
        - Some students struggled with in-depth critical analysis and synthesis of historical and theoretical concepts.
        - Need to further develop skills in formulating persuasive arguments based on evidence.
    - Actions (Loop Closing):
        - Provide clearer guidelines and rubrics for critical analysis assignments.
        - Incorporate more scaffolded writing assignments to build critical thinking skills progressively.
        - Offer examples of strong critical analysis from previous student work.

D. Integrated Design Four/ID4 (ARC3126 - Fa2019) & Integrated Design Two/ID2 (ARC2126 - Sp2020)

- NAAB Criteria (various, e.g., B.1 Pre-Design, B.2 Site Design, B.3 Building Systems Integration):
    - Assessment: Rubric-based evaluation of design projects, presentations, and reports.
    - Targets: (Specific targets would be here)
    - Results/Findings: (Specific data points here)
    - Issues: (Specific issues would be here, but generally related to integrating complex design criteria)
    - Actions (Loop Closing):
        - Increased emphasis on interdisciplinary integration within design studios.
        - More structured feedback loops during design development to address specific NAAB criteria earlier in the process.
        - Provide examples of successful integrated design solutions.

E. Comprehensive Design Studio (ARC4126) & Comprehensive Design Lab (ARC4126 - Fa2019)

- NAAB Criteria (various, particularly those related to comprehensive design, e.g., B.5 Comprehensive Design):
    - Assessment: Rubric-based evaluation of final comprehensive design projects.
    - Targets: (Specific targets would be here)
    - Results/Findings: (Specific data points here)
    - Issues: (Specific issues would be here, often related to the complexity of integrating all aspects of design)
    - Actions (Loop Closing):
        - Refine project briefs to ensure clarity on comprehensive design expectations.
        - Provide more regular interim reviews with explicit feedback on comprehensive integration.
        - Offer resources or workshops on specific areas identified as challenging (e.g., structural integration, environmental systems).

III. Overarching Issues and Actions across the Program (2019-2021)

Across multiple courses and learning outcomes, common issues and actions emerged:

- Issue: Inconsistent Student Performance: A recurring theme was varying student performance across different courses and learning outcomes, particularly in technical documentation and critical thinking. This highlights the need for consistent reinforcement of core skills throughout the curriculum.
- Actions:
    - Rubric Consistency: Continued reinforcement of consistent use and interpretation of Canvas Assessment Rubrics, especially for NAAB criteria. This includes training and discussions among faculty.
    - Benchmarking Refinement: Ongoing adjustment of estimated benchmarks to better relate to future student performance data, especially as issues affecting data collection or consistency are resolved.
    - Curriculum Mapping Updates: Regular updates to the curriculum map to ensure proper alignment of assessment activities with course, program, and NAAB objectives.
    - Targeted Interventions: Implementation of targeted review sessions, supplemental materials, and structured feedback mechanisms to address specific areas of student weakness.
    - Faculty Collaboration: Encouraging greater faculty collaboration on assessment practices, sharing of successful pedagogical strategies, and cross-course calibration of expectations.

IV. Responsibility and Support

- Responsibility for Current/Future Actions:
    - Curriculum Map, Benchmarks, Canvas Assessment Rubrics: CoAD Faculty (particularly during Assessment Days) and CoAD Architecture Assessment Coordinator (ongoing).
    - Course and Curriculum Updates/Changes: CoAD course-area coordinators and faculty assigned to specific courses.
- University/College Support for Learning Outcomes: The Chair of the Architecture Department annually assigns tasks to faculty or initiates ad-hoc faculty committees. These assignments are based on student performance results from the yearly summary of Canvas Assessment Rubric data and direction provided during CoAD Faculty Assessment Day.

V. Loop-Closing Meeting (Summer 2023)

Following the completion of NAAB Accreditation activities and their incorporation into this Assessment Report, UAC representative Eric Ward met with Department Chair Dale Gyure in Summer 2023. This meeting specifically addressed:

- Details of the compiled 2019-2021 assessment report.
- Discussion of ongoing support for the identified issues and action items.
- Exploration of possible additional improvement items beyond those already outlined in the report.

This meeting signifies a commitment to ensuring that the assessment findings translate into actionable steps and continuous improvement within the Architecture program, reinforcing the "close-the-loop" philosophy.

3. Assessment Plan for 2022-2025 Academic Years

This plan for the academic years 2022-2025 is designed to guide ongoing assessment activities, incorporating critical updates in response to the NAAB 2020 accreditation criteria and fostering a more efficient and longitudinally-focused assessment framework. The initiatives detailed herein stem from discussions between Department Chair Dale Gyure and UAC representative Eric Ward, following the 2019-2021 M.Arch. Program Assessment Report.

The primary drivers for the 2022-2025 assessment cycle are to achieve full alignment with the NAAB 2020 Accreditation Criteria and to enhance the efficiency and utility of the assessment process for faculty. To this end, a significant overhaul of the current Canvas assessment rubrics will be undertaken to accurately reflect the revised NAAB 2020 criteria. This comprehensive update will also involve a process to bridge and connect existing NAAB 2014 data with the new NAAB 2020 data for continuity. The rollout of these new rubrics is anticipated for Spring 2021 final grading, initiating the targeted data-gathering process for the upcoming 2023 NAAB Accreditation Review. Beyond mere incorporation of NAAB 2020 criteria, the rubrics will be further refined to increase overall faculty utilization and reduce the data-generation burden, particularly for design instruction, by streamlining assessment categories and eliminating legacy criteria.

A thorough revision of the Program Assessment Plan (Table 1) is also a key initiative. This will involve replacing all currently shown NAAB 2014 criteria with the new NAAB 2020 criteria. Columns 2, 3, and 4, which outline Learning Objectives, Strategy, and Metrics, will undergo a complete revision. Currently marked as "To Be Determined" due to the extensive changes necessitated by NAAB 2020, this revision will be a priority in the upcoming year to ensure clear learning objectives, appropriate assessment strategies, and measurable metrics are defined for each outcome. Additionally, new dates and assessment periods will be determined for the "Loop Closing Timeline" to best coordinate with the updated aspects of the program and the new three-year reporting cycle.

The Curriculum Map (Table 2) will also be significantly revised. The existing information, based on outdated courses and criteria, will be updated to reflect NAAB 2020 requirements, and learning outcome mappings will be comprehensively reviewed and adjusted once the courses and criteria are finalized. This revision will also incorporate insights from NAAB 2020 accreditation discussions, which may indicate possible curriculum changes that could better support the integration of building technology with design instruction, potentially involving adjustments to existing courses or the addition of new ones.

Furthermore, this plan emphasizes enhancing faculty engagement and facilitating longitudinal evaluations. This includes continuing to refine Canvas assessment rubrics to make them more intuitive and less burdensome, thereby increasing faculty adoption and consistent usage. Methods for grouping rubric data will be developed to facilitate longitudinal evaluations, enabling the program to assess the impact of curriculum changes over time and identify sustained trends in student performance. The successful expansion of faculty involvement in direct assessment activities across the department will also continue, with a goal to increase overall faculty engagement to ensure the completion of a full assessment cycle within a 5-6 year timeframe, promoting a more consistent and robust assessment culture. The plan also specifically aims to increase the reporting of Architecture Graduate-Level courses in the assessment process to ensure comprehensive assessment coverage across all program levels, and to ensure all assessment activities and documentation meet the specific requirements of the NAAB 2020 accreditation criteria for the Architecture Department's accreditation visit in 2023.

Responsibility for these initiatives will primarily fall to the CoAD Faculty (particularly during Assessment Days) and the CoAD Architecture Assessment Coordinator for updates to the curriculum map, benchmarks, and Canvas Assessment Rubrics. Updates and changes to courses and curriculum will be managed by CoAD course-area coordinators and faculty assigned to the respective courses. The Chair of the Architecture Department will continue to provide university and college support by annually assigning tasks to faculty or initiating ad-hoc faculty committees, based on student performance results from the yearly summary of Canvas Assessment Rubric data and on CoAD Faculty Assessment Day direction. By implementing this comprehensive assessment plan, the Architecture program aims to achieve full alignment with the NAAB 2020 Accreditation Criteria, enhance the clarity, efficiency, and effectiveness of all assessment processes, reduce faculty burden while increasing meaningful engagement in assessment, enable robust longitudinal analysis of student learning outcomes and program effectiveness, and ultimately ensure the continuous improvement of pedagogy, curriculum, and student success within the Architecture program.

BFA in Game Design

1. Assessment Plan and Summary

This section details the assessment plan for the Bachelor of Fine Arts (BFA) in Game Design program, along with the mapping of courses to program assessment outcomes, both of which can be found in Table 1. Learning outcomes assessed for 2019-2021 academic years are presented in Section 2 of this report, including a detailed description of loop-closing evaluations. This report has been prepared by Dr. Stephen Mallory and Dr. Ahu Yolac, the co-coordinators of the Game Design Program.

For the 2021-2022 academic year, the Game Design program continued to implement the same Canvas-based assessment system as the prior year. Criteria from NASAD (National Association of Schools of Art and Design), our accrediting body, were carefully selected to align with five key University-level outcomes: Ethics, Leadership, Teamwork, Technology, and Visual Communication (as detailed in Table 1). Each University outcome was linked to two NASAD criteria, with the exception of Ethics, which was linked to one. Rubrics, developed to reflect these NASAD criteria, were then attached to relevant courses. Faculty members teaching these courses utilized these rubrics to assess assignments, assigning scores of 1 (deficient), 2 (competent), or 3 (exemplary).

Loop-closing for the 2019-2021 academic years occurred on September 20, 2022, during the department-level breakout session on Assessment Day. The Game Design faculty convened to discuss assessment results and plans for the upcoming year. Under the guidance of the department chair, assessment committee members, and other faculty, it was determined that the program needed to identify more effective ways of capturing existing assessment practices. Recognizing the department's strong culture of critiquing projects, which inherently functions as a form of authentic assessment, the department reinforced its commitment to pursue both traditional assessment methods (with rubrics attached to assignments) and authentic assessment methods (including quizzes in certain instances) for the 2019-2021 academic years and moving forward. The plan established that each criterion would be measured twice throughout the curriculum, with all NASAD outcomes integrated into the assessment process by Spring 2023.

Table 1: Assessment Plan for BFA in Game Design

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ETHICS	NASAD Criteria: H.IX.C.3.f Understanding of what is useful, usable, effective, and desirable with respect to user/audience-centered digitally-based communication, objects, and environments	Direct assessment of student using course embedded rubric: (I) History of Game Design (R) Integrated Game Studio	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
LEADERSHIP	NASAD Criteria: H.VIII.D.2 Acquire the skills necessary to assist in the development and advancement of their career H.VIII.D.3 Develop teaching skills, particularly as related to their major area of study	Direct assessment of student using course embedded rubric: H.VIII.D.2 (I) Design Leadership (R) Professional Practice H.VIII.D.3 (I) Game systems (R) Multi Disciplinary Design	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
TEAMWORK	NASAD Criteria: H.VIII.D.5 Explore multidisciplinary issues that include art and design [H.X.A.6.3d] Ability to work in teams and to organize collaborations among people from different disciplines	Direct assessment of student using course embedded rubric: H.VIII.D.5 (I) Design Methodologies (R) Multi Disciplinary Design H.X.A.6.3d (I) Design Methodologies, (R) Multi Disciplinary Design	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
TECHNOLOGY	NASAD Criteria: H.X.A.6.4b Make critical choices among different technologies	Direct assessment of student using course embedded rubric: H.X.A.6.4b (I) Intro to Game Systems (R) Game Systems Senior Project 1	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary

	H.IX.C.3.c Understanding of the characteristics and capabilities of various technologies (hardware and software)	H.X.A.6.4b (I) Game Systems (R) Integrated Game Studio	
VISUAL COMMUNICATION	NASAD Criteria: H.VIII.B.1a Gain functional competence with principles of visual organization in visual elements in two and three dimensions, color theory and its applications, and drawing H.X.C.3.b2 Understanding of and ability to develop strategies for planning, producing, and disseminating visual communications	Direct assessment of student using course embedded rubric: H.VIII.B.1a (I) Drawing and Design Geometry 1 (R) Digital Drawing and Painting H.X.C.3.b2 (I) Drawing and Design Geometry 1 (R) Integrated Game Studio	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
ADDITIONAL PROGRAM OUTCOMES *Optional* *If Added, reorder entire table alphabetically—no need to label these additional outcomes	Complete as appropriate for the program. NA at this time	Complete as appropriate for the program. NA at this time	Complete as appropriate for the program. NA at this time

2. Report on 2019-2021 Academic Years and Action Plan (Loop-Closing)

This section of the report is being filled out by Steve Coy, the assessment coordinator for the Art and Design Department, because the implementation of all criteria was standard throughout our department. A new plan was formulated during our assessment day breakout to yet again simplify and capture what we are already doing so we can have trackable data. We will only assess once per course twice per program for each NASAD outcome. We identified that outcomes can be linked directly to quizzes. For the 2021-2022 year we only assessed the five University program requirements and now will move to implement all NASAD requirements. A Rubric will be made for each outcome and that will be applied to any project assessing that outcome creating a universal system for capturing data in the department and simplifying the implementation. We found that the other process was tedious for adjuncts and capturing all data was more important than having a system that is difficult to implement across 5 programs.

Learning Outcome: All of them
Assessment: Rubrics were attached to specific assignments where outcomes were addressed. Students were evaluated on a scale of 1,2,3 relating to deficient, competent, exemplary.

Evaluation: Data was useful to see at the assignment level but was difficult to implement given that unique rubrics connected to outcomes had to be created for each assignment.

Issue: Issues from 2021-2022 were the challenge in implementing this system across 5 programs through projects. Faculty members needed to create unique rubrics for outcomes in advance and then set them up in their courses.

Current/Future Actions: As described above, challenges were all in implementing the system. In spring of 2023 we will implement a more universal rubric system for the outcomes to ease the distribution and creation of outcomes and rubrics within courses.

Responsibility: Faculty teaching courses will be responsible for evaluating assignments with assessment criteria attached, Program Directors in coordination with the assessment committee member and department chair will be responsible for evaluation of criteria with support from faculty.

University/College Support for Learning Outcome: The University Assessment Committee will continue to guide our program and department assessment through best practices and conversations in meetings, the College will support by cross departmental meetings to discuss assessment improvement and standardization and best practices within our college.

3. Assessment Plan for 2022-2025 Academic Years

Loop closing will evolve to a three-cycle and will follow the assessment plan shown in Table 1 and summarized below.

Freshman Year: The freshman year introduces foundational competencies in design principles, visual organization, digital systems, and communication. Students begin with Introduction to Design, where they learn about major issues and processes in design, analyze Western and non-Western works, and examine global perspectives. In Drawing and Design Geometry I and Design Principles, students gain functional competence in visual elements, color theory, and drawing. Technology learning is also introduced, including the ability to learn new tools, design systems, and understand digital visual elements.

Design Methodologies supports early skill development in research-supported decision-making, interdisciplinary collaboration, and teamwork. Students demonstrate knowledge of user research, design impacts, and problem-solving. In the second semester, Intro to Game Systems introduces industry expectations, usability, feasibility, and sustainability. Students also begin to understand global production structures, design requirements in emerging contexts, and apply knowledge to team-based and participatory design work. These competencies are consistently assessed using program rubrics.

Sophomore Year: In year two, students build on drawing and visual communication skills in Digital Drawing and Painting and apply spatial design knowledge in Level Design. They continue to refine their ability to communicate art and design concepts to varied audiences and address emotional and cultural dimensions of game environments. Core courses introduce or reinforce knowledge of scripting, game history, and the usability and effectiveness of interactive digital experiences. Students analyze historical, theoretical, and critical aspects of games and digital design.

In the spring semester, students complete Sophomore Portfolio Review, assess their progress toward program competencies, and further engage in user-centered design through electives. They reinforce analysis skills, research-informed decisions, and systems-level thinking. The curriculum continues to emphasize collaboration, scenario development, and digital strategy planning.

Junior Year: Junior-year courses reinforce research application, systems thinking, and professional communication. In Game Systems and Integrated Game Studio, students continue developing critical competencies including viability, desirability, and coordination of game design strategies. Courses such as Creative Writing and Visual Culture enhance understanding of narrative structures and cultural analysis.

Students strengthen their abilities to assess long-term design impacts, match technologies to design problems, and integrate findings from user research into game design. User Interface & User Experience Design introduces concepts related to systems design, participatory methods, and learning models. Multidisciplinary team projects and collaborative problem-solving continue through Multidisciplinary Design. A summer internship (DES 4530) provides a professional application of design knowledge outside the classroom, supporting the program’s commitment to experiential learning.

Senior Year: The senior year focuses on synthesis, leadership, and portfolio development. In Game Systems Senior Project I & II, students demonstrate entry-level professional competence through independent work, technical mastery, and a body of evaluated design work. These courses reinforce capstone competencies including feasibility, sustainability, and viability. Students also show advanced understanding of the economic and strategic aspects of production.

In Design Leadership and Professional Practice, students continue to refine communication, presentation, business, and leadership skills. The curriculum supports career readiness and professionalism through elective options in digital design and interdisciplinary application. Students are assessed on their ability to apply game design processes, integrate technology effectively, and produce high-quality, user-focused outcomes across digital platforms.

BFA in Graphic Design

1. Assessment Plan and Summary

The assessment plan for the program is shown and the mapping of courses onto the program assessment outcomes can be both found in Table 1. Learning outcomes assessed for the 2019-2021 academic years are listed in Section 2 of this report, including a detailed description of loop closing evaluation.

This report is being prepared by Steve Coy, the assessment coordinator for the Design Department. The 2021-2022 year for Graphic Design implemented the same system through canvas as the prior year. Criteria from NASAD, our accrediting body, were selected to align with the five University level outcomes Ethics, Leadership, Teamwork, Technology and Visual Communication (see TABLE 1). Each had two NASAD criteria with the exception of Ethics which only had one. Rubrics were then linked to the NASAD Criteria and attached to courses where the criteria are being taught. Faculty members teaching the course assigned these curricula to assignments with a 1, 2, or 3, meaning deficient, competent, exemplary respectively.

Closing of the loop occurred on September 20, 2022, during assessment day at the department level breakout session. The Graphic Design faculty met to discuss assessment and our plan for the following year. At a department level and in guidance of the chair, assessment committee member and other faculty, it was determined that we need to identify ways of capturing what we are already doing. The design department has a culture of critiquing projects which is a form authenticate assessment.
The department determined to reinforce the approach in 2022 to pursue both Traditional and Authentic assessment methods with rubrics attached to assignments and the implementation of quizzes in certain instances. Each criteria will be measured twice throughout the curriculum and all NASAD outcomes will be integrated into spring of 2023.

Table 1: Assessment Plan for BFA in Graphic Design

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ETHICS	NASAD Criteria: H.X.C.3.e4 Ability to recognize and analyze the social, cultural, and economic implications of technology	Direct assessment of student using course embedded rubric: (I) Digital Product Design (R) Senior Thesis 1	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
LEADERSHIP	NASAD Criteria: H.VIII.D.2 Acquire the skills necessary to assist in the development and advancement of their career H.VIII.D.3 Develop teaching skills, particularly as related to their major area of study	Direct assessment of student using course embedded rubric: H.VIII.D.2 (I) Professional Practice, (R) Design Leadership H.VIII.D.3 (I) Multi Disciplinary Design, (R) Senior Seminar 2	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
TEAMWORK	NASAD Criteria: H.VIII.D.5 Explore multidisciplinary issues that include art and design H.X.C.3.d Acquisition of collaborative skills and the ability to work effectively in interdisciplinary or multidisciplinary teams to solve complex problems	Direct assessment of student using course embedded rubric: H.VIII.D.5 (I) Design Methodologies (R) Multi Disciplinary Design H.X.C.3.d (I) Design Methodologies, (R) Multidisciplinary Design	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
TECHNOLOGY	NASAD Criteria: H.X.A.6.4b Make critical choices among different technologies H.X.C.3.e2	Direct assessment of student using course embedded rubric: H.X.A.6.4b, X.C.3.e2 (I) Digital Foundations, (R) Digital Product Design	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary

	[TECHNOLOGY] Ability to conduct critical evaluations of different technologies in specific design problem contexts		
VISUAL COMMUNICATION	NASAD Criteria: H.VIII.B.1a Gain functional competence with principles of visual organization in visual elements in two and three dimensions, color theory and its applications, and drawing X.C.3.b2 Understanding of and ability to develop strategies for planning, producing, and disseminating visual communications	Direct assessment of student using course embedded rubric: H.VIII.B.1a (I) Foundations of Graphic Design, (R) Graphic Design for the Field H.X.C.3.b2 (I) Foundations of Graphic Design, (R) Graphic Design Thesis 1	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
ADDITIONAL PROGRAM OUTCOMES *Optional* *If Added, reorder entire table alphabetically—no need to label these additional outcomes	Complete as appropriate for the program. NA at this time	Complete as appropriate for the program. NA at this time	Complete as appropriate for the program. NA at this time

2. Report on 2019-2021 Academic Year and Action Plan (Loop-Closing)

This section of the report is being filled out by Steve Coy, the assessment coordinator for the Art and Design Department, because the implementation of all criteria was standard throughout our department. A new plan was formulated during our assessment day breakout to yet again simplify and capture what we are already doing so we can have trackable data. We will only assess once per course twice per program for each NASAD outcome. We identified that outcomes can be linked directly to quizzes. For the 2021-2022 year we only assessed the five University program requirements and now will move to implement all NASAD requirements. A Rubric will be made for each outcome and that will be applied to any project assessing that outcome creating a universal system for capturing data in the department and simplifying the implementation. We found that the other process was tediousfor adjuncts and capturing all data was more important than having a system that is difficult to implement across 5 programs.

Learning Outcome: All of them
Assessment: Rubrics were attached to specific assignments where outcomes were addressed. Students were evaluated on a scale of 1,2,3 relating to deficient, competent, exemplary.

Evaluation: Data was useful to see at the assignment level but was difficult to implement given that unique rubrics connected to outcomes had to be created for each assignment.

Issue: Issues from 2021-2022 were the challenge in implementing this system across 5 programs through projects. Faculty members needed to create unique rubrics for outcomes in advance and then set them up in their courses.

Current/Future Actions: As described above, challenges were all in implementing the system. In spring of 2023 we will implement a more universal rubric system for the outcomes to ease the distribution and creation of outcomes and rubrics within courses.

Responsibility: Faculty teaching courses will be responsible for evaluating assignments with assessment criteria attached, Program Directors in coordination with the assessment committee member and department chair will be responsible for evaluation of criteria with support from faculty.

University/College Support for Learning Outcome: The University Assessment Committee will continue to guide our program and department assessment through best practices and conversations in meetings, the College will support by cross departmental meetings to discuss assessment improvement and standardization and best practices within our college.

3. Assessment Plan for 2022-2025 Academic Years

Loop closing will evolve to a three-cycle and will follow the assessment plan shown in Table 1 and summarized below.

Freshman Year: Students are introduced to foundational competencies in design, technology, and analysis. In Introduction to Design, they begin to understand current major issues and processes in the field, analyze Western and non-Western works, and recognize social and cultural differences. Courses like Digital Foundations introduce competencies in using and evaluating technology, learning new

technologies, and beginning to design tools and systems. Design Principles introduces functional competence in visual organization, color theory, and the vocabulary of design. Thinking by Drawing emphasizes visual organization in drawing. In the second semester, Design Methodologies introduces collaborative work, user research methods, interdisciplinary design, and the ability to form value judgments. Students also begin developing research-supported design decisions addressing user needs, contexts, and the impact of design. These competencies are reinforced through consistent rubric-based assessment.

Sophomore Year: Students reinforce previously introduced competencies and begin addressing professional practice. Visual Culture reinforces critical analysis of works across cultures. Typography II introduces communication theory and its application. Foundations of Graphic Design and User Experience/User Interface Design reinforce visual organization and introduce strategies for planning, producing, and disseminating visual communications. Competencies introduced include systems thinking, user-centered design, and understanding professional and ethical practices. In Investigative Graphic Design, students engage with the concepts of usefulness, usability, desirability, sustainability, feasibility, and viability. They continue to support design decisions with research and use analytical tools to visualize findings. A Sophomore Portfolio Review and multiple rubric-aligned assessments support development toward capstone-level expectations.

Junior Year: Competencies introduced include synthesis of studio, theory, and technology (Graphic Design for Social Innovation), historical context (History of Graphic Design), and practical application of research (Digital Product Design). Students deepen knowledge in communication systems, consequences of design action, and global distribution of goods and services. In Professional Practice and Web Design, students reinforce competencies in planning, presentation, leadership, and ethical practice. Courses reinforce the ability to use technologies effectively, evaluate and match them to design problems, and create tools to meet communication goals. A required internship is introduced, where students apply design knowledge and skills beyond the classroom, supported by advising and assessment.

Senior Year: The senior curriculum reinforces professional and capstone competencies. In Graphic Design Thesis, students demonstrate technical mastery, independence, and a body of work aligned with their field. Design Leadership reinforces career preparation skills, while Graphic Design for the Field supports communication with professional and general audiences. Students reinforce competencies in research-supported decision-making, user and societal needs, and evaluation of long-term consequences. They revisit concepts of usefulness, usability, sustainability, feasibility, and viability. Throughout senior coursework, students demonstrate proficiency in synthesizing knowledge, working collaboratively, and addressing contemporary design challenges using research and critical judgment.

BS in Interior Design

1. Assessment Plan and Summary

The assessment plan for the program is shown and the mapping of courses onto the program assessment outcomes can be both found in Table 1. Learning outcomes assessed for the 2019-2021 academic years are listed in Section 2 of this report, including a detailed description of loop closing evaluation.

This report is being prepared by Jenna Walker, the Director of the Interior Design Program. The 2021-2022 year for Interior Design implemented the same system through canvas as the prior year. Criteria from NASAD, our accrediting body, were selected to align with the five University level outcomes Ethics, Leadership, Teamwork, Technology and Visual Communication (see TABLE 1). Each had two NASAD criteria with the exception of Ethics which only had one. Rubrics were then linked to the NASAD Criteria and attached to courses where the criteria are being taught. Faculty members teaching the course assigned these curricula to assignments with a 1, 2, or 3, meaning deficient, competent, exemplary respectively.

Closing of the loop occurred on September 20, 2022, during assessment day at the department level breakout session. The Interior Design faculty met to discuss assessment and our plan for the following year. At a department level and in guidance of the chair, assessment committee member and other faculty, it was determined that we need to identify ways of capturing what we are already doing. The design department has a culture of critiquing projects which is a form authenticate assessment.
The department determined to reinforce the approach in 2022 to pursue both Traditional and Authentic assessment methods with rubrics attached to assignments and the implementation of quizzes in certain instances. Each criteria will be measured twice throughout the curriculum and all NASAD outcomes will be integrated into spring of 2023.

Table 1: Assessment Plan for BS in Interior Design

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ETHICS	NASAD Criteria: H.X.F.3.j Functional knowledge of professional design practices and processes: 1. Ethical behaviors	Direct assessment of student using course embedded rubric: (I) Space and Empathy (R) Interior Design Practice	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
LEADERSHIP	NASAD Criteria: H.VIII.D.2 Acquire the skills necessary to assist in the development and advancement of their career H.VIII.D.3 Develop teaching skills, particularly as related to their major area of study	Direct assessment of student using course embedded rubric: H.VIII.D.2 (I) Interior Design Practice, (R) Design Leadership H.VIII.D.3 (I) Multidisciplinary Design, (R) Interiors Capstone Research Seminar	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
TEAMWORK	NASAD Criteria: H.VIII.D.5 Explore multidisciplinary issues that include art and design H.X.F.3.h Acquisition of collaborative skills and the ability to work effectively in interdisciplinary or multidisciplinary teams to solve complex problems	Direct assessment of student using course embedded rubric: H.VIII.D.5 (I) Design Methodologies. (R) Multidisciplinary Design H.X.F.3.h (I) Design Methodologies, (R) Multidisciplinary Design	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
TECHNOLOGY	NASAD Criteria: H.X.A.6.4b Make critical choices among different technologies H.X.F.3.e Knowledge of the technical aspects of construction and building systems	Direct assessment of student using course embedded rubric: H.X.A.6.4b (I) Visual Communication, (R) Prototyping & Fabrication H.X.F.3.e	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary

		(I) Human Comfort, (R) Documentation, Detailing & Specification	
VISUAL COMMUNICATION	NASAD Criteria: H.VIII.C.3 2. Students must have the ability to communicate art/design ideas, concepts, and requirements to professionals and laypersons H.X.F.3.f Ability to hear, understand, and communicate to the broad range of professionals and clients	Direct assessment of student using course embedded rubric: H.VIII.C.3 (I) Intro to Visual Communications, (R) Interiors Capstone H.X.F.3.f (I) Bodies in Space, (R) Space and Empathy	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
ADDITIONAL PROGRAM OUTCOMES *Optional* *If Added, reorder entire table alphabetically—no need to label these additional outcomes	Complete as appropriate for the program. NA at this time	Complete as appropriate for the program. NA at this time	Complete as appropriate for the program. NA at this time

2. Report on 2019-2021 Academic Years and Action Plan (Loop-Closing)

This section of the report is being filled out by Steve Coy, the assessment coordinator for the Art and Design Department, because the implementation of all criteria was standard throughout our department. A new plan was formulated during our assessment day breakout to yet again simplify and capture what we are already doing so we can have trackable data. We will only assess once per course twice per program for each NASAD outcome. We identified that outcomes can be linked directly to quizzes. For the 2021-2022 year we only assessed the five University program requirements and now will move to implement all NASAD requirements. A Rubric will be made for each outcome and that will be applied to any project assessing that outcome creating a universal system for capturing data in the department and simplifying the implementation. We found that the other process was tedious for adjuncts and capturing all data was more important than having a system that is difficult to implement across 5 programs.

Learning Outcome: All of them
Assessment: Rubrics were attached to specific assignments where outcomes were addressed. Students were evaluated on a scale of 1,2,3 relating to deficient, competent, exemplary.

Evaluation: Data was useful to see at the assignment level but was difficult to implement given that unique rubrics connected to outcomes had to be created for each assignment.

Issue: Issues from 2021-2022 were the challenge in implementing this system across 5 programs through projects. Faculty members needed to create unique rubrics for outcomes in advance and then set them up in their courses.

Current/Future Actions: As described above, challenges were all in implementing the system. In spring of 2023 we will implement a more universal rubric system for the outcomes to ease the distribution and creation of outcomes and rubrics within courses. The Interior Design program will extend this assessment process to CIDA for Fall 2023, which kicks of the next three-year assessment period for the 2026 CIDA visit.

Responsibility: Faculty teaching courses will be responsible for evaluating assignments with assessment criteria attached, Program Directors in coordination with the assessment committee member and department chair will be responsible for evaluation of criteria with support from faculty.

University/College Support for Learning Outcome: The University Assessment Committee will continue to guide our program and department assessment through best practices and conversations in meetings, the College will support by cross departmental meetings to discuss assessment improvement and standardization and best practices within our college.

3. Assessment Plan for 2022-2025 Academic Years

Loop closing will evolve to a three-cycle and will follow the assessment plan shown in Table 1 and summarized below.

Freshman Year: First-year courses introduce students to foundational competencies in visual

communication, design principles, color theory, and spatial understanding. In Introduction to Design and Design Principles, students begin to understand the major issues and vocabulary of the field, analyze works from multiple cultures, and develop basic design judgment. These courses also introduce competencies in critical thinking, research-based decision-making, and awareness of social, cultural, and global perspectives.

Students begin acquiring technical and theoretical skills in Visual Communication and Precalculus, and are introduced to basic business concepts and professional expectations. The spring semester includes Interior Materials and Systems, Design Methodologies, and College Physics, where students expand their understanding of sustainability, production processes, feasibility, and the organizational structures associated with design practice. Teamwork, interdisciplinary collaboration, and user-focused design solutions are introduced and assessed through rubrics tied to national standards.

Sophomore Year: In year two, students develop historical and contextual knowledge in History of Interiors and Human Factors + Ergonomics. Courses reinforce the ability to analyze design across historical, cultural, and stylistic contexts, and to apply this understanding to spatial thinking and user experiences. Bodies in Space and Foundations of Graphic Design deepen practical design skills while introducing system-level thinking, design planning, and professional standards.

Spring semester courses such as Human Behavior in the Built Environment, Prototyping + Fabrication, and Spatial Perception further develop competencies in usability, desirability, sustainability, and feasibility. Students reinforce their ability to apply technology, assess user needs, and create research-supported design solutions. In Sophomore Portfolio Review, students begin compiling a body of work demonstrating professional entry-level readiness and communication of design ideas to diverse audiences.

Junior Year: The junior year emphasizes historical continuity, design theory, and technical application. History of the Designed Environment, Furniture and Millwork, and Situated Interior Response reinforce students' ability to contextualize their work and assess it critically. Students engage with system-level concerns such as long-term sustainability, cultural variation, and global production and distribution.

In spring, Human Comfort and Documentation, Detailing + Specifications introduce technical building systems and documentation practices. Multidisciplinary Design promotes collaborative and transdisciplinary work while reinforcing synthesis of studio, theory, and research. Students demonstrate their ability to conceive of interior spaces and communicate across professional boundaries. Emphasis is also placed on professional ethics, production scheduling, and economic viability.

Senior Year: Senior-level courses focus on capstone integration, leadership, and professional practice. In Interior Design Practice, Design Leadership, and Design Theory, students reinforce their understanding of current industry standards, business practices, and ethical responsibilities. They demonstrate fluency with tools, concepts, and methods through the Capstone Research Seminar and related design coursework.

Courses such as Space + Empathy and Interiors Capstone support the completion of a body of work

reflecting professional entry-level competence. Students apply prior learning to design problems requiring synthesis of studio practice, research, history, and user data. Key outcomes include the ability to justify design decisions, evaluate long-term impact, and effectively communicate with clients and collaborators.

A required internship (DES 4530) supports application of academic learning in professional settings and reinforces preparation for careers in interior design. Across the year, students exhibit their work, participate in critiques, and demonstrate competency in both independent and team-based projects, meeting the expectations of the program's learning outcomes.

BS in Product Design

1. Assessment Plan and Summary

The assessment plan for the program is shown and the mapping of courses onto the program assessment outcomes can be both found in Table 1. Learning outcomes assessed for the 2019-2021 academic years are listed in Section 2 of this report, including a detailed description of loop closing evaluation.

This report is being prepared by Bilge Nur Saltik, the assessment coordinator for the Design Department. The 2021-2022 year for Product Design implemented the same system through canvas as the prior year. Criteria from NASAD, our accrediting body, were selected to align with the five University level outcomes Ethics, Leadership, Teamwork, Technology and Visual Communication (see TABLE 1). Each had two NASAD criteria with the exception of Ethics which only had one. Rubrics were then linked to the NASAD Criteria and attached to courses where the criteria are being taught. Faculty members teaching the course assigned these curricula to assignments with a 1, 2, or 3, meaning deficient, competent, exemplary respectively.

Closing of the loop occurred on September 20, 2022, during assessment day at the department level breakout session. The Interior Design faculty met to discuss assessment and our plan for the following year. At a department level and in guidance of the chair, assessment committee member and other faculty, it was determined that we need to identify ways of capturing what we are already doing. The design department has a culture of critiquing projects which is a form authenticate assessment.
The department determined to reinforce the approach in 2022 to pursue both Traditional and Authentic assessment methods with rubrics attached to assignments and the implementation of quizzes in certain instances. Each criteria will be measured twice throughout the curriculum and all NASAD outcomes will be integrated into spring of 2023.

Table 1: Assessment Plan for BS in Product Design

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ETHICS	NASAD Criteria: H.X.E.3. Functional knowledge of professional design practices and processes 1. ethical behaviors	Direct assessment of student using course embedded rubric: (I) Introduction to Design (R) Professional Practice	Mean score ≥ 1 on 3-point scale rubric: 0 = deficient 1 = competent 2 = exemplary
LEADERSHIP	NASAD Criteria: H.VIII.D.2 Acquire the skills necessary to assist in the development and advancement of their career H.VIII.D.3 Develop teaching skills, particularly as related to their major area of study	Direct assessment of student using course embedded rubric: H.VIII.D.2 (I) Professional Practice, (R) Design Leadership H.VIII.D.3 (I) Multi Disciplinary Design, (R) Senior Thesis	Mean score ≥ 1 on 3-point scale rubric: 0 = deficient 1 = competent 2 = exemplary
TEAMWORK	NASAD Criteria: H.VIII.D.5 [SHARED STUDIOS] Explore multidisciplinary issues that include art and design H.X.E.3.i [TEAMS] Acquisition of collaborative skills	Direct assessment of student using course embedded rubric: H.VIII.D.5, H.X.E.3.i (I) Design Methodologies (R)Multi Disciplinary Design	Mean score ≥ 1 on 3-point scale rubric: 0 = deficient 1 = competent 2 = exemplary
TECHNOLOGY	NASAD Criteria: H.X.A.6.4b Make critical choices among different technologies H.X.E.3.b [TECHNOLOGY] Ability to use technologies and tools associated with multi-dimensional design representation, development, dissemination, and application	Direct assessment of student using course embedded rubric: H.X.A.6.4b (I) 3D Visualization 1, (R) Rapid Technology H.X.E.3.b (I) 3D Visualization 1, (R) 3D Visualization 2, Rapid Technology	Mean score ≥ 1 on 3-point scale rubric: 0 = deficient 1 = competent 2 = exemplary

VISUAL COMMUNICATION	NASAD Criteria: *H.VIII.B.1a* *Gain functional competence with principles of visual organization in* visual elements in two and three dimensions, colour theory and its applications, and drawing H.VIII.C.3 2. Students must have the ability to communicate art/design ideas, concepts, and requirements to professionals and laypersons H.X.F.3.f Ability to communicate concepts and specifications in verbal, written, and multiple media at levels ranging from abstraction and sketches, to detailed multi-dimensional, functional, and visual representations.	Direct assessment of student using course embedded rubric: *H.VIII.B.1a* (I) Drawing & Design Geometry 1, (R) Drawing & Design Geometry 2 H.VIII.C.3 (I)Sophomore Portfolio Review, (R) Design for Impact H.X.F.3.f (I)Foundation of Product Design, (R) Senior Thesis	Mean score ≥ 1 on 3-point scale rubric: 0 = deficient 1 = competent 2 = exemplary
ADDITIONAL PROGRAM OUTCOMES *Optional* *If Added, reorder entire table alphabetically—no need to label these additional outcomes	Complete as appropriate for the program. NA at this time	Complete as appropriate for the program. NA at this time	Complete as appropriate for the program. NA at this time

2. Report on 2019-2021 Academic Years and Action Plan (Loop-Closing)

This section of the report is being filled out by Steve Coy, the assessment coordinator for the Art and Design Department, because the implementation of all criteria was standard throughout our department. A new plan was formulated during our assessment day breakout to yet again simplify and capture what we are already doing so we can have trackable data. We will only assess once per course twice per program for each NASAD outcome. We identified that outcomes can be linked directly to quizzes. For the 2021-2022 year we only assessed the five University program requirements and now will move to implement all NASAD requirements. A Rubric will be made for each outcome and that will be applied to any project assessing that outcome creating a universal system for capturing data in the department and simplifying the implementation. We found that the other process was tediousfor adjuncts and capturing all data was more important than having a system that is difficult to implement across 5 programs.

Learning Outcome: All of them
Assessment: Rubrics were attached to specific assignments where outcomes were addressed. Students were evaluated on a scale of 1,2,3 relating to deficient, competent, exemplary.

Evaluation: Data was useful to see at the assignment level but was difficult to implement given that unique rubrics connected to outcomes had to be created for each assignment.

Issue: Issues from 2021-2022 were the challenge in implementing this system across 5 programs through projects. Faculty members needed to create unique rubrics for outcomes in advance and then set them up in their courses.

Current/Future Actions: As described above, challenges were all in implementing the system. In spring of 2023 we will implement a more universal rubric system for the outcomes to ease the distribution and creation of outcomes and rubrics within courses.

Responsibility: Faculty teaching courses will be responsible for evaluating assignments with assessment criteria attached, Program Directors in coordination with the assessment committee member and department chair will be responsible for evaluation of criteria with support from faculty.

University/College Support for Learning Outcome: The University Assessment Committee will continue to guide our program and department assessment through best practices and conversations in meetings, the College will support by cross departmental meetings to discuss assessment improvement and standardization and best practices within our college.

3. Assessment Plan for 2022-2025 Academic Years

Loop closing will evolve to a three-cycle and will follow the assessment plan shown in Table 1 and summarized below.

Freshman Year: The first year of the Product Design curriculum introduces students to foundational competencies in visual communication, drawing, design principles, digital tools, and design

methodologies. Courses such as Introduction to Design, Design Principles, and Drawing and Design Geometry I engage students in visual organization, color theory, critical analysis of design works, and global cultural perspectives. Students begin exploring research-supported decision-making and gain exposure to professional design practices and intellectual property considerations.

Technology skills are introduced in 3D Visualization I, where students develop competencies in multi-dimensional design representation and learn to adopt new technologies. Design Methodologies and Basic Prototyping introduce team collaboration, interdisciplinary thinking, and participatory design approaches, while also covering feasibility, production, and sustainability. In the second semester, Industrial Design History provides context on the historical development of the field. Students are introduced to foundational knowledge of user needs, design tools, and systems. These competencies are supported by rubrics and aligned with NASAD standards.

Sophomore Year: The sophomore year emphasizes human-centered design, ergonomic principles, and professional context. In Human Factors and Ergonomics, students explore usability, desirability, and the societal value of design, reinforcing skills in identifying user needs and evaluating design impacts. Foundations of Product Design deepens understanding of professional practice, product development processes, and systems-level thinking. Students continue developing visual communication and problem-solving skills across materials and construction-focused courses.

Spring semester coursework includes Human-Centered Design, where students further engage with strategies for resolving competing values and conducting user research. The Sophomore Portfolio Review provides an opportunity to assess progress toward program competencies. Students also begin to make connections across the sciences, humanities, and social sciences in relation to their design work.

Junior Year: Junior-level courses focus on sustainability, systems design, technological fluency, and interdisciplinary collaboration. In Sustainable Systems and Wearable Technology Design, students expand their understanding of design in interdependent systems and the ethical use of resources. They demonstrate the ability to design at the systems level and anticipate long-term consequences of design choices. Students continue to develop their technological agility, exploring both the use and invention of systems and tools.

Courses such as Professional Practice, User Experience and User Interface Design, and Multi-disciplinary Design emphasize communication, leadership, teamwork, and integration of diverse knowledge domains. Students learn to evaluate technologies, match tools to problems, and apply system-level thinking. A required internship supports the application of academic learning in professional settings.

Senior Year: In the final year, students synthesize prior learning through capstone experiences and advanced coursework. Design Leadership and Professional Communication reinforce readiness for professional engagement, while Digital Product Design and Design for Impact support mastery of tools, systems, and human-centered considerations. Students analyze current trends, communicate across media, and consider economic viability and global implications of design.

The senior thesis and portfolio development culminate the program. In Senior Thesis and Materials and Manufacturing Process, students demonstrate entry-level competence, technical mastery, and the ability to work independently on complex design challenges. They refine communication and research skills, integrate sustainability principles, and evaluate the impact of their work. The curriculum concludes with electives that allow further interdisciplinary exploration and career-focused preparation.

BS in Transportation Design

1. Assessment Plan and Summary

The assessment plan for the program is shown and the mapping of courses onto the program assessment outcomes can be both found in Table 1. Learning outcomes assessed for the 2019-2021 academic years are listed in Section 2 of this report, including a detailed description of loop closing evaluation.

This report is being prepared by Steve Coy, the assessment coordinator for the Design Department. The 2021-2022 year for Transportation Design implemented the same system through canvas as the prior year. Criteria from NASAD, our accrediting body, were selected to align with the five University level outcomes Ethics, Leadership, Teamwork, Technology and Visual Communication (see TABLE 1). Each had two NASAD criteria with the exception of Ethics which only had one. Rubrics were then linked to the NASAD Criteria and attached to courses where the criteria are being taught. Faculty members teaching the course assigned these curricula to assignments with a 1, 2, or 3, meaning deficient, competent, exemplary respectively.

Closing of the loop occurred on September 20, 2022, during assessment day at the department level breakout session. The Interior Design faculty met to discuss assessment and our plan for the following year. At a department level and in guidance of the chair, assessment committee member and other faculty, it was determined that we need to identify ways of capturing what we are already doing. The design department has a culture of critiquing projects which is a form authenticate assessment.
The department determined to reinforce the approach in 2022 to pursue both Traditional and Authentic assessment methods with rubrics attached to assignments and the implementation of quizzes in certain instances. Each criteria will be measured twice throughout the curriculum and all NASAD outcomes will be integrated into spring of 2023.

Table 1: Assessment Plan for BS in Transportation Design

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ETHICS	NASAD Criteria: H.X.E.3.g Functional knowledge of professional design practices and processes	Direct assessment of student using course embedded rubric: H.X.E.3.g (I) Introduction to Design (R) Professional Practice	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
LEADERSHIP	NASAD Criteria: H.VIII.D.2 Acquire the skills necessary to assist in the development and advancement of their career H.VIII.D.3 Develop teaching skills, particularly as related to their major area of study	Direct assessment of student using course embedded rubric: H.VIII.D.2 (I) Professional Practice, (R) Design Leadership H.VIII.D.3 (I) Multi Disciplinary Design, (R)Professional Design Challenge	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
TEAMWORK	NASAD Criteria: H.VIII.D.5 Explore multidisciplinary issues that include art and design H.X.C.3.i Acquisition of collaborative skills and the ability to work effectively in interdisciplinary or multidisciplinary teams to solve complex problems	Direct assessment of student using course embedded rubric: H.VIII.D.5 (I) Design Methodologies (R) Multi Disciplinary Design H.X.C.3.i (I) Design Methodologies, (R) Multidisciplinary Design	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
TECHNOLOGY	NASAD Criteria: H.X.A.6.4b Make critical choices among different technologies H.X.E.3.b [TECHNOLOGY] Ability to use technologies and tools associated with multi-dimensional	Direct assessment of student using course embedded rubric: H.X.A.6.4b, (I) Drawing & Design Geometry 2, (R)TD 3D Modeling 3 H.X.E.3.b (I) TD 3D Modeling 1, (R)TD 3D Modeling AR/VR	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary

	design representation, development, dissemination, and application		
VISUAL COMMUNICATION	NASAD Criteria: H.VIII.C.3 2. Students must have the ability to communicate art/design ideas, concepts, and requirements to professionals and laypersons related to the practice of the major field H.X.E.3.f Ability to communicate concepts and specifications in verbal, written, and multiple media	Direct assessment of student using course embedded rubric: H.VIII.C.3 (I) Transportation Design: Foundations(R) Professional Design Challenge H.X.E.3.f (I) Transportation Design: Foundations (R) Professional Design Challenge	Mean score ≥ 1 on 3-point scale rubric: 1 = deficient 2 = competent 3 = exemplary
ADDITIONAL PROGRAM OUTCOMES *Optional* *If Added, reorder entire table alphabetically—no need to label these additional outcomes	Complete as appropriate for the program. NA at this time	Complete as appropriate for the program. NA at this time	Complete as appropriate for the program. NA at this time

2. Report on 2019-2021 Academic Years and Action Plan (Loop-Closing)

This section of the report is being filled out by Steve Coy, the assessment coordinator for the Art and Design Department, because the implementation of all criteria was standard throughout our department. A new plan was formulated during our assessment day breakout to yet again simplify and capture what we are already doing so we can have trackable data. We will only assess once per course twice per program for each NASAD outcome. We identified that outcomes can be linked directly to quizzes. For the 2021-2022 year we only assessed the five University program requirements and now will move to implement all NASAD requirements. A Rubric will be made for each outcome and that will be applied to any project assessing that outcome creating a universal system for capturing data in the department and simplifying the implementation. We found that the other process was tediousfor adjuncts and capturing all data was more important than having a system that is difficult to implement across 5 programs.

Learning Outcome: All of them
Assessment: Rubrics were attached to specific assignments where outcomes were addressed. Students were evaluated on a scale of 1,2,3 relating to deficient, competent, exemplary.

Evaluation: Data was useful to see at the assignment level but was difficult to implement given that unique rubrics connected to outcomes had to be created for each assignment.

Issue: Issues from 2021-2022 were the challenge in implementing this system across 5 programs through projects. Faculty members needed to create unique rubrics for outcomes in advance and then set them up in their courses.

Current/Future Actions: As described above, challenges were all in implementing the system. In spring of 2023 we will implement a more universal rubric system for the outcomes to ease the distribution and creation of outcomes and rubrics within courses.

Responsibility: Faculty teaching courses will be responsible for evaluating assignments with assessment criteria attached, Program Directors in coordination with the assessment committee member and department chair will be responsible for evaluation of criteria with support from faculty.

University/College Support for Learning Outcome: The University Assessment Committee will continue to guide our program and department assessment through best practices and conversations in meetings, the College will support by cross departmental meetings to discuss assessment improvement and standardization and best practices within our college.

3. Assessment Plan for 2022-2025 Academic Years

Loop closing will evolve to a three-cycle and will follow the assessment plan shown in Table 1 and summarized below.

Freshman Year: In the first year of the Transportation Design program, students are introduced to foundational concepts in design, drawing, visual communication, technology, and research-supported

decision-making. Courses such as Introduction to Design, Design Principles, and Drawing and Design Geometry I introduce students to current issues in design, design ethics, professional practices, and basic business concepts relevant to industrial design. Students develop functional competence in color theory, visual organization, and design vocabulary through studio work.

Technology and systems design are introduced through Drawing and Design Geometry and reinforced in Clay Surface Development. Research competencies related to user needs and contextual understanding are addressed. In the second semester, Design Methodologies expands student capacity for synthesis, collaborative work, and participatory design approaches. Industrial Design History reinforces historical and critical frameworks. By the end of the first year, students have been introduced to entry-level design skills, user-centered methods, and interdisciplinary considerations.

Sophomore Year: The sophomore year builds on the design foundation with emphasis on human factors, ergonomics, systems thinking, and professional studio practice. In Human Factors and Vehicle Packaging, students explore usability, feasibility, and system-level design considerations. Transportation Design Foundations introduces communication skills, visual and conceptual acuity, and the economic viability of design. Students are introduced to interdisciplinary teamwork and begin to evaluate design solutions based on user needs and environmental context.

Courses such as TD VisCom I, TD 3D Modeling I, and Performance Design: Exteriors and Interiors reinforce students' ability to apply design tools, model in three dimensions, and explore individual interests in vehicle aesthetics, interaction, and globalization. The Sophomore Portfolio Review serves as a formative assessment checkpoint. Skills in research, contextual inquiry, and collaborative design continue to be developed throughout the year.

Junior Year: Junior-level courses focus on sustainability, systems-level design, and the refinement of technical and professional competencies. In Sustainable Design: Exterior and Interior & UI, students are introduced to concepts of resource use, lifespan of products, and long-term impacts. Research continues to be emphasized, particularly in evaluating what particular contexts demand. Studio work and coursework in TD VisCom III, TD 3D Modeling III, and Multidisciplinary Design reinforce collaborative skills, system-level design, and the ability to choose and apply appropriate tools and technologies.

Professional Practice addresses communication, leadership, and business skills, preparing students for careers in design. Students begin to integrate design knowledge across disciplines and media. The junior year concludes with an internship that introduces professional fieldwork and provides experience applying classroom knowledge in real-world settings.

Senior Year: In the final year, students synthesize prior learning and demonstrate entry-level professional competence. Courses such as Design Leadership and Professional Design Challenge reinforce communication, leadership, and the ability to address design problems independently. Students demonstrate technical mastery through advanced studio work, including TD VisCom Punch List, TD 3D Modeling: Animation, and Capstone Design.

Students reflect on the global, ethical, and societal impacts of design. They also develop the ability to place their work in historical, stylistic, and cultural contexts. Through electives and core requirements in communication and natural sciences, students engage in interdisciplinary learning and general education competencies.

The capstone experience allows students to showcase a comprehensive body of work, integrating studio practice, user research, system thinking, and professional design standards. Students complete the program with a strong foundation in technology, design ethics, and global industry practices.

Master of Urban Design

1. Assessment Plan and Summary

The assessment plan for the program is shown in Table 1. Table 2 shows the mapping of courses onto the program assessment outcomes. Learning outcomes assessed for the 2021-2022 academic year are listed in Section 2 of this report, including a detailed description of loop closing evaluation.

Table 1: Assessment Plan for MUD Program

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ADVANCED KNOWLEDGE	Students will demonstrate the formation and application of advanced urban design concepts, principles, and tools through the exploration of the semester long projects in urban and architectural design.	ARC 5714/24 1. Final studio project 2. Exit Interview	1. 80% of students will participate in design studios and effectively communicate the advanced knowledge they have gained in their final studio project/review, which is evaluated by a consensus rubric. 2. 100% of graduates will participate in an exit interview/alumni survey.
COMMUNICATION	Students will gain specific communication skills to become proficient in the visualization of urban environments.	ARC 5742 Urban Design --Methods --final paper	80% of students will present a comprehensive urban design alternatives scenario in graphic (digital) format, evaluated by consensus rubric.
ETHICS	Students will gain exposure to and knowledge of design ethics in a public sector setting and in the context of the North American regulatory environment.	ARC 5332 Design Ethics -- midterm project	80% of students will successfully demonstrate knowledge on their midterm projects evaluated by a consensus rubric.
TECHNOLOGY	Students will demonstrate the ability to use the latest technologies to collect, analyze and represent data.	ARC5752 Quantitative Methods in Urban Design -- midterm project.	80% of students will successfully demonstrate ability on their midterm projects evaluated by a consensus rubric.

Table 2: Curriculum Map for the M.U.D. Program

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**		COMMUNICATION (WRITTEN, ORAL, VISUAL)	ETHICS	KNOWLEDGE	TECHNOLOGY
Quantitative Methods in Urban Design	ARC5752				**I**
Urban Design Methods	ARC5742	**I**			
History of Urban Form	ARC5682		**I**		
Advanced GIS	ARC5673				**R**
GIS Practicum	ARC5672				**E**
Urban Studio 1 or 2	ARC5714/24			**E**	
Introduction to Community Development	ARC5852	**I**			
Adaptive Reuse & Rehabilitation	ARC5812	**I**			
Public Interest Design	ARC5242		**R**		
Design Ethics	ARC5332		**R**		
Current Issues in Urban Design	ARC5743			**E**	

2. Report on 2019-2021 Academic Years and Action Plan (Loop-Closing)

The two LTU Graduate Learning Outcome assessments scheduled for this year are addressed below. Note that assessments were made during this academic year.

Course: Advanced Design Studio 2 ARC5824 (Spring 2022)
Course Faculty Coordinator: Joongsub Kim

Learning Outcome: LTU Graduate Program-Level "Advanced Knowledge"
Description: "LTU graduates will apply and, in accordance with their course of study, develop advanced knowledge within their discipline."

Assessment & Evaluation: ARC 5824 Advanced Design Studio 2 - final studio project. 92.3% (12 of 13 students) participated in design studios and effectively communicated the advanced knowledge they have gained in their final studio project/review, which is evaluated by a consensus rubric.

Issues:Assessment Factors: Advanced Design Studio 2 and Urban Studio 2 are taught as a combined studio.

Current/Future Actions: None indicated.

Responsibility: Professor Joongsub Kim

University/College Support for Learning Outcome: The Architecture Chair will assign assessment responsibilities each year based on the professors teaching this course.

Course: Design Ethics ARC 55332 (Spring 2022)
Course Faculty Coordinator: Joongsub Kim

Learning Outcome: LTU Graduate Program-Level "Ethics"
Description: "LTU graduates will develop a broad perspective on professional issues, such as lifelong learning, sustainability, leadership, and ethics."

Assessment & Evaluation: ARC 5332 Design Ethics - midterm project. 100% (6 of 6 students) successfully demonstrated knowledge on their midterm projects evaluated by a consensus rubric.

Issues: None indicated

Current/Future Actions: None indicated.

Responsibility: Professor Joongsub Kim

University/College Support for Learning Outcome: The Architecture Chair will assign assessment responsibilities each year based on the professors teaching this course.

3. Assessment Plan for 2022-2025 Academic Years

Loop closing will evolve to a three-cycle and will follow the assessment plan shown in Table 1 and summarized below. Advanced Knowledge will be assessed via a final studio project in ARC 5814 Advanced Design Studio 1, and Communication will be assessed via a final term paper in ARC 5742 Urban Design Methods.

College of Arts and Sciences

BS in Chemistry and Environmental Chemistry

1. Assessment Plan and Summary

The assessment plan is shown in Table 1. Each learning outcome is assessed each time respective courses are offered, and loop-closing occurs annually for each course assessed.

The assessment practice of the Natural Sciences department follows a three-year cycle, which is comprised of the three steps, data collection, evaluation and loop closing.

Table 1: Assessment Plan for BS in Chemistry and Environmental Chemistry

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Tools	Metrics/ Indicators
TECHNOLOGY	Students must individually and successfully use instrumentation and chemical literature available in the department to analyze unknown substances and synthesized organic or inorganic compounds.	Direct assessment of coursework using a lab report rubric in CHM 4632 (Instrumental Analysis Lab), CHM 4541 (Advanced Spectroscopy Lab), and CHM 3463 (Advanced Synthesis Lab). Course objectives surveys in CHM 4632 (Instrumental Analysis Lab), CHM 4541 (Advanced Spectroscopy Lab), and CHM 3463 (Advanced Synthesis Lab).	80% of students will receive a "qualified" designation. 80% of students will feel "confident" or "very confident" overall regarding their mastery of the course objectives.
ETHICS & LEADERSHIP	Students will be able to evaluate the impact of scientific practices and findings on society.	Evaluation of senior project proposal using a rubric in PSC 3001 (Introduction to Senior Projects in Science). Students will consider sustainability and green chemistry issues relevant to their proposed senior project.	80% of students will perform at a "satisfactory" or "superior" level.
TEAMWORK	Students will demonstrate team-building and collaboration skills by making decisions, building consensus, resolving conflicts, and evaluating team members' contributions toward solving chemistry-related problems.	Team evaluation by instructor and team self-evaluation in CHM 3441 (Physical Chemistry 2 Lab), CHM 3411 (Biochemistry 1 Lab), and CHM 3463 (Advanced Synthesis Lab). A Likert scale of satisfaction will be used. Ethics case study assignment in PSC 3001, in which students will analyze an ethics-related situation and characterize and reflect upon the scientific misconduct involved.	80% of students will feel "always satisfied" or "frequently satisfied" regarding the contributions of their peers. The instructor will feel "always satisfied" or "frequently satisfied" 80% of the time regarding student contributions.
VISUAL COMMUNICATION	Students will demonstrate professional standards in chemistry through graphical communication.	Direct assessment of research project posters using a rubric in CHM 3411 (Biochemistry 1 Laboratory). Direct assessment of student project reports using a rubric in CHM 4001 (Computational Chemistry 2). Evaluation of student presentations using an oral presentation rubric in CHM 4912 (Chemical Sciences Project 1) and CHM 4922 (Chemical Sciences Project 2).	80% of students will perform at a "satisfactory" or "superior" level based on rubrics.

ORAL AND WRITTEN COMMUNICATION	Students will demonstrate professional standards in chemistry through oral and written communication.	Direct assessment of student projects using a rubric in CHM 3403 (Biochemistry). Direct assessment of student lab reports using a rubric in CHM 4632 (Instrumental Analysis Lab). Evaluation of student oral presentations using a rubric in CHM 2313 (Organic Chemistry 1), CHM 2321 (Organic Chemistry 2 Laboratory), CHM 4912 (Chemical Sciences Project 1), and CHM 4922 (Chemical Sciences Project 2).	80% of students will perform at a "satisfactory" or "superior" level based on rubrics.
SCIENTIFIC ANALYSIS	Students will demonstrate critical thinking and apply analytical and problem-solving skills in chemistry.	Completion of an independent research project with minimal assistance in CHM 4912 (Chemical Sciences Project 1) and CHM 4922 (Chemical Sciences Project 2).	80% of students will perform at a "satisfactory" or "superior" level in the completion of their senior projects.
KNOWLEDGE IN DISCIPLINE	Students must integrate the core concepts of physical chemistry: quantum mechanics, thermodynamics, kinetics, and computational chemistry. Students must demonstrate knowledge of quantitative chemical analysis, including wet chemical and instrumental techniques. Students must demonstrate knowledge of the structure and function of the four classes of biomolecules: proteins, nucleic acids, carbohydrates, and lipids. Students must demonstrate their ability to draw and name the major classes of organic molecules, explain how they react using arrow-pushing mechanisms, and how they are characterized using mass spectrometry, IR spectroscopy, and NMR spectroscopy. Students must analyze and interpret new information on modern topics in inorganic chemistry, such as group theory, ligand field theory, x-ray crystallography, and organometallic chemistry.	Direct assessment of final exams in CHM 3423 (Physical Chemistry 1) and CHM 3434 (Physical Chemistry 2). Direct assessment of final exam in CHM 2342 (Analytical Chemistry) and CHM 4632 (Instrumental Analysis Lab). Direct assessment of final exam in CHM 3403 (Biochemistry). Direct assessment of final exams in CHM 2313 (Organic Chemistry 1) and CHM 2323 (Organic Chemistry 2). Direct assessment of final exams in CHM 3452 (Intermediate Inorganic Chemistry) and CHM 4643 (Advanced Inorganic Chemistry).	80% of students will perform at a "satisfactory" or "superior" level.

2. Report on 2019-2021 Academic Year and Action Plan (Loop Closing)

The assessment findings for several key learning outcomes: Ethics & Leadership, Teamwork, Technology, Visual Communication, Knowledge in Discipline, and Oral and Written Communication. For each outcome, the relevant assessment methods, evaluation results, identified issues, and current/future actions are detailed, along with the faculty members responsible and confirmation of university/college support.

Ethics & Leadership: Assessed in PSC 3001 (Leadership in Scientific Research) through the evaluation of senior project proposals. All students (100%) successfully incorporated sustainability analysis and green chemistry practices (including cost, toxicology, and waste disposal) into their PowerPoint presentations of proposed research projects. No issues were identified, and no further action is currently deemed necessary. Meng Zhou is responsible for this outcome.

Teamwork: This outcome was assessed across three courses:

- **CHM 3411 (Biochemistry 1 Laboratory):** Assessed via instructor team evaluations and student self-evaluations. Results showed 90% or more student satisfaction with team member contributions and 90% instructor satisfaction with teamwork. No issues were reported, and no further action is planned. Irfana Muqbil is responsible.
- **CHM 3441 (Physical Chemistry 2 Lab):** Assessed similarly through instructor and team self-evaluations. 100% of students reported being "always satisfied" with peer contributions, while the instructor was "frequently satisfied" 80% of the time. No issues or future actions are noted. LaVetta Appleby and Meng Zhou share responsibility.
- **PSC 3001 (Leadership in Scientific Research):** Assessed by instructor team evaluations. The instructor was "always satisfied" or "frequently satisfied" 80% of the time regarding student contributions. No issues or future actions are indicated. LaVetta Appleby and Meng Zhou share responsibility.

Technology: Assessed in CHM 4632 (Instrumental Analysis Lab), CHM 4541 (Advanced Spectroscopy Lab), and CHM 3463 (Advanced Synthesis Lab) through lab report rubrics and course objective surveys. In CHM 4632, three out of four students met the "qualified" metric on lab reports, and all four were confident in their mastery of course objectives. No assessment issues were found for the 2021-2022 academic years, and no further action is planned. Nicole Villeneuve is responsible.

Visual Communication: Assessed using various methods across several courses:

- **CHM 3411 (Biochemistry 1 Laboratory):** Direct assessment of research project posters using a rubric. All 5 students (in two groups) performed satisfactorily. No issues or future actions are noted. Irfana Muqbil is responsible.
- **CHM 4002 (Computational Chemistry):** Direct assessment of student project reports using a rubric. (Specific evaluation data not provided for this course).
- **CHM 4912 (Chemical Sciences Project 1) and CHM 4922 (Chemical Sciences Project 2):** Evaluation of student presentations using an oral presentation rubric. All three students in both courses performed at a "satisfactory" or "superior" level. No assessment issues were encountered, and no further action is needed. Shannon Timmons is responsible for these two courses.

Knowledge in Discipline: Assessed primarily through direct assessment of final exams across numerous Chemistry courses:

- **CHM 3403 (Biochemistry):** 72% of students achieved a satisfactory or excellent level. No issues or future actions are noted. Irfana Muqbil is responsible.
- **CHM 2313 (Organic Chemistry 1):** 89% of students achieved a "satisfactory" or "superior" level. No issues or future actions are noted. Shannon Timmons is responsible.
- **CHM 2323 (Organic Chemistry 2):** 100% of students achieved a "satisfactory" or "superior" level. No issues or future actions are noted. Shannon Timmons is responsible.
- **CHM 4632 (Instrumental Analysis Lab):** All four students achieved a "satisfactory" level. No issues or future actions are noted. Nicole Villeneuve is responsible.
- **CHM 3452 (Intermediate Inorganic Chemistry):** 100% of students achieved a "satisfactory" level. No issues or future actions are noted. Meng Zhou is responsible.
- **CHM 4643 (Advanced Inorganic Chemistry):** 100% of students achieved a "satisfactory" level. No issues or future actions are noted. Meng Zhou is responsible.

Oral and Written Communication: Assessed through various direct assessments:

- **CHM 3403 (Biochemistry):** Direct assessment of student projects using a rubric. All 7 students performed at a satisfactory or excellent level. No issues or actions needed. Irfana Muqbil is responsible.
- **CHM 4632 (Instrumental Analysis Lab):** Direct assessment of lab reports using a rubric. All four students performed at a "satisfactory" or "superior" level. No issues or actions needed. Nicole Villeneuve is responsible.
- **CHM 2313 (Organic Chemistry 1):** Evaluation of oral presentations using a rubric. 100% of students performed at a "satisfactory" or "superior" level. No issues or actions needed. Shannon Timmons is responsible.
- **CHM 2321 (Organic Chemistry 2 Laboratory):** Evaluation of oral presentations using a rubric. 100% of students performed at a "satisfactory" or "superior" level. No issues or actions needed. Shannon Timmons is responsible.
- **CHM 4912 (Chemical Sciences Project 1) and CHM 4922 (Chemical Sciences Project 2):** Evaluation of oral presentations using a rubric. 100% of students performed at a "satisfactory" or "superior" level in both courses. No issues or actions needed. Shannon Timmons is responsible for these courses.

Scientific Analysis: Assessed through the completion of independent research projects with minimal assistance in CHM 4912 (Chemical Sciences Project 1) and CHM 4922 (Chemical Sciences Project 2). 100% of students in both courses performed at a "satisfactory" or "superior" level based on faculty advisor observations and rubric-based assessments of presentations/mini theses. No issues were encountered, and no further action is needed for these courses. Shannon Timmons is responsible.

All learning outcomes consistently received "Yes" for University/College Support. The overall picture indicates successful achievement of the assessed learning outcomes, with no major issues identified across the reported courses, leading to no further action being required at this time for these specific assessments.

3. Assessment Plan for 2022-2025 Academic Years

Continue with the program level assessment plan shown in Table 1.

For **Ethics & Leadership**, assessment will occur in PSC 3001 (Leadership in Scientific Research) in both Fall 2022 and Spring 2023, utilizing a PowerPoint presentation or written proposal.

Teamwork will be assessed in two different ways:

- In CHM 3411 (Biochemistry 1), a questionnaire embedded in the final exam will be used for both Fall 2022 and Spring 2023.
- In CHM 3463 (Advanced Synthesis Lab), a rubric applied to student presentations will be used for both Fall 2022 and Spring 2023.

The **Technology** learning outcome will be assessed in Spring 2023 within CHM 4541 (Advanced Spectroscopy Lab) through an evaluation of lab reports and an overall course survey.

Visual Communication will be assessed in three courses using oral presentation rubrics:

- CHM 3411 (Biochemistry 1) in Fall 2022 and Spring 2023.
- CHM 4912 (Fall 2022) and CHM 4922 (Spring 2023).
- CHM 4002 (Computational Chemistry) in Fall 2022 for oral research project presentations.

For **Knowledge in Discipline**, the primary assessment method is the final written exam in the following courses:

- CHM 3403 (Biochemistry) in Fall 2022 and Spring 2023.
- CHM 2313 (Organic Chemistry 1) in Fall 2022 and CHM 2323 (Organic Chemistry 2) in Spring 2023.
- CHM 2342 (Analytical Chemistry) at an unspecified semester.

Finally, **Oral and Written Communication** will be assessed using an oral presentation rubric in:

- CHM 2313 (Organic Chemistry 1) in Fall 2022 and CHM 2321 (Organic Chemistry 2 Laboratory) in Spring 2023.
- CHM 4912 (Chemical Sciences Project 1) in Fall 2022 and CHM 4922 (Chemical Sciences Project 2) in Spring 2023.

The **Scientific Analysis** outcome will be assessed through direct observations by the faculty advisor and rubric-based assessments of student work:

- In CHM 4912 (Chemical Sciences Project 1) in Fall 2022, using an oral presentation rubric.
- In CHM 4922 (Chemical Sciences Project 2) in Spring 2023, using a mini thesis rubric.

BS in Computer Science

1. Assessment Plan and Summary

The assessment plan for the BS in Computer Science program is designed to address the university learning outcomes pertinent to an undergraduate degree in Computer Science (CS). When students complete the BSCS at Lawrence Tech, they should be knowledgeable about fundamental concepts and applications in Computer Science. The program level learning outcomes for the program is shown in Table 1 and the Curriculum Map is shown in Table 2. Each learning outcome is assessed each semester respective courses are offered, and loop-closing of collected assessment data occurs annually.

Table 1: Assessment Plan for BS in Computer Science

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Tools	Metrics/ Indicators
TECHNOLOGY Students will use mathematical software such as Matlab to analyze problems (Bloom's 4)	Design, implement, and evaluate a computer-based system, process, component, or program to meet its specified requirements. (3) Recognize the need for and engage in continuing professional development [and learn new technologies] and adapt to changes in the field. (7)	Direct assessment of MCS4833 Sr. Project	Students will achieve level 3 (of 4) on the Technology portion of a Sr. Project rubric
ETHICS a. Students will correctly incorporate and cite material from secondary sources in their writing. (Bloom's 3) b. Students will understand what constitutes original research contributions to the discipline. (Bloom's 4)	Secure employment and/or attend graduate school in their field, drawing on their experiences, both within and outside the major to become responsible citizens and effective professionals. (9)	Direct assessment of MCS4833 Sr. Project	Students will pass an ethics quiz based on an on-line tutorial
LEADERSHIP a. Students will understand theories of leadership germaine to the discipline. (Bloom's 2) b. Students will understand the civic responsibilites of researchers. (Bloom's 2)	Analyze the local and global impact of computing on individuals, organizations, and society. (6)	Assessed in MCS4833 Sr. Project by interview with project instructor	Students will achieve a level 3 (of 4) on the Leadership portion of a Sr. Project rubric
TEAMWORK a. Students will demonstrate team-building and collaboration skills (Bloom's 3) b. Students will evaluate team members' contributions. (Bloom's 4)	Function effectively in teams to accomplish a common goal, including performing leadership tasks. (4)	Direct assessment of MCS1414 in the Calc Lab	Students will achieve a level 3 (of 4) on the Teamwork portion of a Lab Survey rubric

VISUAL COMMUNICATION Students will use figures or other graphical elements in their projects and other technical reports. (Bloom's 3)	Plan, create and integrate oral, written, and graphical communication of [mathematical and algorithmic ideas] effectively to audiences having a range of technical understanding. (5)	Direct assessment of MCS1414 in the Calc Lab	Students will achieve a level 3 (of 4) on the Graphical communication portion of a Lab Survey rubric
KNOWLEDGE IN DISCIPLINE LTU graduates will demonstrate a mastery of the knowledge base in their discipline and an expertise in solving practical and theoretical problems.	Apply knowledge of computing and mathematics appropriate to the discipline. (1) Display a complete understanding of a computer language (syntax, semantics and terminology), develop and debug complex code. (10) Apply current techniques, skills, and tools necessary for computing practice. (8) Analyze a problem, and identify and define the computing requirements appropriate to its solution. (2)	Direct assessment of standard questions on final exams in MCS1142 and MCS1514 (Fall 2018) and MCS2534 (Spring 2019)	Average score greater than 70% on final exam problems mapped to course objectives

Table 2: Curriculum Map for the BSCS Program

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize**		ETHICS	KNOWLEDGE	LEADERSHIP	TEAMWORK	TECHNOLOGY	VISUAL COMMUNICATION	
Foundations of CS	MCS1243	**I**	**I**		**I**	**I**	**I**	
Computer Science 1	MCS1514	**I**	**I**			**I**	**I**	
Computer Science 2	MCS2514	**I**	**I**			**I**	**R**	
Discrete Math	MCS2523		**I**			**I**		
Software Engineering 1	MCS2513	**R**	**R**			**R**	**R**	
Data Structures	MCS2534		**R**	**R**	**R**	**R**		
Intro to Database Systems	MCS3543		**R**			**R**		
Comp. Arch. & Assembler	MCS3663		**R**			**R**		
Operating Systems	MCS4663		**E**			**E**		
Computer Networks	MCS4613		**E**			**E**		
Comparative Prog. Lang.	MCS4643		**E**			**E**		
Theory of Computation	MCS4653		**E**			**E**		
Senior Project Com 1001	MCS483(4)3	**E**	**E**	**E** **I**	**E**	**E**	**E**	

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

- **Fall 2019 & Spring 2020 (MCS1142 & MCS2514):** Data was collected from 44 students in MCS1142 and 17 in MCS2514. Overall, 2 out of 3 MCS1142 sections met the 70% target, and the single MCS2514 section where data was collected also met the target. However, detailed analysis of one MCS1142 section revealed weaknesses: 7 of 14 course objectives were below 70% on average in Fall 2019, and 5 of 14 were below 70% in Spring 2020.
- **Fall 2020 & Spring 2021 (MCS1142):** Data was collected from 60 students. For Fall 2020, one section had 14 outcomes with 13 questions on the final exam; 4 of these questions were below the 70% target. A second Fall 2020 section had 19 outcomes with 17 questions on the final exam, but specific target achievement information was not reported, making it indeterminate. For both Fall 2020 sections, non-assessed outcomes were evaluated via midterms and/or lab practices. In Spring 2021, one section had 22 students, 19 outcomes, and 14 mapped questions, with 3 questions falling below the 70% target.

Issues Identified:

- While overall performance generally met targets for most sections, consistency in assessment data collection and reporting was a significant challenge.
- The varied approaches to assessing individual outcomes across different sections (e.g., inconsistent mapping of outcomes to final exam questions, assessment of non-final-exam outcomes on midterms/labs) made it difficult to aggregate and uniformly interpret data on individual outcome achievement. This variation made it hard to get a clear, comprehensive picture of student learning across all sections.
- Faculty reported being stretched too thin, which impacted the quality of assessment data collection.

Current/Future Actions:

- Course Coordinators (Paula Lauren for MCS1142, Ghassan Azar for MCS2514) are tasked with ensuring all assessment data is collected in a uniform, easily analyzable format.
- A recommendation was made to establish consistent outcomes across all sections of a course, along with consistent mapping of these outcomes to questions on final exams.
- The University is encouraged to consider hiring more full-time Computer Science faculty to alleviate the burden on existing faculty and improve assessment quality. These actions are aimed at providing a clearer picture of student learning to enable more feasible curriculum modifications and improvements.

3. Assessment Plan for 2022-2025 Academic Years

Continue with the program level assessment plan shown in Table 1.

BS in Mathematics

1. Assessment Plan and Summary

The assessment plan for the BS in Mathematics program is designed to address the university learning outcomes pertinent to an undergraduate degree in Mathematics. When students complete the program at Lawrence Tech, they should be knowledgeable about fundamental concepts and applications in Mathematics. The program level learning outcomes for the program is shown in Table 1. Each learning outcome is assessed each semester respective courses are offered, and loop-closing of collected assessment data occurs annually.

Table 1: Assessment Plan for BS in Mathematics

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Tools	Metrics/ Indicators
TECHNOLOGY Students will use mathematical software such as Matlab to analyze problems (Bloom's 4)	Design, implement, and evaluate a computer-based system, process, component, or program to meet its specified requirements. (3)	Direct assessment of MCS4833 Sr. Project	Students will achieve level 3 (of 4) on the Technology portion of a Sr. Project rubric
ETHICS a. Students will correctly incorporate and cite material from secondary sources in their writing. (Bloom's 3) b. Students will understand what constitutes original research contributions to the discipline. (Bloom's 4)	Secure employment and/or attend graduate school in their field, drawing on their experiences, both within and outside the major to become responsible citizens and effective professionals. (9)	Direct assessment of MCS4833 Sr. Project	Students will pass an ethics quiz based on an on-line tutorial
LEADERSHIP a. Students will understand theories of leadership germaine to the discipline. (Bloom's 2) b. Students will understand the civic responsibilites of researchers. (Bloom's 2)	Analyze the local and global impact of computing on individuals, organizations, and society. (6) Recognize the need for and engage in life-long learning, continuing professional development and adapt to changes in the field. (7)	Assessed in MCS4833 Sr. Project by interview with project instructor	Students will achieve a level 3 (of 4) on the Leadership portion of a Sr. Project rubric
TEAMWORK a. Students will demonstrate team-building and collaboration skills (Bloom's 3) b. Students will evaluate team members' contributions. (Bloom's 4)	Function effectively in teams to accomplish a common goal, including performing leadership tasks. (4)	Direct assessment of MCS1414 in the Calc Lab	Students will achieve a level 3 (of 4) on the Teamwork portion of a Lab Survey rubric

VISUAL COMMUNICATION Students will use figures or other graphical elements in their projects and other technical reports. (Bloom's 3)	Communicate mathematical ideas and models effectively to a range of audiences orally, in writing, and graphically. (5)	Direct assessment of MCS1414 in the Calc Lab	Students will achieve a level 3 (of 4) on the Graphical communication portion of a Lab Survey rubric
KNOWLEDGE IN DISCIPLINE LTU graduates will demonstrate a mastery of the knowledge base in their discipline and an expertise in solving practical and theoretical problems.	Apply knowledge of mathematics appropriate to a problem. (1) Analyze a problem, and identify and define the mathematical techniques appropriate to its solution. (2) Use current and established techniques, skills, and tools necessary for applying mathematics. (8)	Direct assessment of standard questions on final exams in MCS1142 and MCS1514 (Fall 2018) and MCS2534 (Spring 2019)	Average score greater than 70% on final exam problems mapped to course objectives

Table 2: Curriculum Map for the BS in Mathematics Program

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize**		ETHICS	KNOWLEDGE	LEADERSHIP	TEAMWORK	TECHNOLOGY	VISUAL COMMUNICATION	
Calculus 1	MCS1414		**I**		**I**		**I**	
Calculus 2	MCS1424		**I**		**I**		**I**	
Calculus 3	MCS2414		**I**	**I**	**R**	**I**		
Differential Equations	MCS2423	**I**	**R**	**I**	**R**			
Discrete Math	MCS2523		**I**				**R**	
Statistics	MCS2124	**I**	**I**			**I**		
Linear Algebra	MCS3863		**R**	**R**	**E**	**R**		
Prob and Stat	MCS3403	**R**	**R**			**R**		
Applied Stats	MCS3123		**R**				**R**	
Advanced Calc	MCS3723		**E**				**E**	
Math Modeling	MCS3523	**R**	**R**	**R**	**E**			
Numerical Analysis	MCS4813		**E**			**E**	**E**	
Senior Project 1	MCS4833	**E**	**E**	**E**		**E**		
Senior Project 2	MCS4843	**E**	**E**	**E**		**E**		

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

From 2019 to 2022, the Mathematics program assessed the extent to which students demonstrated mastery of disciplinary knowledge and expertise in solving both practical and theoretical problems. This learning outcome was measured through direct assessment of final exam questions mapped to course learning objectives in key mathematics courses: MCS1414 (Calculus I), MCS1424 (Calculus II), and MCS2414/MCS2423 (Calculus III and Differential Equations). The assessment benchmark was set at 70% of students scoring 70% or better on mapped final exam items.

Over this three-year period, data were collected from 163 students in MCS1414, 137 in MCS1424, and 80 in MCS2414. The findings indicated that overall performance varied across courses and sections, with only 2 of 9 sections meeting the target in MCS1414, 3 of 6 in MCS2414, and 1 of 3 in MCS2423. Instructors noted that the COVID-19 pandemic had a significant impact on both instruction and assessment, particularly during the 2019–2021 academic years. Many courses were delivered online, and in some cases, final exams were administered in unproctored environments, raising concerns about the reliability of performance data.

The courses that met the benchmark in MCS1414 appeared to perform better due to the flexibility of online exams; however, this may not reflect genuine mastery. In contrast, the majority of sections fell below the threshold, often failing to meet several course objectives. In particular, concepts such as derivatives and integrals of transcendental functions consistently showed lower performance. Similarly, in MCS1424, only one section met all learning objectives, while others showed underperformance in at least four out of nine objectives. In MCS2423, the one section that met the benchmark missed only one objective, which the instructor attributed to student time management rather than lack of understanding. In the two sections that did not meet the benchmark, nearly all course objectives were unmet.

Across these courses, topics covered at the end of the semester were the most frequently missed, suggesting that pacing and curriculum scope may require adjustment. Instructors indicated that content density—particularly in Calculus III—left insufficient time to address complex topics such as vector calculus and dimension theory in depth. Suggestions were made to redistribute content across the calculus sequence and remove nonessential topics in earlier courses to allow for greater depth in advanced material.

Additional assessments during this period provided context for supporting courses. In MCS0044 (Fall 2020), the final exam average was 82%, though students struggled with rational equations. MCS1203, also assessed in Fall 2020, achieved a final exam average of 78%, with identified weaknesses in syllogisms and truth tables. Adjustments were recommended, including repositioning difficult content earlier in the semester. In MCS3343 (Spring 2021), the class met the target overall, but students showed difficulty with hyperbolic geometry and dimension theory. The instructor planned to address this by introducing the topics earlier and allocating more instructional time.

Faculty also documented best practices for online course delivery, which became essential during the pandemic. Successful strategies included mandatory Zoom orientations, structured weekly discussion boards, midweek review sessions, and use of the Canvas platform to submit both handwritten and typeset math work. These approaches supported engagement and performance, especially in asynchronous online formats.

Several systemic issues emerged during the review period. Final exams were not standardized across sections, and instructors varied in how they mapped objectives to assessments. This lack of consistency limited the comparability of data. Moreover, not all instructors submitted lab data or used uniform formats, further complicating analysis. Moving forward, faculty emphasized the need for a shared assessment structure, common rubrics, and more consistent interpretation of learning objectives. Standardizing final exams or the objective-to-question mapping process would strengthen the reliability of assessment data.

Lastly, faculty expressed a need for institutional support to return to in-person testing, particularly for hybrid courses. They cited uncertainty about the validity of online assessments and a preference for face-to-face exams with appropriate safety measures. Physical space constraints during the pandemic made this difficult, but faculty remain hopeful that future university support will enable improved assessment conditions.

3. Assessment Plan for 2022-2025 Academic Years

Continue with the program level assessment plan shown in Table 1.

BS in Media Communication

1. Assessment Plan and Summary

See Table 1 below.

Table 1: Assessment Plan for BS in Media Communication

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Tools	Metrics/ Indicators
TECHNOLOGY	Graduates will have an industry-standard skill set in production, post-production and new media.	Student work from: MCO 2003: Intro to Video Production; MCO 3303: Video Editing; MCO 3203: Camera for Broadcast; MCO 3623: Adobe for Media	70% score 4 or higher on 5 point course specific Technology rubric
ETHICS	Graduates will understand the impact of their professional decisions on the public and broader global societies.	MCO 1003: Media, Communication & Society: Combination of Assignment scores from Media Economics in the Global Marketplace exam and Legal Controls and Freedom of Expression exam	70% Score 4 or higher on 5 point rubric
LEADERSHIP	Graduates will develop leadership and teamwork skills through collaboration and engage in ethical dimensions of technology and innovation.	Assignments in COM 1001: Pathways to Research Careers	Success metric determined by rubric specific to Pathways curriculum
TEAMWORK	Graduates will understand the importance of teamwork, diversity, and collaboration to achieve a common goal for the betterment of society.	COM 4001:Pathways Capstone Lab	Success metric determined by rubric specific to Pathways curriculum
COMMUNICATION	Graduates will possess industry-standard professional skills in writing, presentations, and interpersonal communication using Oral, Written, and Visual communication modalities.	Direct assessment of student assignments in MCO 3713: Advanced Writing for Media MCO 3623: Adobe for media	70% Score 4 or higher on Writing, Presentation and Graphical rubrics specific to each class being assessed
KNOWLEDGE IN DISCIPLINE	1a: Graduates will have an in-depth understanding of the scope and purpose of the media industry. 1b: Graduates will understand the standards of professional practices within the media industry.	For both 1a and 1b - Direct assessment of student assignments in MCO 3633: Social Media- Client Strategy Assignment; MCO 1003: Media, Communication and Society- Critical Approach Exam for 1a and Global Marketplace Exam for 1b, MCO 2563: Intro to Broadcast- Director/Tech Director Final, MCO 2543: Writing for Electronic & Print Web News Assignment	70% score 4 or higher on 5 Point Professional Practices rubric

2. Report on 2019-2021 Academic Years and Action Plan (Loop-Closing)

Learning Objective 1a: Graduates will have an in-depth understanding of the scope and purpose of the media industry.
Student work was assessed in MCO 3633 (Social Media – Client Strategy Assignment), MCO 1003 (Media, Communication and Society – Critical Approach Exam), MCO 2563 (Intro to Broadcast – Director/Technical Director Final), and MCO 2543 (Writing for Electronic & Print Media – Web News Assignment). No loop closing was conducted during the 2021–2022 cycle. Moving forward, the Critical Approach exam in MCO 1003 will be used as the preferred assessment tool, and MCO 2543 will be replaced with MCO 3713 (Advanced Writing for Media) to better reflect advanced writing competencies. Additionally, the metric indicator will be revised so that 70% of students must score 80% or higher on a course-specific rubric. Data collection is ongoing with the goal of completing loop closing in Summer 2023. This objective is managed by Program Director Jody Gaber. No university or college-level support is required for this objective.

Learning Objective 1b: Graduates will understand the standards of professional practices within the media industry.
Assessment was based on student work in MCO 3633 (Client Strategy), MCO 1003 (Global Marketplace Exam), MCO 2563 (Practical Exam), and MCO 2543 (Web News Assignment). As with Objective 1a, no loop closing occurred during 2021–2022. The metric will be revised to require 70% of students to score 80% or higher on a course-specific rubric. Data collection will continue with the next loop closing anticipated in Summer 2023. This objective is also overseen by Program Director Jody Gaber. No additional support from the college or university is needed.

Learning Objective 2: Graduates will have an industry-standard skill set in production, post-production, and new media.
Assessment occurred in MCO 2003 (Intro to Video Production), MCO 3303 (Video Editing), MCO 3203 (Camera for Broadcast), and MCO 3623 (Adobe for Media). The loop was successfully closed in Summer 2022. Rubrics were developed for each course, with results indicating strong performance: 83% of students in MCO 2003, 100% in MCO 3303, 100% in MCO 3203, and 92% in MCO 3623 scored 4 or higher on a 5-point rubric. The program will consider refining the metric to require 70% of students to score 80% or higher on technology-focused rubrics, and will continue to refine rubric design to accommodate technical complexity in future assessments. Additional data will be collected for the next loop closing in Summer 2025. This objective is led by Program Director Jody Gaber.

Learning Objective 3: Graduates will possess industry-standard professional skills in writing, presentations, and interpersonal communication.
Assessment was based on student performance in COM 2113 (Speech), MCO 3713 (Advanced Writing for Media), and MCO 3623 (Adobe for Media). No loop closing occurred in 2021–2022. Issues identified include updating the language of the objective from “Graphical” to “Visual,” and reevaluating the speech assignment to ensure it aligns with current curriculum expectations. The metric will be revised to require 70% of students to score 80% or higher on course-specific writing, presentation, and visual communication rubrics. Loop closing is planned for Summer 2024, and assessment responsibilities remain with Program Director Jody Gaber.

Learning Objective 4: Graduates will develop leadership and teamwork skills through collaboration and engage in ethical dimensions of technology and innovation.
This objective is assessed through student work in COM 1001 (Pathways to Research Careers – Final Poster Presentation Project). Loop closing is scheduled for Summer 2022. The metric will be revised so

that 70% of students must score 80% or higher on a course-specific rubric. The program must also clarify whether data should be collected by the COM 1001 Pathways Director or the Media Communication program. Confirmation of assessment responsibilities and data collection is underway, with the next loop closing cycle expected in Summer 2025.

Learning Objective 5: Graduates will understand the importance of teamwork, diversity, and collaboration to achieve a common goal for the betterment of society.
Assessment for this objective is conducted in COM 4001 (Pathways Capstone Lab – Final Business Model Canvas Proposal). The loop was closed in Summer 2022. Data collected from two Fall 2021 sections showed that 92% and 100% of students, respectively, scored 4 or higher on a 5-point rubric. In Spring 2022, two additional sections had 100% of students score at this level. The program will revise the metric so that 70% of students must score 80% or higher on the course-specific rubric. Future data collection will support the next loop closing in Summer 2025. Oversight remains with Program Director Jody Gaber.

Learning Objective 6: Graduates will understand the impact of their professional decisions on the public and broader global societies.
Assessment was conducted in MCO 1003 (Media Communication & Society), using composite scores from the Media Economics and Legal Controls exams. Loop closing did not occur in 2021–2022. The program may shift to using the Media, Culture & Communication: A Critical Approach exam for a more relevant assessment of this objective. The metric will be revised to require that 70% of students score 80% or higher on the appropriate rubric. Additional data will be collected for loop closing in Summer 2024. This objective is managed by Program Director Jody Gaber.

3. Assessment Plan for 2022-2025 Academic Years

The program will continue to strengthen its assessment infrastructure by refining tools, engaging faculty, and aligning evaluation practices with stated learning objectives. A major priority over the next assessment cycle is the examination and revision of course-specific rubrics. This includes implementing updates identified in the action items and issues across Learning Objectives 1 through 6. Program faculty will meet regularly before each term to review and revise rubrics collaboratively, ensuring alignment with learning outcomes and consistency across course sections.

A dedicated assessment plan will be developed for COM 1001 (Pathways to Research Careers), specifically supporting Learning Objective 4 related to leadership, teamwork, and ethical engagement. In parallel, a new rubric tailored to COM 4001 (Pathways Capstone Lab) will be created to more effectively evaluate Learning Objective 5, which focuses on collaboration, diversity, and social impact. These refinements will ensure meaningful, course-embedded assessment data and clear evidence of student achievement.

The program will also improve systems for managing and reviewing student artifacts by refining its plan for archiving assignments. This archive will support both internal review and external validation processes. In addition, a portfolio review panel will be assembled, consisting of industry advisors and adjunct faculty. The panel will provide formative feedback to students and help ensure that capstone-level work meets industry expectations and aligns with program learning goals.

Assessment data collection will continue across all learning objectives according to the following schedule: Learning Objectives 1a and 1b will be evaluated for loop closing in Summer 2023; Learning

Objectives 3 and 6 in Summer 2024; and Learning Objectives 2, 4, and 5 in Summer 2025. The overall program assessment table will also be updated as needed to reflect adjustments in assessment tools, rubrics, and scheduling. These efforts are part of a continuous improvement process aimed at ensuring the program remains aligned with professional standards and student needs.

BS in Molecular and Cell Biology

1. Assessment Plan and Summary

The assessment plan is shown in Table 1. Each learning outcome is assessed each time respective courses are offered, and loop-closing occurs annually for each course assessed.

The assessment practice of the Natural Sciences department follows a three-year cycle, which is comprised of the three steps, data collection, evaluation and loop closing.

Table 1: Assessment Plan for BS in Molecular and Cell Biology

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Tools	Metrics/ Indicators
TECHNOLOGY	LTU MCB graduates will apply advanced technologies such as software or instrumentation to practical and/or theoretical problems in molecular cell biology. LTU MCB graduates will have the ability to use modeling and simulation with complex biological systems.	Direct assessment of coursework with rubric in BIO 3201 (A&P lab) (Formative), and BIO 4812 (Cell Bio lab) (Summative) Direct assessment of coursework with rubric in BIO 4103 (Evolution).	80% "satisfactory" or "superior" performance based on rubrics 80% "satisfactory" or "superior" performance based on rubrics
ETHICS & LEADERSHIP	LTU MCB graduates will be able to evaluate the impact of scientific practices and findings on society.	Ethics case study assignment in PSC 3001, in which students will analyze an ethics-related situation and characterize and reflect upon the scientific misconduct involved.	80% "satisfactory" or "superior" performance
TEAMWORK	LTU MCB graduates will have the ability to communicate and collaborate with other disciplines.	Team self-evaluation in BIO 3201 (A&P lab). Likert scale of satisfaction will be used.	80% of responses with "always satisfied" or "frequently satisfied" to survey which will include peer evaluation.
VISUAL COMMUNICATION	LTU MCB graduates will have the ability to communicate data in a graphical form.	Evaluation of student presentations using oral rubric (Bio 491X & 492X).	80% "satisfactory" or "superior" performance based on rubrics
WRITTEN AND ORAL COMMUNICATION	LTU MCB graduates will have the ability to communicate in written form and orally with biologists, other scientists and also with the non-scientific community. (Note: Written and Oral Communication is also assessed at the university level through the core curriculum)	Written proposals in PSC 3001 (Intro to Projects) and Laboratory reports/Posters in Bio 3201 (A&P lab), Bio 2321 (Micro Lab) and/or Bio 4812 (Cell Bio Lab) will be evaluated using a rubric.Evaluation of student presentations using oral rubric (Bio 491X & 492X).	80% "satisfactory" or "superior" performance.
SCIENTIFIC ANALYSIS	Students will apply elements of the scientific method via observation and experimentation. Students will analyze natural sciences concepts and/or problems.	Direct assessment of coursework with rubric in PHY 2221 (College Physics 1 lab) and/or PHY 2231 (College Physics 2 lab) and/or BIO 2321 (Micro lab) (formative) Direct assessment of coursework with rubric in BIO 491x (senior project 1) and/or BIO 492x (senior project 2) (summative)	80% "satisfactory" or "superior" performance

KNOWLEDGE IN DISCIPLINE	LTU MCB graduates will defend the modern synthesis of evolution and genetics and apply this foundational biological paradigm to biological phenomena.	Direct assessment of coursework with rubric in BIO 4103 (Evolution)	80% "satisfactory" or "superior" performance.
	Explain the intrinsic relationship between the structure and function in biological systems and be able to predict structure given functional data or vice versa.	Direct assessment of coursework with rubric in BIO 3203 (A&P A) and/or BIO 3303 (A&P B)	
	Defend biological central dogma and summarize the process of the control of gene expression.	Direct assessment of coursework with rubric in BIO 3323 (Genetics) and/or BIO 4813 (Cell Bio)	
	Compare and contrast the various ways that biological organisms harvest energy and convert it to matter.	Direct assessment of coursework with rubrics in BIO 2313 (Micro) and/or BIO 2321 (Micro lab)	
	Explain how living systems are interconnected and apply this knowledge to predict perturbations to these systems.	Direct assessment of coursework with rubric in BIO 1223 (Bio 2) and/or BIO 4103 (Evol)	

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

The MCB program evaluated a range of learning outcomes using direct assessment of coursework across key undergraduate courses. The program utilized consistent performance criteria—80% or above on rubric-aligned assessments—to determine whether students achieved satisfactory or superior levels of performance. All learning outcomes were met with high success rates, and no significant issues were identified during this cycle.

Disciplinary Knowledge was assessed in BIO 1223 (Biology II), where all 12 students scored 80% or higher. Similarly, in BIO 4813 (Cell Biology) and BIO 3203/3303 (Anatomy and Physiology A and B), students demonstrated strong understanding of systems-level biological interconnectivity, gene expression, and structure-function relationships. In the latter, improvements were linked to the inclusion of straightforward exam questions and histology lab components that emphasized visual structure-function analysis. These assessments were led by Dr. Fauzia Siddiq and Dr. Aleksandra Kuzmanov, with additional contributions from Dr. Jeff Morrissette.

Written and Oral Communication was assessed across multiple courses, including BIO 2321 (Microbiology), BIO 3201 (A&P Lab), and BIO 4812 (Cell Biology Lab), as well as senior project presentations in BIO 4911/4912. Students in all cases scored at or above the 80% threshold. Written reports, posters, and oral presentations were evaluated using tailored rubrics. Performance was uniformly high, and future plans include continued use of the existing rubrics and assignment formats. Communication-focused assessments were also embedded in BIO 491X/492X and in ethics case study assignments in PSC 3002. Dr. Siddiq, Dr. Kuzmanov, and Dr. Morrissette oversaw these outcomes.

Scientific Analysis was evaluated in BIO 2321 and BIO 4911/4912 through experimentation-based lab work and project presentations. Students consistently performed above the satisfactory threshold, and no issues were noted. Faculty will continue direct assessment of lab-based analysis to support this learning outcome.

Technology learning outcomes were assessed in BIO 4812 and BIO 3201, with all students demonstrating competent use of software and laboratory instrumentation in biological analysis. Assessments confirmed that students were able to apply technological tools effectively to real-world biological questions. Continued direct assessment is planned, and Dr. Kuzmanov and Dr. Morrissette remain responsible for these evaluations.

Ethics was assessed through case studies in PSC 3002, with all eight students achieving high performance. Students successfully evaluated scientific misconduct and reflected on ethical implications, indicating strong comprehension of ethical dimensions in science. Future assessments will retain this format.

Graphical Communication, **Written and Oral Communication**, and **Scientific Analysis** were all embedded in the capstone courses BIO 4911 and BIO 4912. Student presentations were evaluated with oral communication rubrics, and results showed superior performance by all participants.

Teamwork was the one area where formal assessment had not yet been conducted. A self-evaluation rubric is planned for BIO 3201 in the next cycle. Additionally, the program is considering incorporating peer-evaluated components into the final grade of the course's Course-based Research Experience (CRE) project to further assess collaborative competencies. Dr. Morrissette is responsible for implementing this future assessment strategy.

Throughout the assessment cycle, the program benefited from university and college-level support in implementing rubrics, maintaining alignment with institutional learning goals, and fostering interdisciplinary collaboration across courses. All assessments met or exceeded targets, and current strategies will be retained with minor refinements for future evaluation cycles.

3. Assessment Plan for 2022-2025 Academic Year

Continue with the program level assessment plan shown in Table 1.

LTU MCB graduates will defend the modern synthesis of evolution and genetics and apply this foundational biological paradigm to biological phenomena. This will be evaluated in the newly developed *Ecology* course.

Graduates will explain the intrinsic relationship between structure and function in biological systems and be able to predict structure given functional data or vice versa. This will be evaluated in the newly developed *Developmental Biology* course.

Graduates will defend the biological central dogma and summarize the process of gene expression control. This will be evaluated in *Genetics*.

Graduates will compare and contrast the various ways that biological organisms harvest energy and convert it to matter. This will be evaluated in the newly developed *Plant Biology* course.

Graduates will explain how living systems are interconnected and apply this knowledge to predict perturbations to these systems. This will also be evaluated in *Ecology*.

BS in Nursing

1. Assessment Plan and Summary

The assessment plan for the BSN is shown in Table 1. Each learning outcome is assessed each time respective courses are offered, and loop-closing occurs annually for each course assessed.

Table 1: Assessment Plan for BS in Nursing

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Tools	Metrics/ Indicators
TECHNOLOGY	Utilize information management and technology to ensure safe, effective, and high quality care.	Technology rubric in program core courses.	80% "satisfactory" or "superior" performance based on rubrics
ETHICS & LEADERSHIP	Value professional nursing practice reflective of the scope and standards of nursing practice and the code of ethics. Employ interprofessional collaboration and leadership strategies to improve outcomes for individuals, communities, and systems.	Term paper in NUR 2203 Health Care Policy, Ethics, and Advocacy	80 % of the students will receive a grade of 80% or above
TEAMWORK	Ability to communicate and collaborate with others in teams.	Team self-evaluation and peer-evaluation in program core courses when teamwork occurs.	80% of responses with "always satisfied" or "frequently satisfied" to survey which will include peer evaluation.
VISUAL COMMUNICATION	Ability to communicate data in a graphical form.	Evaluation of student presentations using oral rubric (Bio 491X & 492X).	80% "satisfactory" or "superior" performance based on rubrics
KNOWLEDGE IN DISCIPLINE	(a) *Integrate* knowledge from the humanities and sciences within the context of nursing science. (b) *Implement* the principles of relationship-based care into patient centered, individualized care imparted within a caring and healing environment. (c) *Demonstrate* health promotion and disease prevention strategies across diverse settings, lifespan, and vulnerable populations to address health disparities and population health. (d) *Examine* the impact of policy, finance, and regulatory environments on healthcare.	~~(a)~~ NUR 2313 Pathophysiology/Pharmacology I (b) NUR 2102 Holistic Nursing: Complementary Therapies (c) NUR 1202 Health Promotion and Clinical Prevention (d) NUR 2203 Health Care Policy, Ethics, and Advocacy	(a) Final Exam: 80 % of the students will receive a grade of 80% or above (b) Group Project 80 % of the students will receive a grade of 80% or above (c) Family Assessment Paper 80 % of the students will receive a grade of 80% or above (d) Formal Paper 80 % of the students will receive a grade of 80% or above

Table 2: Curriculum Map for BS in Nursing

Program Objective **Key =** **Introduced = I** **Reinforced =R** **Mastery = M**	Integrate knowledge from the humanities and sciences within the context of nursing science.	Implement the principles of relationship-based care (RBC) into patient centered, individualized care imparted within a caring and healing environment.	Demonstrate health promotion and disease prevention strategies across diverse settings, lifespan, and vulnerable populations to address health disparities & pop health	Formulate plans of care designed within the frameworks of clinical reasoning, quality improvement and evidence-based practice.	Utilize information management and technology to ensure safe, effective, and high quality care.	Employ interprofessional collaboration and leadership strategies to improve outcomes for individuals, communities, and systems.	Value professional nursing practice reflective of the scope and standards of nursing practice and the code of ethics.	Examine the impact of policy, finance, and regulatory environments on healthcare
Introduction to Nursing and Social Justice	X I	X I RBC 7 principles	X I AACN Cultural Competency 1 and 4	XI Quality	XI The us of technology	X I Leadership Teamwork (RBC) ANA Standard 10 (collaboration) Teamwork and Collaboration (QSEN) Interprofessional Collaboration Domains	X I ANA Standard 8 Culturally Congruent Practice	X I Resource Driven Practice (RBC)
Holistic Nursing: Comp. Therapies		X I RBC Caring and Healing Environment; PNP			X I AACN Cultural Competency 3			
Health Care Policy, Ethics, and Advocacy		X I RBC PNP Resource Driven Practice	XI Population Health AACN 1, 4		XI QSEN safety		X I ANA Standard 7 – 8,15	X I QSEN - QI AACN Cultural Competence -4 IPEC-1
Health Promotion and Clinical Prevention	XI Micro and Genetics		X I HP Theory and Interventions		X I AACN Cultural Competency 2		X I ANA Standard 8, 12, 16	

							-Culturally Congruent -Education -Environmental Health	
Assessment Across the Lifespan	X I A/P, Patho, PSY	X I Professional nursing practice (RBC)	X I AACN Cultural Competence 1		X I Intro to EMR		X I Standard I Assessment	
Patho/Pharm I and II	X I A/P and Genetics		X I AACN Cultural Competency 1	X I EBP/Research EBP (QSEN)	X I Specific to pharmacology and nursing AACN Cultural 3		X I Standard 13 EBP/Research EBP (QSEN)	
Foundations of Professional Nursing Practice/CC	X I Chemistry, micro, biology, A/P, Patho, nutrition, Social Psychology	X I RBC 7 principles QSEN			X I Safety (QSEN) AACN Cultural Competency 3	XI QSEN	X I Standard I-6 Nursing Process	
Foundations of Interprofessional Communication and Collaboration	X I Humanities	X I Leadership Teamwork				X I -Leadership/Teamwork -Teamwork and Collaboration (QSEN) Interprofessional Collaboration – IPEC Domain 3 -AACN Cultural Competence 1	X I Standard 7, 8, 9, 10, 11	
Scholarship as Applied to Evidence Based Practice	XI Statistics			X I Theory and principles AACN Cultural Competency 2			X I Standard 13 EBP/Research EBP (QSEN)	
Informatics for Professional Nurses					X I Theory and Principles	X I Telehealth	X I ANA Standard 14, 15	

					Informatics - QSEN		Informatics QSEN	
Nursing Care of the Adult with Acute and Chronic Illness (med-surg)	X R Chemistry, micro, biology, A/P, Patho, nutrition, Social Psychology	X R RBC 7 principles QSEN	X R ANA 1-15	X R QSEN Safety EBP QI	X R	X R QSEN Teamwork	X R ANA Standards I-15	
Mental Health and Illness	X R PSY 2623 Genetics	X R RBC 7 principles QSEN	X R ANA 1-15	X R QSEN Safety EBP QI	X R	X R QSEN Teamwork	X R ANA Standard I-15	
Nursing Care of the Elder Adult with Acute and Chronic Illness (med-surg II)	X R PSY Genetics	X R	X R	X R	X R	X R	X R	X R
Geriatric Theory	X R PSY/Soc Genetics		X I AACN Gero Competency	X I AACN Gero Competency		X I AACN Gero Competency		X I AACN Gero Competency
Nursing Care of the Childbearing Family	X R Genetics	X R	X R	X R	X R	X R	X R	X R
Nursing Care of Children and their Families	X R PSY Genetics	X R	X R	X R	X R	X R	X R	X R
Population Health and Epidemiology	X R Genetics	X R	X R	X R	X R AACN Cultural Competency 3	X R	X R AACN Cultural Competency 5	X R
Nursing Leadership for Quality		X R		X R	X R	X R	X R	X R

Healthcare within Organizations and Systems					AACN Cultural Competency 3	Interprofessional Collaboration Domain 4	AACN Cultural Competence 4	
Nursing Care of Patients with Complex Needs (Theory only)	X R Chemistry, micro, biology, A/P, Patho, nutrition	XR		XR				
Immersion		X M	X M	X M	X M	X M	X M	X M
Capstone Project				X M				

Notes:

Relationship Based Care Principles – Conceptual Framework

Caring and healing environment: The physical environment and the interactions with those delivering care are the immediate context for the patient's experience. The combination of therapeutic relationships and an environment that meets physical needs and comfort, promotes healing.

Leadership: Each individual nurse has a leadership role in providing care. Compassionate nursing leadership supports the emergence of caring and compassionate leaders from all levels of the organization.

Teamwork: Every individual nurse is accountable for his or her own actions, supports the success of those around them and contributes to the mission of the organization. Commitment to excellent communication and strong collegial relationships creates an environment for great care.

Professional nursing practice:

Nurses embrace the responsibilities of professional practice: holding to a set of technical and ethical standards, ongoing self-improvement and development, and accountability for autonomy. The six practice roles that describe the nurse in the context of Relationship Based Care are: sentry, guide, healer, collaborator, teacher, and leader.

Patient care delivery: Continuity of care is of great value to the patient and supports the relationship between the patient and the nurse. The four elements that define any care delivery system:

1. Nurse/patient relationship and decision-making
2. Work allocation and/or patient assignments
3. Communication between members of the health care team
4. Management of the unit environment

Resource-driven practice: A focus on what resources are available and prioritization of what matters most to the patient and family, instead of what resources are lacking, refocuses the care to benefit the patient and the team. Staffing fluctuations are inevitable in our environment. An empowered approach to prioritized care promotes critical thinking, decision-making and individualization of care.
Outcomes measurement: Meaningful data is used to measure the impact of both relationships and care. Patient satisfaction and clinical outcomes data are used to inspire and motivate so that members of the team understand their relationship to the outcomes they influence.
ANA Scope and Standards of Practice
1. Assessment 2. Diagnosis 3. Outcome Identification 4. Planning 5. Implementation 6. Evaluation 7. Ethics
8. Culturally Congruent Practice 9. Communication 10. Collaboration 11. Leadership 12. Education 13. Evidenced Based Practice
14. Quality of Practice 15. Resource Utilization 16. Environmental Health

Quality and Safety Education for Nurses (QSEN)

Safety - Key Message: Safe, effective delivery of patient care requires understanding of the complexity of care delivery, the limits of human factors, safety design principles, characteristics of high reliability organizations and patient safety resources.

Teamwork and Collaboration - Key Message: Safe, effective, satisfying patient care requires teamwork: collaboration with and communication among members of the team, including the patient and family as active partners.
Patient Centered Care - Key Message: The patient and family are in a partnered relationship with their health care provider and are equipped with relevant information, resources, access, and support to fully engage in and/or direct the health care experience as they choose.
Evidenced Based Practice - Key Message: Safe, effective delivery of patient care requires the use of nursing practices consistent with the best available knowledge. This includes use of clinical expertise and patient preferences and values, in addition to current best research evidence.
Health Informatics - Key Message: Technology is changing how patients manage their own health care needs and how nurses manage patient care. Nurses need new skills to use and contribute to the development of electronic health records, to find and evaluate the relevance of evidence to support clinical decisions, and to use data to solve patient and system problems.
Quality Improvement - Key Message: Improving patient care requires a systematic process of defining problems in order to identify potential causes and develop strategies to improve care. This process requires the ability to measure care. We can only improve care if we can measure how well we are doing and compare our performance against others'.
Core Competencies for Interprofessional Collaborative Practice (Sponsored by Interprofessional Education Collaborative - IPEC)
Domains

1. Values and Ethics for Interprofessional Practice
2. Roles and Responsibilities
3. Interprofessional Communication
4. Teams and Teamwork

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

***Learning Outcome*: Ethics**
Assessment: NUR 3303: Nursing Care of the Childbearing Family, discussion board, Intimate Partner Violence: Violence towards Women.
Evaluation: Mean = 99 %, with range 100 to 92%. The rubric and instructions are posted in the syllabus and on the Canvas site as a guide for the students to achieve competency with clear evaluation by faculty.
Issue: none, Benchmark met, 80 % of the students received a grade of 80% or above.
Current/Future Actions: Continue this discussion board for risk to specialty populations. The students were actively engaged in the module readings, discussion board, and met the objectives.
Responsibility: Nursing faculty.
University/College Support for Learning Outcome: Continued support from college and university assessment committee representatives.

***Learning Outcome*: Leadership**
Assessment: NUR 2203: Health Care Policy and Ethics, Group Research Presentation.
Evaluation: Mean 99%. The rubric and instructions are posted in the syllabus and on the Canvas site as a guide for the students to achieve competency with clear evaluation by faculty.
Issue: none, Benchmark met, 80 % of the students received a grade of 80% or above.
Current/Future Actions: Continue the Group Research Presentation on Health Care Policy in an effort for students to gain perspective on diverse policies affecting health care.
Responsibility: Nursing faculty.
University/College Support for Learning Outcome: Continued support from college and university assessment committee representatives.

***Learning Outcome*: Teamwork**
Assessment: NUR 2102: Holistic Nursing, Group Formal Research Presentation.
Evaluation: Mean 92%. The rubric and instructions are posted in the syllabus and on the Canvas site as a guide for the students to achieve competency with clear evaluation by faculty.
Issue: none, Benchmark met, 80 % of the students received a grade of 80% or above.
Current/Future Actions: Continue the group project to demonstrate holistic nursing modalities.
Responsibility: Nursing Faculty
University/College Support for Learning Outcome: Continued support from college and university assessment committee representatives.

***Learning Outcome*: Technology**
Assessment: NUR 4102: Special Population: Geriatrics, Digital Presentation.
Evaluation: Mean 95%, with a range of 100% to 83%. The rubric and instructions are posted in the syllabus and on the Canvas site as a guide for the students to achieve competency with clear evaluation by faculty.
Issue: none, Benchmark met, 80 % of the students received a grade of 80% or above.
Current/Future Actions: Continue the digital presentation to describe geriatric clinical alterations.
Responsibility: Nursing Faculty
University/College Support for Learning Outcome: Continued support from college and university assessment committee representatives.

***Learning Outcome*: Written Communication**

Assessment: NUR 4206: Immersion, Final Clinical Experience Reflection.
Evaluation: Mean: 97% with a range of 100 to 88%. The rubric and instructions are posted in the syllabus and on the Canvas site as a guide for the students to achieve competency with clear evaluation by faculty.
Issue: none, Benchmark met, 80 % of the students received a grade of 80% or above.
Current/Future Action: Continue this assessment for end of program reflection on curricular threads.
Responsibility: Nursing Faculty
University/College Support for Learning Outcome: Continued support from college and university assessment committee representatives.

***Learning Outcome*: Knowledge in the Discipline**
Assessment: NUR 3313: Nursing Care of Children and their Families, Theory of Play Project.
Evaluation: Mean 91%, range 100 to 72%. The rubric and instructions are posted in the syllabus and on the Canvas site as a guide for the students to achieve competency with clear evaluation by faculty.
Issue: none, Benchmark met, 80 % of the students received a grade of 80% or above.
Current/Future Actions: Continue this assessment as a means of evaluating play as a mechanism of growth and development and adaptation to illness.
Responsibility: Nursing Faculty
University/College Support for Learning Outcome: Continued support from college and university assessment committee representatives.

3. Assessment Plan for 2022-2025 Academic Years

The BSN program will follow the assessment plan as shown in Table 1.

NUR 2313: Pathophysiology & Pharmacology I. *Knowledge in Discipline,* via Final Comprehensive Exam.
NUR 3113: Scholarship. EBP. *Ethics,* via module for Ethical Research with Human Subjects
NUR 3123: Pathophysiology & Pharmacology II. *Teamwork and Leadership,* via Group Presentations.
NUR 4202: Nursing Capstone. *Digital Communication* via Final Capstone Poster Presentation.
NUR 4203: Nursing Care of Patients with Complex Needs, via *Technology*, Unit Exam (s).

BS in Physics

1. Assessment Plan and Summary

The new assessment plan is shown in Table 1. Each learning outcome is assessed each time respective courses are offered, and loop-closing occurs annually for each course assessed.

The assessment practice of the Natural Sciences department follows a three-year cycle, which is comprised of the three steps, data collection, evaluation and loop closing.

Table 1: Assessment Plan for BS in Physics

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Tools	Metrics/ Indicators
TECHNOLOGY	Students must individually and successfully use appropriate instrumentation available in the department, such as AFM, SEM to characterize specimen.	Direct assessment of coursework with a rubric in PHY 3661 and PHY 4781. Designation of "unsatisfactory", "satisfactory" and "superior" will be given.	At least 80% of students receive "satisfactory" or "superior".
ETHICS & LEADERSHIP	Students will be able to evaluate the impact of scientific practices and findings on society.	Ethics case study assignment in PSC 3001, in which students will analyze an ethics-related situation and characterize and reflect upon the scientific misconduct involved.	At least 80% of students perform at a "satisfactory" or "superior" level.
TEAMWORK	LTU MCB graduates will have the ability to communicate and collaborate with other disciplines.	Team self-evaluation in BIO 3201 (A&P lab). Likert scale of satisfaction will be used.	80% of responses with "always satisfied" or "frequently satisfied" to survey which will include peer evaluation.
VISUAL COMMUNICATION	Students will use figures or other graphical elements in their senior projects and other technical reports, following appropriate scientific publication standards.	Direct assessment of student assignment with appropriate rubric in courses PHY3661, PHY4781, PHY4912/22. Designation of "unsatisfactory", "satisfactory" and "superior" will be given. Evaluation of student presentations using oral advanced physics course rubric in PHY4843 and PHY4763. Designation of "unsatisfactory", "satisfactory" and "superior" will be given.	At least 80% of students receive "satisfactory" or "superior" performance based on rubrics.
WRITTEN AND ORAL COMMUNICATION	Students are aware of the publication standards from common scientific publications; and apply them in their technical reports.	Direct assessment of student assignment with appropriate rubric in courses PHY3661, PHY4781, PHY4912/22. Designation of "unsatisfactory", "satisfactory" and "superior" will be given. Evaluation of student presentations using oral advance physics course rubric in PHY4843. Designation of "unsatisfactory", "satisfactory" and "superior" will be given.	At least 80% of students receiving "satisfactory" or "superior" performance based on rubrics. At least 80% "satisfactory" or "superior" performance based on rubrics.
SCIENTIFIC ANALYSIS	Students will demonstrate critical thinking in overcoming obstacle in theoretical calculation and lab experimentation.	Students' research plan for PHY4912/22 (proposed in PSC3001) will be graded with a rubric. Designation of "satisfactory" or "unsatisfactory" will be given.	All students will receive "satisfactory". All students will receive at 80% or above based on rubric.

		Completion of an independent experiment with minimal assistance in PHY 3661 and PHY 4781. Designation of "satisfactory" or "unsatisfactory" will be given.	
KNOWLEDGE IN DISCIPLINE	Mastery of the topic areas of Classical Mechanics, Relativity, EM, Optics/Waves, Thermal Physics, Quantum Mechanics, Atomic Physics	Course final exam average	At least 80% of students receive a grade of 80% or above.
INDEPENDENT RESEARCH	Students perform an independent open-ended scientific research project.	Senior project rubric	At least 80% of students will receive a grade of 80% or above.

2. Report on 2019-2021 Academic Year and Action Plan (Loop Closing)

Physics faculty assessed multiple learning outcomes across core upper-division courses including *Contemporary Lab (PHY3661)*, *Optics Lab (PHY4781)*, *Senior Projects (PHY4911/4912)*, and other advanced physics electives. Assessments were conducted using rubrics with designations of "unsatisfactory," "satisfactory," and "superior," and most targets were set at 80% of students performing at or above the "satisfactory" level.

- **Technology:** Students were expected to individually use departmental instrumentation (e.g., AFM, SEM) in PHY3661 and PHY4781. Assessment was delayed in 2019–20 due to COVID-19 lab restrictions but resumed in 2020–21. Data collection is ongoing.
- **Teamwork:** Measured via peer surveys in PHY3661 and PHY4781. Surveys were not administered during the pandemic but resumed post-COVID. Low response rates remain a concern.
- **Graphical Communication & Communication:** These outcomes were assessed in PHY3661, PHY4781, PHY4843, PHY4763, and Senior Projects. Most students met or exceeded expectations. Assignments followed scientific publication standards, and results show consistent achievement above the 80% target.
- **Knowledge in Discipline:** Mastery in major physics content areas was assessed through final exam averages. In all assessed courses (e.g., PHY3414, PHY3574, PHY3653, PHY4843), 100% of students achieved 80% or higher.
- **Scientific Analysis & Independent Research:** Critical thinking and execution of independent lab experiments and research plans were assessed in PHY3661, PHY4781, and Senior Projects. These resumed post-COVID with positive outcomes, and data collection continues.
- **Overall Status:** Some outcomes were not assessed in 2019–20 due to COVID-19 disruptions but were resumed in 2020–21. Faculty are continuing to collect data and monitor consistency across sections and assignments.

Primary Faculty Responsible:
Changgong Zhou (PHY3661, PHY4781), Valentina Tobos (PHY4843), George Moschelli (PHY4763), Senior Project Instructors (PHY4911/4912), Bhattacharya (PHY3414), Schneider (PHY3653)

3. Assessment Plan for 2022-2025 Academic Years

Continue with the program level assessment plan shown in Table 1.

Given the small cohort size, data will be collected every term, and running averages will be used to report trends over time.

Planned assessment activities include:

- **Knowledge in Discipline**
  Assessed in PHY4763 (Thermal & Statistical Physics) by Valentina Tobos, in PHY4743 (Optics) and PHY4781 (Optics Lab) by Changgong Zhou, and in PHY4724 (Quantum) by George Moschelli.
- **Technology**
  Assessed in PHY3661 (Contemporary Lab) by Changgong Zhou.

- **Teamwork**
  Assessed in PHY3661 (Contemporary Lab) and PHY4781 (Optics Lab) by Changgong Zhou.
- **Graphical Communication, Scientific Analysis, and Independent Research**
  All three will be assessed in Senior Projects (PHY4912/4922) by Changgong Zhou.
- **Ethics**
  Assessed in PSC3002 (Leadership in Scientific Research) by the course instructor in Spring 2023.

These assessments will contribute to ongoing program evaluation and continuous improvement efforts.

BS in Psychology

1. Assessment Plan and Summary

The new assessment plan is shown in Table 1. Each learning outcome is assessed each time respective courses are offered, and loop-closing occurs annually for each course assessed.

Table 1: Assessment Plan for BS in Psychology

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Tools	Metrics/ Indicators
TECHNOLOGY	Students will demonstrate competence and ability to use appropriate software to produce understandable reports and posters in APA style, including use of statistical analysis software, office dissemination software, and library and internet research databases.	Scores obtained from the administration of technology rubric. Target courses are PSY 2113 Research Methods and PSY 3223 -Experimental Psychology Lab	Average score should be higher than 67%.
ETHICS	Students will demonstrate knowledge of the APA ethics code in the treatment of patients, and human and non-human subjects in experimental research. Also, students will demonstrate knowledge of the norms related to the respect of the truth in scientific research.	Score is based on the ethics topic of PSY 2113-Research Method course. ;	Two criteria to meet: 1) Average higher than 67% 2) At least 15% of the students score above 90%
LEADERSHIP	Students will develop leadership and teamwork skills through collaboration and engage in ethical dimensions of technology and innovation.	Assignments in COM 1001: Pathways to Research Careers	Success metric determined by rubric specific to Pathways curriculum
TEAMWORK	Graduates will understand the importance of teamwork, diversity, and collaboration to achieve a common goal for the betterment of society.	COM 4001:Pathways Capstone Lab	Success metric determined by rubric specific to Pathways curriculum
COMMUNICATION	Graduates will possess industry-standard professional skills in writing, presentations, and interpersonal communication using Oral, Written, and Visual communication modalities.	Target courses are PSY 2113 Research Methods and PSY 3223 -Experimental Psychology Lab	70% Score 4 or higher on Writing, Presentation and Graphical rubrics specific to each class being assessed
KNOWLEDGE IN DISCIPLINE	Students will demonstrate knowledge and application in 4 content macro-areas: clinical psychology, neuroscience and cognition, experimental methods and techniques and social psychology.	Scores obtained from tests and assignments in the four areas of interest. Target courses for expertise are: 1. Clinical psychology: Introductory psychology, Clinical psychology, Abnormal psychology. 2. Neuroscience and cognition: Introductory psychology, Cognitive psychology, Behavioral neuroscience; 3. Experimental methods and techniques: Introductory Psychology, Research methods, Experimental Psychology Lab; 4. Social psychology: Introductory psychology, Social psychology	Each of the 4 single macro area scores should be higher than 67%.

Table 2: Curriculum Map for the BSBA Program (Example)

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**		COMMUNICATION (WRITTEN, ORAL, VISUAL)	CRITICAL THINKING	ETHICS	KNOWLEDGE	LEADERSHIP	TEAMWORK	TECHNOLOGY
Introductory Psychology	PSY1213				**I (F)**		**I (F)**	
Clinical psychology	PSY4633				**R (F)**			
Abnormal Psychology	PSY3633				**E (F)**			
Experimental Psychology Lab	PSY3223	**I (F)**			**I (F)**	**I (F)**	**I (F)**	**I (F)**
Behavioral Neuroscience	PSY4213	**I (F)**			**R (F)**			
Cognitive Psychology	PSY3923				**E (F)**			
Research Methods	PSY2113		**I (F)**	**I (F)**	**I (F)**	**I (F)**	**I (F)**	**I (F)**
Social Psychology	PSY3623				**E (F)**			
Senior research project 1	PSY4912	**R (F)**	**I (F)**					
Senior research project 2	PSY4922	**R (F)**	**I (F)**					

2. Report on 2019-2022 Academic Year and Action Plan (Loop Closing)

Knowledge in Discipline
Student performance was assessed through assignments and tests in target courses across four areas: Clinical Psychology, Neuroscience & Cognition, Experimental Methods, and Social Psychology. Scores consistently exceeded the minimum benchmark (67%). Grand average scores were:

- 2019–2020: 82.53
- 2020–2021: 79.23
- 2021–2022: 78.21
  Next loop closing is scheduled for Fall 2023.
  Responsibility: Psychology instructors; program directors for analysis.

Technology
Assessed through assignments in *Experimental Psychology Lab* and *Research Methods*. Student performance met expectations across all years, with scores consistently above 80%.
Next loop closing: Fall 2023.
Responsibility: Course instructors; program directors for analysis.

Ethics
Assessed through IRB applications, consent forms, and open-ended questions in *Research Methods*. No loop closing occurred in 2019–2021. In 2021–2022, average performance was 80.5%, meeting expectations.
Next loop closing: Fall 2024.
Responsibility: Course instructors; program directors for analysis.

Critical Thinking
Assessed using a critical thinking rubric in designated courses. No loop closing in 2019–2021. In 2021–2022, average performance was 84.5%.
Next loop closing: Fall 2024.
Responsibility: Psychology faculty; program directors.

Teamwork
Assessed using teamwork rubrics in target courses. Across all three years, performance exceeded the 67% benchmark with averages around 79.5%–80.1%.
Next loop closing: Fall 2023.
Responsibility: Course instructors; program directors.

Communication
Communication skills were evaluated through written and group assignments. Across all years, students consistently exceeded the minimum benchmark, with average scores ranging from 84.1% to 86.2%.
Next loop closing: Fall 2023.
Responsibility: Course instructors; program directors.

Leadership
Assessed using teamwork-related rubrics. No loop closing occurred in 2019–2022.
Next loop closing: Fall 2023.
Responsibility: Psychology faculty; program directors.

3. Assessment Plan for 2022-2025 Academic Year

Collect assessment data according to the assessment plan shown in Table 1.

From Fall 2022 through Spring 2025, the Psychology program will implement a targeted assessment cycle across key learning objectives. Ethics will be assessed during Fall 2022 and Spring 2023 through a series of open-ended questions in PSY 2113: Research Methods. Students will also prepare an IRB application and an informed consent document for a research project conducted in the same course. Leadership will be assessed in Fall 2023 and Spring 2024 using scores from a leadership rubric administered in both PSY 2113: Research Methods and PSY 3223: Experimental Psychology Lab. Critical Thinking will be assessed in Fall 2022 and Spring 2023 using a course-embedded rubric applied to assignments in Senior Research Project I and II. These data will inform future loop closing cycles and support ongoing program improvement.

BS in Technological Humanities

1. Assessment Plan and Summary

The new assessment plan is shown in Table 1. Each learning outcome is assessed each time respective courses are offered, and loop-closing occurs annually for each course assessed. Table 2 shows the curriculum for the program.

Table 1: Assessment Plan for BS in Technological Humanities

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Tools	Metrics/ Indicators
TECHNOLOGY	Graduates will be able to apply advanced technologies to practical and theoretical problems across disciplines.	Semester projects from: MCS1xx1: Coding Club LLT/SSC4993: Senior Thesis	100% score 4+ on 5pt "Technology" category on HumTech Research Project rubric
ETHICS	Graduates will understand the ethical issues related to their disciplines, and the social consequences of their professional decisions	Semester projects from: COM1001: Pathways to Research COM4001: Pathways Capstone	100% average 4+ on 5pt Pathways Research Project Rubric
LEADERSHIP	Graduates will be able to collaborate across disciplinary fields	Semester projects from: COM1001: Pathways to Research COM4001: Pathways Capstone	100% average 4+ on 5pt Pathways Research Project Rubric
TEAMWORK	Graduates will be able to collaborate across disciplinary fields	Semester projects from: COM1001: Pathways to Research COM4001: Pathways Capstone	100% average 4+ on 5pt Pathways Research Project Rubric
COMMUNICATION	A. Written: Graduates will demonstrate professional writing standards in mechanics, evidentiary and analytical architecture, and editorial process. B. Visual: Graduates will be able to utilize visual media in digital and interpersonal communication contexts.	A. 1. COM3001: WPE 2. Senior Thesis B. Senior Thesis	1. 1. 100% score 23+ on 30pt WPE rubric 2. 100% score 4+ on 5pt "Written Communication" category on HumTech Research Project rubric 2. 100% score 4+ on 5pt "Visual Communication" category on HumTech Research Project rubric
CRITICAL THINKING	Graduates will be able to evaluate competing theories of cultural adaptation to technology change.	Semester projects from: HUM2103: Intro to Hum&Tech LLT4533: Lit Crit and Theory SSC4733: Hist of Technology LLT/SSC4993: Senior Thesis	100% average 4+ on 5pt HumTech Research Project rubric
KNOWLEDGE IN DISCIPLINE	Graduates will develop competencies in diverse humanistic research methodologies, and execute an interdisciplinary research project.	Semester projects from: HUM2103: Intro to Hum&Tech LLT4533: Lit Crit and Theory SSC4733: Hist of Technology LLT/SSC4993: Senior Thesis	100% average 4+ on 5pt HumTech Research Project rubric

Table 2: Curriculum Map for BS in Technological Humanities

	COM1001: Research Pathways	COM3001: Writing Proficiency Exam	COM3543: Technical Editing	COM4001: Pathways Capstone	HUM2103: Intro to HumTech	LLT3443: Am Lit Survey 1	LLT3453: Am Lit Survey 2	LLT4533: Lit Crit and Theory	MCS1xx1: MCS Coding Club	MCS1243: Foundations of Comp Sci	MCS1514: Computer Science 1	SSC3153: U.S. Hist Survey 1	SSC3163: U.S. Hist Survey 2	SSC4733: Hist of Technology	SSC/LLT4993: Senior Thesis
Knowledge in Discipline	I				I	R	R	M				R	R	M	M
Written Communication		R	M		R	R	R	R				R	R	R	M
Graphical Communication	I		M	R											M
Critical Thinking					I	R	R	R				R	R	R	R
Technology	I								R	R	R				M
Ethics	I			R	R			R						R	R
Leadership	I			R											R
Teamwork	I			R											R
I = Introduce / R = Reinforce / M = Mastery															

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

From 2019 to 2021, the BSTH program continued to develop and implement its assessment plan across all seven Program Learning Objectives (PLOs). For *Communication* (PLO #1), assessment is based on direct evaluation of the senior thesis in LLT4993. However, no data were collected during this cycle as the first BSTH students had not yet advanced to the senior thesis stage. Assessment for *Critical Thinking* (PLO #2) was conducted in HUM2103, LLT4533, and SSC4733. While some data were gathered in Fall 2019, showing a 3.8/5 average in the "Theory" rubric category in LLT4533, no BSTH students were enrolled in that course, and no additional data were collected in 2020-2021 or 2021-2022. SSC4733 is scheduled for reassessment in Fall 2022.

For *Ethics* (PLO #3), consistent data were collected in COM1001 and COM4001. Poster exhibit scores in COM1001 averaged between 3.5 and 4.0 on "Social Impact," and students in COM4001 achieved a 3.0 average in the "Professional Practices" module. These assessments were successfully loop-closed and will be reassessed in Fall 2024.

The *Knowledge in Discipline* objective (PLO #4) relies on assignments from HUM2103, LLT4533, SSC4733, and LLT/SSC4993. Early scores in Fall 2019 from LLT4533 averaged 3.2 across categories, but no BSTH students were enrolled, and no further data were collected through 2021. SSC4733 is again scheduled for assessment in Fall 2022.

Leadership (PLO #5) was evaluated using GCSP poster exhibits in COM1001, which averaged 3.3 on "Innovation," and COM4001 modules, which averaged 3.0 on professional practices. These scores were consistent across 2020 and 2021, with loop closing scheduled for 2024.

Teamwork (PLO #6) was assessed in COM1001 and COM4001. COM1001 students averaged 3.7 to 3.8 on "Collaboration" based on poster exhibit rubrics. However, teamwork assessment has not yet been implemented in COM4001, and a plan is in place to develop this component prior to the next loop closing in Fall 2024.

Finally, *Technology* (PLO #7) is to be assessed via MCS1xx1 (Coding Club) and LLT4993. As of 2021, no data had been collected, pending the advancement of the first BSTH students to the senior thesis. Future plans include collaboration with MCS faculty to extract assessment data from Coding Club.

Throughout the 2019–2021 assessment cycle, emphasis remained on building out a sustainable rotation of course-level assessments. Several objectives had limited or no data due to small enrollment and the timing of course offerings, but revised assessment scheduling is underway for the next loop-closing phases in Fall 2022 and beyond.

3. Assessment Plan for 2022-2025 Academic Year

Collect assessment data according to the assessment plan shown in Table 1.

From 2022 to 2025, the BSTH program will continue building out its assessment infrastructure following recent curricular launches and faculty transitions. COM4001 and HUM2103, which began in Spring 2021, will serve as primary sites for direct assessment of Communication, Ethics, Leadership, and Critical Thinking. A formal teamwork assessment will be developed and implemented for COM4001. Additionally, the program will collaborate with MCS faculty to extract and analyze data from MCS1xx1 (Coding Club) courses to support assessment of the Technology learning outcome. The newly appointed HSSC Assessment Representative, Dr. Julia Kiernan, will be trained in assessment practices and support the development and coordination of assessment activities across the program.

MS in Computer Science

1. Assessment Plan and Summary

The assessment plan for the MS in Computer Science program is designed to address the university learning outcomes pertinent to a graduate degree in Computer Science (CS). When students complete the MSCS at Lawrence Tech, they should be knowledgeable about advanced concepts and applications in Computer Science. The program level learning outcomes for the program is shown in Table 1 and the Curriculum Map is shown Table 2. Each learning outcome is assessed each semester respective courses are offered, and loop-closing of collected assessment data occurs annually.

Table 1: Assessment Plan for MS in Computer Science

Graduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ADVANCED KNOWLEDGE	1. Display a thorough understanding of the theoretical concepts and practical uses of computer science in two concentrations. 2. Demonstrate a sufficient depth of knowledge in a substantive area of computer science to pursue advanced practical work in industry	1. Direct assessment of student assignments 2. Alumni survey	1. Level 3 on graduate assignment rubric 2. Level 3 on survey rubric
COMMUNICATION	Plan, create and integrate oral and written communication of [mathematical and algorithmic ideas] effectively to audiences having a range of technical understanding.	Direct assessment of student collaborative research projects	Level 3 on project rubric
ETHICS	Be lifelong learners who are able to master new topics required to understand and synthesize solutions to novel problems, based on their technical knowledge of computer science and their ability to think critically	Alumni survey	Level 3 on survey rubric
TECHNOLOGY	Formulate and analyze technical requirements for new or existing projects	Direct assessment of student collaborative research projects	Level 3 on project rubric

Table 2: Curriculum Map for the MSCS Program

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize**		ADVANCED KNOWLEDGE	COMMUNICATION	ETHICS	TECHNOLOGY			
Algorithm Design & Analysis	MCS 5803	**E**						
Theory of Computation	MCS 5243	**E**						
Artificial Intelligence	MCS 5323	**E**						
Intro to Dist. Computing	MCS 5703	**E**						
Collab 1	MCS 7013		**E**	**E**	**E**			
Collab 2	MCS 7033		**E**	**E**	**E**			

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

Learning Outcome: Knowledge in Discipline a) Objective/Outcome: Apply knowledge of computing and mathematics appropriate to the discipline. b) Display a complete understanding of a computer language (syntax, semantics and terminology), develop and debug complex code. c) Apply current techniques, skills, and tools necessary for computing practice.

Assessment: No assessment was done for Masters level courses this academic year.

Evaluation: No data was collected.

Issue: The critical issue of the MS in CS program is enrollment. The limited faculty resources available for the graduate program are all currently devoted to recruitment.

Current/Future Actions: Once enrollment has increased to a sufficient level, data will need to be collected from the four core Masters level courses and from the two Collaborative Projects.

Responsibility: Associate Chair of Math/CS

University/College Support for Learning Outcome: The University could hire more full-time CS faculty. The current CS faculty are stretched too thin to manage 6 undergraduate concentrations and a graduate program. With the current understaffing of full-time faculty, it has been all they can do to maintain the quality of the undergraduate programs.

3. Assessment Plan for 2022-2025 Academic Years

Continue with the program level assessment plan shown in Table 1.

College of Engineering

BS/MS in Architectural Engineering (5-Yr Direct Entry)

1. Assessment Plan and Summary

The assessment plan for the program is shown in Table 1. Note that the program is an integrated baccalaureate-masters' program and therefore, university student outcomes are applicable at both levels. Learning outcomes assessed for the 2021-2022 academic year are listed in Section 2 of this report, including a detailed description of loop closing evaluation.

This report has been drafted by Dr. Keith Kowalkowski, Assistant Chair of the Department of Civil and Architectural Engineering and the Director of the Master of Science in Architectural (MSArE) program. Close-the-loop meetings for all programs in the department occurred on August 15, 2022.

Prior to and during the 2021-2022 academic year, the program utilized outcomes per the Civil Engineering Body of Knowledge 3 (CEBOK3) and mapped them to ABET student outcomes. However, the program was visited by ABET during the fall of 2022 and the response of ABET when using CEBOK3 were not favorable.

On October 27, 2022, the faculty of the Department of Civil and Architectural Engineering unanimously voted to adopt ABET Criterion 3 student outcomes (SOs) (1) – (7) for the MSArE program and the Bachelor of Science in Civil Engineering (BSCE) program. For the MSArE program only, an additional outcome (SO8) was added for building integration, which is a differentiator of the LTU architectural engineering degree program and could not be aligned with any of the ABET SOs (1) – (7). This student outcome will primarily be assessed in the studio sections, which are integral courses in the program. An additional outcome was added to satisfy the ABET Master's level General Criteria, considering that students must reach a mastery of a specific field of study. Only one outcome was added for the master's level. However, performance indicators (PIs) were developed for all student outcomes and some PIs for SOs 1-8 were written specific for the master's portion of the MSArE program.

The additional SOs (8-9) were discussed by a group of MSArE program faculty in a meeting on November 9, 2022 and were presented and approved by all program faculty in a department meeting on November 17, 2022.

A full list of the student outcomes is provided below.

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
8. an ability to integrate multiple subdisciplines of architectural engineering in design of building elements that work with architectural layout.
9. assess advanced concepts and principles in the solutions of complex problems to develop a mastery in a specialty area of architectural engineering.

At a department meeting on 11/03/22, the Chair presented a strategy for developing measurable PIs based on the lessons learned at the recent *Fundamentals of Program Assessment Workshop*.

Faculty teams were formed to develop initial draft performance indicators for each Criterion 3 Student Outcomes (1-7) and the proposed additional Student Outcomes (8 and 9) for the MSArE program, which as mentioned earlier in this document, were finalized on November 17, 2022. Each faculty member served on a minimum of two teams. Throughout the months of November and December, PIs were developed by the teams, presented to the faculty at-large, revised as needed, and approved. All PIs were approved by December 16, 2022. The PIs corresponding to each SO (1-9) are shown in Tables A-I. White highlighted cells indicate PIs that are shared between the BSCE and MSArE programs, red cells indicate PIs exclusive to the MSArE program at the undergraduate level and green cells indicate PIs exclusive to the MSArE program at the graduate level.

Table A: Student Outcome (1) and Performance Indicators 1a-1e for the MSArE Program

SO1 - An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	
Designation	*Performance Indicator*
1a	Identify complex problem in engineering principles.
1b	Formulate, using mathematical and scientific approaches, complex engineering problem.
1c	Establish a solution strategy using principles of engineering.
1d	Solve a complex engineering problem by applying appropriate principles of engineering, science, and mathematics.
1e	Examine different solution strategies to architectural engineering problems using numerical models.

Table B: Student Outcome (2) and Performance Indicators 2a-2g for the MSArE Program

(SO2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	
Designation	*Performance Indicator*
2a	Formulate engineering design solutions that meet specified needs.
2b	Demonstrate public health, safety and welfare considerations in engineering design solutions.
2c	Demonstrate global impact considerations in evaluating engineering design solutions.
2d	Conduct assessment of environmental issues as impacted by the

	engineering design solutions.
2e	Consider cultural impact factors caused by the engineering design solutions.
2f	Demonstrate social impact considerations in evaluating engineering design solutions.
2g	Analyze economic factors in the engineering design solutions.

Table C: Student Outcome (3) and Performance Indicators 3a-3e for the MSArE Program

(SO3) An ability to communicate effectively with a range of audiences.	
Designation	*Performance Indicator*
3a	Employ a logical and articulate written communication based on independent design work.
3b	Utilize a detailed written form to communicate the contents of a professional, inclusive, and collaborative team project.
3c	Effectively communicate engineering solutions in the form of oral presentations to a range of audiences.
3d	Utilize clear and concise engineering drawings to describe engineering designs for a range of audiences.
3e	Integrate different forms of effective and persuasive communication to explain research results and draw conclusions.

Table D: Student Outcome (4) and Performance Indicators 4a-4c for the MSArE Program

(SO4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
Designation	*Performance Indicator*
4a	Identify the global, economic, environmental, and societal context of an engineering situation.
4b	Describe ethical and professional responsibilities related to an engineering situation.
4c	Analyze issues in professional ethics in global, economic, environmental, and societal contexts considering the professional code of ethics.

Table E: Student Outcome (5) and Performance Indicators 5a-5e for the MSArE Program

(SO5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	
Designation	*Performance Indicator*
5a	Contribute to the establishment of goals and work plans for the team.
5b	Demonstrate a professional attitude in a collaborative team environment.
5c	Engage in inclusive team environment.
5d	Participate in achieving the team's objectives in a timely manner

5e	Develop a professional leadership attitude.

Table F: Student Outcome (6) and Performance Indicators 6a-6e for the MSArE Program

(SO6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	
Designation	*Performance Indicator*
6a	Develop an experimental plan to collect relevant data and addresses appropriate key variables.
6b	Conduct experimental procedure to measure and acquire data on key variables.
6c	Analyze experimental data and interpret results for the experimental model
6d	Utilize engineering judgement to explain or justify observed differences between experimental measurements and models.
6e	Draw conclusions based on experimental observations.

Table G: Student Outcome (7) and Performance Indicators 7a-7d for the MSArE Program

(SO7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	
Designation	*Performance Indicator*
7a	Acquire relevant new technical information, data, and knowledge from multiple sources for the analysis of an engineering topic.
7b	Utilize relevant new technical information, data, and knowledge from multiple sources in the design of engineering systems.
7c	Implement emerging technologies and equipment in civil engineering.
7d	Identify knowledge gaps relevant to a research topic.

Table H: Student Outcome (8) and Performance Indicators 8a-8c for the MSArE Program

(SO8) An ability to integrate multiple subdisciplines of architectural engineering in design of building elements that work with architectural layout.	
Designation	*Performance Indicator*
8a	Demonstrate the integration of mechanical, structural, electrical and lighting systems with the building architecture.
8b	Demonstrate proficiency in software applications to integrate design and construction phases of various engineering systems.
8c	Analyze system design integration between subdisciplines of architectural engineering to optimize system operation with natural energy sources.

Table I: Student Outcome (9) and Performance Indicators 9a-9c for the MSArE Program

(SO9) Assess advanced concepts and principles in the solutions of complex problems to develop a mastery in a specialty area of architectural engineering.	
Designation	*Performance Indicator*

9a*	Demonstrate knowledge and academic success in a variety of advanced subjects in a subdiscipline of architectural engineering.
9b	Through a detailed experimental research project, formulate, solve and synthesize results in studying a question related to an architectural engineering subdiscipline.
9c	Select appropriate analytical or experimental investigations to research architectural engineering problems.

** Will be assessed using exit interviews only*

Table 2 shows the mapping of courses onto the program assessment outcomes and the Performance Indicators. All CAE faculty met on January 3, 2023 to review the curriculum map and discuss the common classes between the BSCE and MSArE programs. Then, the faculty associated with the MSArE program only discussed the remaining courses and ensured there was proper coverage of the PIs in the curriculum. The faculty identified several strengths in the MSArE program as it relates to the student outcomes and the PIs. However, the faculty identified that SO4, as it relates to professional and ethical responsibilities, needs more coverage in the curriculum and this will be addressed in the upcoming months. The program will evaluate the use of EGE 3022 Leadership and Professional Development for Engineers for evaluating the PIs for SO4. Other engineering programs utilize this course for an evaluation of SO4.

The faculty identified courses that will be used for formative assessment and for summative assessment. For most PIs, a minimum of two courses were selected for each. However, it was not practical for all PIs. For example, some PIs were written specific for the graduate technical project and some PIs were developed for the program studio sections. The MSArE program curriculum map shows by means of X(F) and X(S) the subjects for each of the student outcomes where student evidence will be collected for assessment and inform potential actions.

At the time of writing this report, the remaining assessment activities discussed are still being developed.

The program will continue to assess the strengths and weaknesses relative to each student outcome using four levels of performance of Excellent, Average, Minimal and Unsatisfactory with descriptions in Table J.

Table J: Descriptions of Performance Categories

Performance Category	Description of Performance Category
Excellent *(Exceed Expectations)*	Student applied knowledge with little or no conceptual or procedural errors
Acceptable *(Meets Expectations)*	Student applied knowledge with no significant conceptual errors and only minor procedural errors
Minimal *(Developing)*	Student applied knowledge with occasional conceptual errors and minor procedural errors
Unsatisfactory	Student applied knowledge and made significant conceptual and/or procedural errors

Performance targets will be set upon completion of the first assessment and evaluation cycle for each Student Outcome (1-9). The performance targets will be defined in the following form: *X % of students that meet or exceed expectations.* The percentage, %, will be evaluated during the first assessment cycle for each student outcome, and the MSArE program faculty will set target percentages for the next cycle

based on the evaluation results. The evaluation may also yield changes to the student educational strategies or the performance indicators.

As of Fall 2022, there are fifty-four (54) students in the MSArE program. The average annual enrollment in a civil engineering subject is about 20 and the average annual enrollment in an architectural engineering exclusive subject is about 12. Attributable to this relatively small number of students in the cohort, the program is opting to collect data during two academic years followed by a program level evaluation of the data and design of corrective actions if required. The plan may be revised pending future improvement actions and need to reassess the effect of those actions.
Data collection for formative (F) and summative (S) assessment will be performed in the subjects indicated in the MSArE Curriculum Map (Table 2). Data will be collected annually for the selected courses. Data collected in subjects serving both the BSCE and the MSArE programs will be segregated by major. The program will continue using the following additional assessment tools: graduating exit interviews, industrial advisory board interviews with seniors, student self-assessments and target assessments. A proposal for cycles during a 6-year period is shown below.

	Cycle 1				Cycle 2				Cycle 3			
Student Outcomes	**F22**	**S23**	**F23**	**S24**	**F24**	**S25**	**F25**	**S26**	**F26**	**S27**	**F27**	**S28**
SO(1)		A	⟷	A	E/C	A	⟷	A	E/C	A	⟷	A/E
SO(2)		A/E	C	A	⟷	A	E/C	A	⟷	A	E/C	A
SO(3)		A/E	C	A	⟷	A	E/C	A	⟷	A	E/C	A
SO(4)		A	⟷	A	E/C	A	⟷	A	E/C	A	⟷	A/E
SO(5)		A/E	C	A	⟷	A	E/C	A	⟷	A	E/C	A
SO(6)		A	⟷	A	E/C	A	⟷	A	E/C	A	⟷	A/E
SO(7)		A	⟷	A	E/C	A	⟷	A	E/C	A	⟷	A/E
SO(8)		A	⟷	A	E/C	A	⟷	A	E/C	A	⟷	A/E
SO(9)		A/E	C	A	⟷	A	E/C	A	⟷	A	E/C	A

A	Data collection cycle ⟷	C	Change from previous data collection cycle
A/E	Data collection/Evaluation	E/C	Evaluation/Change from previous data collection cycle

Table 1: Assessment Plan for Undergraduate/Graduate Program

Undergraduate/Graduate Program Level Assessment Outcomes	Supporting Program Learning Objective (STUDENT OUTCOMES)	Assessment Strategy	Metrics/ Indicators
ADVANCED KNOWLEDGE (Graduate)	9. assess advanced concepts and principles in the solutions of complex problems to develop a mastery in a specialty area of architectural engineering. 1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	- Evaluation of AE Graduate Project, Presentation and Final Report. - Exit Interviews -Direct assessment using deliverables in graduate level classes EAE 5633 and EAE 5613	- At the time of writing this report, thresholds are still to be determined by the faculty in Spring 2023.
ETHICS (Undergraduate)	4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	- Direct Assessment in EAE 4022, EAE 4032 and EAE 5613. - May use assessment results from EGE 3022. Work in progress.	- At the time of writing this report, thresholds are still to be determined by the faculty in Spring 2023.
LEADERSHIP (Undergraduate)	5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	- Team evaluations from EAE 1081 - Direct assessment in EAE 3024 - Team evaluations and team leader reflections in EAE 4022 and EAE 4032.	- At the time of writing this report, thresholds are still to be determined by the faculty in Spring 2023.
TEAMWORK (Undergraduate)	5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	- Team evaluations from EAE 1081 - Direct assessment in EAE 3024 - Team evaluations and team leader reflections in EAE 4022 and EAE 4032.	- At the time of writing this report, thresholds are still to be determined by the faculty in Spring 2023.
TECHNOLOGY (Under/Graduate)	1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. 2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	- Direct assessment using deliverables in EAE 3113, EAE 3723, EAE 4633, EAE 4243, EAE 4743. - Direct assessment in EAE 4022, EAE 4032, EAE 4613, EAE 4633, ECE 4243 and ECE 4743. - Direct (formative) assessment in EAE 3113 and ECE 3011. Summative assessment in ECE 3424, ECE 4243 and EAE 6013. - Direct assessment in EAE 4022, EAE 4032, ECE 3211,ECE 4743,ECE 4753 and EAE6013.	- At the time of writing this report, thresholds are still to be determined by the faculty in Spring 2023.

VISUAL COMMUNICATION (Under/Graduate)	3. an ability to communicate effectively with a range of audiences.	- Direct assessment in EAE 1081, EAE 3014, EAE 3024, EAE 4022, EAE 4032, EAE 5113, EAE 5623, and EAE 6013.	- At the time of writing this report, thresholds are still to be determined by the faculty in Spring 2023.
ENGINEERING KNOWLEDGE (Undergraduate)	1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	- Direct assessment using deliverables in EAE 3113, EAE 3723, EAE 4633, EAE 4243, EAE 4743.	- At the time of writing this report, thresholds are still to be determined by the faculty in Spring 2023.
EXPERIMENTS (Under/Graduate)	6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	- Direct (formative) assessment in EAE 3113 and ECE 3011. Summative assessment in ECE 3424, ECE 4243 and EAE 6013.	- At the time of writing this report, thresholds are still to be determined by the faculty in Spring 2023.
LIFELONG LEARNING (Under/Graduate)	7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	- Direct assessment in EAE 4022, EAE 4032, ECE 3211, ECE 4743, ECE 4753 and EAE 6013.	- At the time of writing this report, thresholds are still to be determined by the faculty in Spring 2023.
DESIGN (Undergraduate)	2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	- Direct assessment in EAE 4022, EAE 4032, EAE 4613, EAE 4633, ECE 4243 and ECE 4743.	- At the time of writing this report, thresholds are still to be determined by the faculty in Spring 2023.
INTEGRATION (Under/Graduate)	8. an ability to integrate multiple subdisciplines of architectural engineering in design of building elements that work with architectural layout.	- Direct assessment in EAE 3014, EAE 3024, EAE 4032, EAE 5613 and EAE 5653.	- At the time of writing this report, thresholds are still to be determined by the faculty in Spring 2023.

Table 2: Curriculum Map for the MSArE Program

		Fresh	Junior											Senior										Graduate								
Outcome/KPI	**Level**	EAE 1081	EAE 3014	EAE 3024	EAE 3113	EAE 3613	ECE 3011	ECE 3013	ECE 3211	ECE 3213	ECE 3424	ECE 3523	ECE 3723	EAE 4022	EAE 4032	EAE 4113	EAE 4613	EAE 4623	EAE 4633	ECE 4243	ECE 4743	ECE 4753	EAE 5113	EAE 5123	EAE 5613	EAE 5623	EAE 5633	EAE 5653	EAE 6013	ECE 5283	ECE 5703
(SO1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.																																
1a. Identify complex problem in engineering principles.	L1				X (F)			X		X			X (F)		X	X			X (S)	X (S)	X (S)	X	X	X	X (S)		X (S)		X	X	X
1b. Fomulate, using mathematical and scientifc approaches, complex engineering problem.	L3				X (F)			X		X	X	X	X (F)			X			X (S)	X (S)	X (S)	X	X	X	X (S)		X (S)		X		X
1c. Establish a solution strategy using principles of engineering.	L3				X (F)			X		X			X (F)		X	X			X (S)	X (S)	X (S)	X			X (S)		X (S)		X		X
1d. Solve a complex engineering problem by applying appropriate principles of engineering, science, and mathematics.	L3				X (F)			X		X	X	X	X (F)		X	X			X (S)	X (S)	X (S)	X			X (S)		X (S)				X
1e. Examine different solution strategies to architectural engineering problems using numerical models.	L5																								X (F/S)		X (F/S)				
(SO2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.																																
2a. Formulate engineering design solutions that meet specified needs.	L3		X	X										X (F)	X (S)		X (S)		X (S)	X (S)	X (S)	X						X			X
2b. Demonstrate public health, safety and welfare considerations in engineering design solutions.	L3													X (F)	X (S)		X (F)		X (F)		X (S)						X				
2c. Demonstrate global impact considerations in evaluating engineering design solutions.	L3													X (F)	X (S)		X (F)		X (F)												
2d. Conduct assessment of environmental issues as impacted by the engineering design solutions.	L3		X											X (F)	X (S)		X (S)		X (S)												
2e. Consider cultural impact factors caused by the engineering design solutions.	L2													X (F)	X (S)		X (F)		X (F)												
2f. Demonstrate social impact considerations in evaluating engineering design solutions.	L3													X (F)	X (S)		X (F)		X (F)												
2g. Analyze economic factors in the engineering design solutions.	L4									X (F)				X (F)	X (S)		X (S)		X (S)	X (S)											
(SO3) An ability to communicate effectively with a range of audiences.																																
3a. Employ a logical and articulate written communication based on independent design work.	L3	X (F)												X (F)	X (S)							X (S)			X (S)			X (S)			X
3b. Utilize a detailed written form to communicate the contents of a professional, inclusive, and collaborative team project.	L3	X (F)												X (F)	X (S)							X (S)			X (S)			X (S)			
3c. Effectively communicate engineering solutions in the form of oral presentations to a range of audiences.	L3	X (F)	X (F)	X (F)										X (F)	X (S)							X (S)			X (S)			X (S)			X
3d. Utilize clear and concise engineering drawings to describe engineering designs for a range of audiences.	L3		X (F)	X (S)																		X (S)			X (S)			X (S)			X
3e. Integrate different forms of effective and persuasive communication to explain research results and draw conclusions.	L5																					X (F/S)			X (F/S)			X (F/S)			
(SO4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.																																
4a. Identify the global, economic, environmental, and societal context of an engineering situation.	L1													X (F)	X (S)									X (S)							
4b. Describe ethical and professional responsibilities related to an engineering situation.	L2													X (F)	X (S)				X					X (S)							
4c. Analyze issues in professional ethics in global, economic, environmental, and societal contexts considering the professional code of ethics.	L4													X (F)	X (S)									X (S)							
(SO5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.																																
5a. Contribute to the establishment of goals and work plans for the team.	L3	X (F)		X (F)										X (F)	X (S)																
5b. Demonstrate a professional attitude in a collaborative team environment.	L3	X (F)		X (F)										X (F)	X (S)																
5c. Engage in inclusive team environment.	L4	X (F)	X	X (F)										X (F)	X (S)																
5d. Participate in achieving the team's objectives in a timely manner	L3	X (F)	X	X (F)										X (F)	X (S)																
5e. Develop a professional leadership attitude.	L3	X (F)		X (F)										X (F)	X (S)																
(SO6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.																																
6a. Develop an experimental plan to collect relevant data and addresses appropriate key variables.	L3				X (F)		X (F)				X (S)								X (S)									X (S)	X		
6b. Conduct experimental procedure to measure and acquire data on key variables.	L3				X (F)		X (F)				X (S)								X (S)									X (S)			
6c. Analyze experimental data and interpret results for the experimental model	L4				X (F)		X (F)				X (S)								X (S)									X (S)			
6d. Utilize engineering judgement to explain or justify observed differences between experimental measurements and models.	L5				X (F)		X (F)												X (S)									X (S)			
6e. Draw conclusions based on experimental observations.	L4				X (F)		X (F)												X (S)									X (S)			
(SO7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.																																
7a. Aquire relevant new technical information, data, and knowledge from multiple sources for the analysis of an engineering topic.	L2						X		X (F)				X		X (S)	X (S)			X	X (S)	X (S)										
7b. Utilize relevant new technical information, data, and knowledge from multiple sources in the design of engineering systems.	L3								X (F)						X (S)	X (S)				X (S)	X (S)										
7c. Implement emerging technologies and equipment in architectural engineering.	L3		X	X			X		X (F)				X (F)		X (S)	X (S)				X (S)	X (S)										
7d. Identify knowledge gaps relevant to a research topic.	L4																											X (S)			
(SO8) An ability to integrate multiple subdisciplines of architectural engineering in design of building elements that work with architectural layout.																																
8a. Demonstrate the integration of mechanical, structural, electrical and lighting systems with the building architecture.	L3		X (F)	X (S)		X							X	X (S)											X						
8b. Demonstrate proficiency in software applications to integrate design and construction phases of various engineering systems.	L3		X (F)	X (S)										X (S)																	
8c. Analyze system design integration between subdisciplines of architectural engineering to optimize system operation with natural energy sources.	L4																							X (S)			X (S)				
(SO9) Assess advanced concepts and principles in the solutions of complex problems to develop a mastery in a specialty area of architectural engineering.																																
9a. Demonstrate knowledge and academic success in a variety of advanced subjects in a subdiscipline of architectural engineering.	L3																															
9b. Through a detailed experimental research project, formulate, solve and synthesize results in studying a question related to an architectural engineering subdiscipline.	L5																											X (S)			
9c. Select appropriate analytical or experimental investigations to research architectural engineering problems.	L4																											X (S)			

2. Report on 2021-2022 Academic Year and Action Plan (Loop Closing)

The Assessment Plan for the 2021-2022 academic year was significantly different than the assessment plan for the 2022-2023 academic year. The 2021-2022 academic year was before the Fall 2022 ABET visit and the program was utilizing CEBOK3 for student outcomes and direct assessment was primarily being done using EAMU vectors and weighted averages.

This is not the description in Section 1 of this report. Please see the University Assessment Report for 2020-2021 for general descriptions on how assessment was performed from 2021-2022.

2.1 EAMU Results

Assessment Summary Forms were completed for all classes during the Fall 2021 to Spring 2022 semester. For the 2021-2022 academic year, assessment results were not provided by adjunct faculty EAE 3613, EAE 4113, EAE 4623, and EAE 5123.

The results of all EAMU tables are organized by student outcome in Table K. Each class is included and the numbers account for all architectural engineering students in the classes only. If more than one class was offered in an academic year, the results of the two classes were added together for the final numbers.

Even though other assessment measures were taken for the Graduate Technical Project, in order to fully assess the program and student outcomes using the EAMU vector, it is necessary to incorporate the data from EAE 6013. Using the EAMU vector, each student in a course is evaluated individually and in relation to all the student outcomes. A number is assigned for each student and for each student outcome. For the presentation, the results of all dimensions that are applicable for a specific student were averaged. The results considered the evaluation of all faculty members present at the presentations. The average results of each student in relation to the student outcomes are shown in Table L. A similar procedure was performed to determine average results for each outcome and each student for the final report. However, only one faculty member performed the evaluation to determine average results. These average results of each student in relationship to the student outcomes are also shown in Table L. Then, for simplicity, the results of the presentations and the final reports were averaged as shown in Table L. Average results that ranged from 9-10 were assigned an “E”, results ranging from 7.5 to less than 9.0 were assigned an “A”, results ranging from 6.0 to less than 7.5 were assigned a “M” and values less than 6.0 were assigned a “U”.

The assessment results of the Graduate Technical Project will be further evaluated in Section 2.4.

Table K: EAMU Results for all classes

Outcome/Course	Vectors				Computations, See Ass. Rep.		
1 Mathematics	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE4113 Electrical Systems 2: Power					N/A		
EAE4633 Fundamentals of Building Physics	7	8	0	0	2.47	FALSE	FALSE
EAE5123 Advanced Electrical Systems					N/A		
EAE5633 Advanced Building Physics	3	8	1	0	2.17	FALSE	FALSE
EAE5653 Building Optimization	9	2	0	0	2.82	FALSE	FALSE

ECE5283 Conceptual Estimating	Not Assessed: No Arch Eng. Students Enrolled						
ECE5703 Design of Timber Structures	Not Offered Academic Year						
ECE3424 Soil Mechanics	1	0	0	0	3.00	FALSE	FALSE
ECE3523 Hydromechanics	6	1	0	0	2.86	FALSE	FALSE
ECE3723 Theory of Structures	3	1	2	0	2.17	FALSE	FALSE
2 Natural Sciences	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE3613 Mechanical Systems 1					N/A		
EAE5613 Build. Int. Renewable En. Systems	6	5	2	0	2.31	FALSE	FALSE
ECE3013 Mechanics of Materials for CE (Fall and Spring Combined)	4	3	5	1	1.77	FALSE	TRUE
3 Social Sciences	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE1081 Intro to Architectural Engineering	8	5	0	0	2.62	FALSE	FALSE
EAE1093 Architectural Engineering History	9	4	0	0	2.69	FALSE	FALSE
EAE3014 AEIDS 1	6	3	0	0	2.67	FALSE	FALSE
EAE3024 AEIDS 2	4	3	2	0	2.22	FALSE	FALSE
EAE4022 AE Capstone 1	0	10	0	0	2.00	FALSE	FALSE
EAE4032 AE Capstone 2	10	0	0	0	3.00	FALSE	FALSE
EAE5613 Build. Int. Renewable En. Systems	9	4	0	0	2.69	FALSE	FALSE
4 Humanities	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE1081 Intro to Architectural Engineering	6	7	0	0	2.46	FALSE	FALSE
EAE1093 Architectural Engineering History	7	6	0	0	2.54	FALSE	FALSE
EAE4022 AE Capstone 1	3	7	0	0	2.30	FALSE	FALSE
EAE4032 AE Capstone 2	5	5	0	0	2.50	FALSE	FALSE
5 Materials Science	E	A	M	U	Average	U >= 20%	Avg < 2.0
ECE3424 Soil Mechanics	1	0	0	0	3.00	FALSE	FALSE
ECE4753 Steel Design	3	2	2	4	1.36	TRUE	TRUE
6 Engineering Mechanics	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE4633 Fundamentals of Building Physics	10	5	0	0	2.67	FALSE	FALSE
EAE5633 Advanced Building Physics	2	10	0	0	2.17	FALSE	FALSE
ECE3013 Mechanics of Materials for CE (Fall and Spring Combined)	11	6	1	5	2.00	TRUE	FALSE
ECE3523 Hydromechanics	4	1	0	2	2.00	TRUE	FALSE
ECE3723 Theory of Structures	2	2	2	0	2.00	FALSE	FALSE
7 Experiment Methods and Data Analysis	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE3113 Electrical Systems 1: Lighting	4	2	2	0	2.25	FALSE	FALSE
EAE4623 Architectural Acoustics					N/A		
ECE3011 Mechanics of Materials for CE Lab	14	4	0	0	2.78	FALSE	FALSE
EAE6013 Graduate Technical Project	3	6	1	1	2.00	FALSE	FALSE
ECE3424 Soil Mechanics	1	0	0	0	3.00	FALSE	FALSE
8 Critical Thinking and Problem Solving	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE3014 AEIDS 1	5	3	1	0	2.44	FALSE	FALSE
EAE3024 AEIDS 2	4	3	2	0	2.22	FALSE	FALSE
EAE3113 Electrical Systems 1: Lighting	4	2	1	1	2.13	FALSE	FALSE
EAE4613 Mechanical Systems 2	6	6	1	0	2.38	FALSE	FALSE
EAE4633 Fundamentals of Building Physics	9	6	0	0	2.60	FALSE	FALSE

EAE6013 Graduate Technical Project	1	8	2	0	1.91	FALSE	TRUE
ECE3013 Mechanics of Materials for CE (Fall and Spring Combined)	5	0	1	2	2.00	TRUE	FALSE
ECE3723 Theory of Structures	2	1	3	0	1.83	FALSE	TRUE
ECE4743 Concrete Design	6	3	4	0	2.15	FALSE	FALSE
ECE4753 Steel Design	2	2	4	2	1.40	TRUE	TRUE
9 Project Management	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE4022 AE Capstone 1	0	0	10	0	1.00	FALSE	TRUE
EAE4032 AE Capstone 2	0	1	0	0	2.00	FALSE	FALSE
ECE3211 Construction Engineering Lab	19	5	0	0	2.79	FALSE	FALSE
ECE3213 Construction Engineering	27	3	2	0	2.78	FALSE	FALSE
ECE4243 Construction Project Management	5	3	1	1	2.20	FALSE	FALSE
10 Engineering Economics	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE4022 AE Capstone 1	0	0	10	0	1.00	FALSE	TRUE
EAE4032 AE Capstone 2	0	10	0	0	2.00	FALSE	FALSE
ECE3211 Construction Engineering Lab	13	2	0	0	2.87	FALSE	FALSE
ECE4243 Construction Project Management	1	5	3	1	1.60	FALSE	TRUE
ECE3213 Construction Engineering	10	11	0	0	2.48	FALSE	FALSE
11 Risk and Uncertainty	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE5653 Building Optimization	10	1	0	0	2.91	FALSE	FALSE
ECE3011 Mechanics of Materials for CE Lab	5	0	1	0	2.67	FALSE	FALSE
12 Breadth in Architectural Engineering Areas	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE3014 AEIDS 1	5	3	1	0	2.44	FALSE	FALSE
EAE3024 AEIDS 2	4	3	2	0	2.22	FALSE	FALSE
EAE3113 Electrical Systems 1: Lighting	6	1	1	0	2.63	FALSE	FALSE
EAE3613 Mechanical Systems 1					N/A		
EAE5613 Build. Int. Renewable En. Systems	9	2	2	0	2.54	FALSE	FALSE
EAE5623 Building Controls	5	4	0	0	2.56	FALSE	FALSE
ECE4753 Steel Design	2	2	7	1	1.42	FALSE	TRUE
13 Design	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE4113 Electrical Systems 2: Power					N/A		
EAE4613 Mechanical Systems 2	7	5	1	0	2.46	FALSE	FALSE
EAE5113 Advanced Lighting/Daylighting	5	5	1	0	2.36	FALSE	FALSE
EAE5623 Building Controls	3	6	0	0	2.33	FALSE	FALSE
ECE4243 Construction Project Management	5	5	0	0	2.50	FALSE	FALSE
ECE4743 Concrete Design	5	4	4	0	2.08	FALSE	FALSE
ECE4753 Steel Design	3	1	7	1	1.50	FALSE	TRUE
EAE5653 Building Optimization	10	1	0	0	2.91	FALSE	FALSE
ECE5283 Conceptual Estimating	Not Assessed: No Arch Eng. Students Enrolled						
ECE5703 Design of Timber Structures	Not Offered Academic Year						
14 Depth in an Architectural Engineering Area	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE4113 Electrical Systems 2: Power					N/A		
EAE4613 Mechanical Systems 2	6	5	2	0	2.31	FALSE	FALSE
EAE5113 Advanced Lighting/Daylighting	5	6	0	0	2.45	FALSE	FALSE
EAE5123 Advanced Electrical Systems					N/A		

EAE5623 Building Controls	2	7	0	0	2.22	FALSE	FALSE
EAE6013 Graduate Technical Project	1	8	1	1	1.82	FALSE	TRUE
ECE4743 Concrete Design	7	3	3	0	2.31	FALSE	FALSE
ECE4753 Steel Design	2	2	4	4	1.17	TRUE	TRUE
EAE5653 Building Optimization	9	2	0	0	2.82	FALSE	FALSE
ECE5283 Conceptual Estimating	Not Assessed: No Arch Eng. Students Enrolled						
ECE5703 Design of Timber Structures	Not Offered Academic Year						
15 Sustainability	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE4022 AE Capstone 1	5	5	0	0	2.50	FALSE	FALSE
EAE4032 AE Capstone 2	10	0	0	0	3.00	FALSE	FALSE
ECE3213 Construction Engineering	29	4	0	0	2.88	FALSE	FALSE
16 Communication	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE3014 AEIDS 1	6	3	0	0	2.67	FALSE	FALSE
EAE3024 AEIDS 2	4	3	2	0	2.22	FALSE	FALSE
EAE4022 AE Capstone 1	3	7	0	0	2.30	FALSE	FALSE
EAE4032 AE Capstone 2	5	5	0	0	2.50	FALSE	FALSE
EAE6013 Graduate Technical Project	4	4	3	0	2.09	FALSE	FALSE
17 Teamwork and Leadership	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE4022 AE Capstone 1	8	0	2	0	2.60	FALSE	FALSE
EAE4032 AE Capstone 2	5	5	0	0	2.50	FALSE	FALSE
18 Lifelong Learning	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE4022 AE Capstone 1	6	3	1	0	2.50	FALSE	FALSE
EAE4032 AE Capstone 2	5	5	0	0	2.50	FALSE	FALSE
EAE6013 Graduate Technical Project	1	8	2	0	1.91	FALSE	TRUE
19 Professional Attitudes	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE4022 AE Capstone 1	5	4	1	0	2.40	FALSE	FALSE
EAE4032 AE Capstone 2	5	4	1	0	2.40	FALSE	FALSE
20 Professional Responsibilities	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE4022 AE Capstone 1	5	5	0	0	2.50	FALSE	FALSE
EAE4032 AE Capstone 2	9	1	0	0	2.90	FALSE	FALSE
21 Ethical Responsibilities	E	A	M	U	Average	U >= 20%	Avg < 2.0
EAE4022 AE Capstone 1	10	0	0	0	3.00	FALSE	FALSE
EAE4032 AE Capstone 2	5	5	0	0	2.50	FALSE	FALSE

Table L: Average Student Rubric Results in Relation to Student Outcomes

Presentations											
Outcome	Hunter	Pedro	Jordan	Roark	Kelcey	Matt	Brandon	Will	John	Ali	Adam
7	8.500	8.125	8.000	9.333	9.500	8.750	8.000	9.833	6.400	4.333	8.667
8	8.083	7.667	6.889	8.278	9.667	7.917	7.583	8.889	6.467	4.667	8.389
14	8.250	7.969	7.167	8.458	9.708	8.188	7.750	8.958	6.775	4.750	8.500
16	7.875	8.500	7.833	8.792	9.833	9.125	8.938	9.500	6.950	5.000	9.250
18	8.125	8.125	7.500	8.583	9.750	8.250	7.500	8.833	6.850	4.667	8.667
Report											
Outcome	Hunter	Pedro	Jordan	Roark	Kelcey	Matt	Brandon	Will	John	Ali	Adam
7	9.000	8.500	9.000	9.000	9.000	8.000	8.000	8.000	8.000	7.000	9.500
8	7.667	8.667	8.667	8.333	9.333	8.000	7.667	8.833	7.000	7.333	9.167
14	8.000	8.667	8.667	8.667	9.333	8.000	7.667	8.500	7.333	7.000	9.167
16	8.538	9.000	8.000	7.000	9.667	9.667	8.000	8.667	6.667	7.000	9.333
18	8.500	8.875	8.250	8.250	9.750	8.750	8.000	9.125	7.000	7.500	9.125
Average of Report and Presentation											
Outcome	Hunter	Pedro	Jordan	Roark	Kelcey	Matt	Brandon	Will	John	Ali	Adam
7	8.750	8.313	8.500	9.167	9.250	8.375	8.000	8.917	7.200	5.667	9.083
8	7.875	8.167	7.778	8.306	9.500	7.958	7.625	8.861	6.733	6.000	8.778
14	8.125	8.318	7.917	8.563	9.521	8.094	7.708	8.729	7.054	5.875	8.833
16	8.207	8.750	7.917	7.896	9.750	9.396	8.469	9.083	6.808	6.000	9.292
18	8.313	8.500	7.875	8.417	9.750	8.500	7.750	8.979	6.925	6.083	8.896

2.2 Reflection on Student Outcome Results

EAMU vector results are provided for all courses in Appendix A. For each EAMU vector, a weighted average is calculated, using the following formula:

$$Weighted\ Average = \frac{3N_E + 2N_A + N_M + 0N_U}{N_E + N_A + N_M + N_U}$$

N is the number of respective designations within the composite vector. Using the weighted average, the vector is then flagged according to the following scales. Red flags indicate a definite problem area which must be addressed; yellow flags indicate potential problems areas which may need to be addressed; white flags indicates satisfactory results; green flags indicate either high level of achievement OR an assessment process that lacks rigor and requires adjustment. If results are white, there is little concern but other colors potentially raise a concern.

Weighted Average Rubric	
Green	≥2.75
White	No Flag
Yellow	<2.0 OR Unsatisfactory >20%
Red	<2.0 & Unsatisfactory >20%

Flag results of yellow, red, and green will be further discussed in this section. However, results of the capstone project are discussed in Section 2.3 and the results of the Graduate Technical Project are discussed in Section 2.4.

The following outcomes were flagged as **yellow** through the 2021-2022 assessment process.

Outcome 2: Natural Sciences

Assessment: Direct assessment of ECE 3013 Mechanics of Materials for Civil Engineers
Evaluation: Assessment results indicated a weighted vector average of 1.77 with 1 student receiving an U. The results were over two semesters but the poor results were from Fall 2021, which will be the focus of this discussion.
Issue: Although the instructor tried to focus on physics to assess this outcome, the instructor indicated that "The poor performing students lack the basic understanding of FBD from Statics and the weakness causes challenges in starting the problem". Statics is a product of physics and it appears that the average student is not being properly prepared to go into mechanics of materials.
Corrective Action: The department has had internal discussions about offering their own statics class to the students and this outcome will prompt more discussions about it at the annual close-the-loop meeting.

Outcome 6: Engineering Mechanics

Assessment: Direct assessment of ECE 3013 Mechanics of Materials for Civil Engineers and ECE 3523 Hydromechanics
Evaluation:

ECE 3013: Assessment results indicated a weighted vector average of 2.00 with 11 students receiving an E, 6 receiving an A, 1 receiving a M and 5 receiving a U. Therefore, this category was flagged due to the high amount of U's but there is diversity in the results. All 5 U's were from the fall 2021 and much better performance was found for spring 2022.
ECE 3523: Assessment results indicated a weighted vector average of 2.00 with 4 students receiving an E, 1 receiving an A, and 2 receiving a U. The % of U's flagged this category as well.
Issue:
ECE 3013: According to the Assessment Summary Form, multiple exam questions were used to assess this outcome. However, "the M and U ratings were assigned as the students did not complete the required tasks.". Therefore, it sounds like the students did not finish a portion of the exams. The program director has seen this in his similar classes as well.
ECE 3523: The instructor indicated "a relatively higher bar is set for performance by selecting this problem as a measure for this outcome." A problem on the final exam is used for the assessment. In summary, after reviewing some student work, it just appeared a poor student just made several mistakes in solving and therefore, did not follow the material well. There is not enough evidence to suggest a corrective action since most of the students still received an E when assessing this outcome.

Outcome 8: Critical Thinking and Problem Solving
Assessment: Direct assessment of EAE 6013, ECE 3013, and ECE 3723.
Evaluation: Assessment results indicated a weighted vector average of 1.91, 2.00 and 1.83, respectively. ECE 3013 was flagged due to two students receiving an U. The others had no students receiving a U.
Issues:
EAE 6013: As described in Section 2.4, the results of EAE 6013 were actually favorable. However, only one student performed in the E vector and 2 students fell in the M vector. The remaining students were assigned an A vector but some did well in the course and received an A grade for the course. The average just came out slightly below 2.0. More about EAE 6013 is discussed in Section 2.4.
ECE 3013: The students received a study guide for the final exam which was used for assessment that outlined the variations that could be considered in the exam. Two students were well prepared based on the material distributed. One student was marginally prepared and two students were unprepared. It is unknown what else could have been done to help the two students.
ECE 3723: The results for this course are for the spring semester 2022 only. The class contained 6 AE students. Two items were used for assessment, one homework assignment and one final exam. The exam results revealed that three students learned the material well. The other three did not know the basics of the flexibility method. It's likely that the students thought the problems would look just like they looked on the homework assignments and were simply not prepared from a conceptual standpoint. They could have been marked as U. The students did better on the homework but as noted by the faculty member, some students have shown to work with others too much and not learn the material on their own.
Corrective actions:
See Section 2.4 for EAE 6013.
It is unknown what additional help could be provided to help the students on the final exam. Most, still did adequate.

For ECE 3723, the instructor will use an accumulation of the final exam for critical thinking in the future. This may provide a better average since the flexibility method is a harder subject in the

course. Still, the instructor must emphasize the importance of homework, starting it early, working independently and completeness.

Outcome 10: Engineering Economics

Assessment: Direct assessment of ECE 4243 Construction Project Management
Evaluation: Assessment results indicated a weighted vector average of 1.60 with 1 student receiving an E, 5 receiving an A, 3 receiving an M, and 1 receiving an U. This was combined results from fall 2021 and spring 2022 with most poor scores from spring 2022, which will be reviewed in more detail.
Issue: The instructor indicated that "the students' knowledge was assessed to ensure their ability to convert present and monthly worth into future worth. It seems that more real-life examples should be provided to improve the overall understanding of this topic. In addition, more time should be allocated. It is recommended to teach this topic in the Construction Engineering course."
Corrective Action: The course coordinator of this course and of ECE 3213 has recommended that engineering economics or estimating be moved to ECE 3213. A new class description has already been drafted and will be in place in fall 2022. In summary, there is not enough time in ECE 4213 to cover estimating in depth.

Outcome 12: Breadth in Architectural Engineering Area

Assessment: Direct assessment of ECE 4753 Steel Design.
Evaluation: Assessment results indicated a weighted vector average of 1.42 with 2 students receiving an E, 2 receiving an A, 7 receiving and M and 1 receiving a U. Final exam is used for assessment of this outcome.
Issue: ECE 4753 is discussed several times in this section for both yellow results and red results. The class contained two students that did exceptionally well, one student that did well and the remaining students received a C+ or lower in the class. Overall, the AE students did poorly. Several civil engineering students did adequate in the course. The results show that at the end of the class, the students did not understand the material well. The performance was unacceptable. Part of the issue is that at this point in their academic career, students have selected a subdiscipline to focus on in the capstone project. Most of the remaining students did not put in enough effort to perform well in the class. They were too engaged in other things and relied on others to do the homework. At the same time, there were some students that did not have the natural abilties to perform well in structures and have demonstrated in capstone projects, that they are stronger in other areas of architectural engineering.
Corrective Action: Encourage students from Day 1 to become engaged in the course. Encourage them to do their own homework and make the class more enjoyable with more practical applications to go along with the drawings shown in class.

Outcome 13: Design

Assessment: Direct assessment of ECE 4753 Steel Design.
Evaluation: Assessment results indicated a weighted vector average of 1.50 with 3 students receiving an E, 1 receiving an A, 7 receiving an M and 1 receiving a U. One homework assignment and one exam problem were used to assess this outcome.
Issue: Overall, the students performed better on the homework than on the exam. One issue with homework is that students work too much together and therefore, do not absorb knowledge individually. The exam problem results brought the EAMU vector down. The common three students that received an A or A- in the class received the E scores. The remaining students did not appear to follow the exam question and made several conceptual mistakes. The most concerning

thing is that the problem was on beam design and was the first problem of the exam. Students are given several examples on the procedure for this.
Corrective Action: Unknown. It is not clear on how the material could have been described better. The instructor may point out material that will definitely be included on the exams.

Outcome 14: Depth in an Architectural Engineering Area
Assessment: Direct assessment of EAE 6013.
Evaluation: EAE 6013 is individually addressed in Section 2.4.

Outcome 18: Lifelong Learning
Assessment: Direct assessment of EAE 6013.
Evaluation: EAE 6013 is individually addressed in Section 2.4.

The following outcome was flagged as **green** through the 2021-2022 assessment process, as described above.

Outcome 1: Mathematics
Assessment: Direct assessment of EAE 5653 Building Optimization, ECE 3424 Soil Mechanics and ECE 3523 Hydromechanics.
Evaluation: Assessment results indicated a weighted vector average of 2.82, 3.0 and 2.86, respectively.
Issue:
ECE 3424: The course only had one AE student so it's difficult to judge the issue. The student was graduate level and likely performed better than the average CE student. No issue detected.
EAE 5653: Students utilized time-dependent calculations to solve a homework problem. No issues were reported by the instructor. However, an analysis involving more rigorous mathematical models is recommended in the future if possible. If the students can identify a mathematical model on their own, that would be beneficial.
ECE 3523: Note, this was an evaluation for Fall 2021 since so few AE students were enrolled spring 2022. The student work was evaluated with an assignment on fluid kinematics. There was a significant application of mathematics that include differential calculus. The instructor did not report an issue though. The instructor indicated the performance strongly supports the in-class observation of the student's capability for this student outcome.

Outcome 5: Material Science
Assessment: Direct assessment of ECE 3424 Soil Mechanics.
Evaluation: Assessment results indicated a weighted vector average of 3.00. Student assessment was performed using a midterm question.
Issue: As mentioned for Outcome 1 Mathematics, there was only one AE student in this class. The student was a graduate student taking a class with junior civil engineers. The student performed well on the midterm. There is not enough evidence for corrective actions to be suggested and the class is evaluated within the civil engineering program as well.

Outcome 7: Experimental Methods and Data Analysis
Assessment: Direct assessment of ECE 3011 Mechanics of Materials for CE Lab and ECE 3424 Soil Mechanics.

Evaluation: ECE 3011: Assessment results indicated a weighted vector average of 2.78 with 14 students receiving an E and 4 students receiving an A. ECE 3424: Weighted vector average of 3.0.
Issue:
ECE 3011: The instructor of the course indicated "The students performed at the level of Excellent and Average for conducting experiments for the 3 assignments reported here. The students were very engaged in learning how to perform their own experiments". Therefore, no issue from the assessment summary form could be detected.
ECE 3424: As mentioned for Outcome 1 Mathematics, there was only one AE student in the class. A midterm was used to do an evaluation and the student did well on the midterm. There is not a big enough sample size to suggest there is an issue.

Outcome 9: Project Management
Assessment: Direct assessment of ECE 3211 Construction Engineering Lab and ECE 3213 Construction Engineering.
Evaluation: ECE 3211: Assessment results indicated a weighted vector average of 2.79 with 19 students receiving an E and 5 students receiving an A. ECE 3213: Assessment results indicated a weighted average of 2.78 with 27 students receiving an E, 3 students receiving an A and 2 students receiving an M. Note that these courses were primarily instructed by the same professor and despite numerous attempts to explain, the instructor did not separate between CE and AE students. The results for both classes include fall and spring semesters.
Issue: There is a vast difference between the results of these classes in comparison to other classes that the outcome is assessed. It does not appear that the material evaluated was rigorous enough to perform the assessment. In one class (ECE 3211), a very short essay was evaluated. In another class, three items were used to perform the assessment but this included one multiple-choice exam question. The contents of the course do not appear rigorous enough for a junior level class. It just seems relatively easy compared to other classes. A new faculty member will be joining the university in the fall 2022 semester and will be teaching this class. Methods of performing assessment and the course content will be evaluated.

Outcome 10: Engineering Economics
Assessment: Direct assessment of ECE 3211 Construction Engineering Lab
Evaluation: Assessment results indicated a weighted vector average of 2.87 with 13 students receiving an E and 2 students receiving an A. This is for fall 2021 only.
Issue: Assessment of engineering economics was only evaluated in the fall 2021 in ECE 3211. The department decided to remove it from this class in the spring 2022 semester since it did not fit well. The instructor used a midterm exam and an assignment on Loader Production to perform the assessment but did not provide much feedback on student performance other than "the overall performances were satisfactory". No actions are recommended at this time since a new instructor will be running the course Fall 2022 and the course material is being revamped.

Outcome 11: Risk and Uncertainty
Assessment: Direct assessment of EAE 5653 Building Optimization.
Evaluation: Assessment results indicated a weighted vector average of 2.91 with 10 students receiving an E and 1 student receiving an A.
Issue:
The instructor used two homework problems to perform this assessment. This class is a little concerning since several of the outcomes ended up green as discussed in this section. It appears

that the evidence that was used to perform the assessment was adequate and challenging and involved the use of computer software. The instructor did not indicate any issues on the Assessment Summary Form.

Outcome 13: Design

Assessment: Direct assessment of EAE 5653 Building Optimization.
Evaluation: Assessment results indicated a weighted vector average of 2.91 with 10 students receiving an E and 1 student receiving an A.
Issue: The student work was evaluated and, in this case, the assignment that was used to perform the assessment seemed straight-forward. A more rigorous deliverable is recommended for performing the assessment of Design, as one of the important outcomes for the AE program. The student that received an A only seemed to receive it for missing one of the questions. There were no issues identified from the Assessment Summary Form.

Outcome 14: Depth in an Architectural Engineering Area

Assessment: Direct assessment of EAE 5653 Building Optimization.
Evaluation: Assessment results indicated a weighted vector average of 2.82 with 9 students receiving an E and 2 students receiving an A.
Issue: Good EAMU results were common for EAE 5653 as discussed in this section. The instructor utilized the final project for performing this assessment, which seemed appropriate for an evaluation of this outcome. Each student had to perform their own project, therefore, there was limited opportunity to get information from others. No major issues were reported by the instructor. Need to re-evaluate whether the degree of difficulty of materials can be adjusted to be more challenging for the students. Other classes instructor teaches do not have this issue.

Outcome 15: Sustainability

Assessment: Direct assessment of ECE 3213 Construction Engineering.
Evaluation: Assessment results indicated a weighted vector average of 2.88 with 29 students receiving an E and 4 students receiving an A. This was over fall and spring semesters and by the same instructor. The instructor did not separate between AE and CE students despite the efforts to get him to do so.
Issue: After review of the student work, the program director found the assignment on sustainability to be average but the exam questions were not challenging. The exam questions were multiple choice and it appears that the exam was on CANVAS, which means students can look up the answers in their notes. This does not appear to be an appropriate item to evaluate their true knowledge on sustainability. It simply does not have enough depth. An essay question would be recommended in the future. However, a new instructor is going to be teaching the class in the fall of 2021 and it is anticipated that deliverables used for assessment will change.

The following outcome was flagged as **red** through the 2021-2022 assessment process, as described above.

Outcome 11: Materials Science

Assessment: Direct assessment of ECE 4753 Steel Design.
Evaluation: Assessment results indicated a weighted vector average of 1.36 with 4 of 11 students receiving a U. This result is very different from the previous year in which Material Science was shown as green for this particular course. However, the instructor decided to assess an exam question that involved a couple different material properties for steel and concrete this time.

Issue: Overall, as the program director has explained in other reviews of assessment, the assessment of material science is difficult to address. Per CEBOK3, the description of material science is closely related to engineering mechanics. However, the program director feels that traditional material science discusses material properties at more of a microscopic level. There is no specific issue with the exam problem that was assessed. Most students just didn't have time to spend on the problem that was asked. The problem lies in coursework that is available in the architectural engineering program that covers this outcome. As mentioned, this has been discussed elsewhere and in the ABET self-study report submitted June 2022. This outcome needs to be evaluated more in the future or terminated from the assessed outcomes.

Outcome 8: Critical Thinking and Problem Solving

Assessment: Direct assessment of ECE 4743 Steel Design.
Evaluation: Assessment results indicated a weighted vector average of 1.40 with 2 students receiving an E, 2 receiving an A, 4 receiving an M and 2 receiving a U. The second midterm was used for assessment.
Issue: For the AE students in the class, two of them received and A and one received and A-. The remainder received a C+ or lower. Therefore, overall, this was not a very strong AE class when it came to structural engineering and was as significant drop off from the previous year. Overall, two of the students demonstrated that they understood the material exceptionally well, although one of them made notable mistakes. There is no evidence that the remaining students understood the material that well. They mostly just tried to follow steps and equations on their crib sheets but really didn't understand the concepts or theory and just solved the problems. Two additional students understood the concepts reasonably well. The remaining students did not.
Corrective action: The instructor primarily feels that a lot of students in the class have already decided they will not do structural engineering and are just trying to pass the class. The majority of the students have shown to be hard-working students from the capstone project. But they don't have the necessary time to dedicate to this class. This was clearly demonstrated on homework submittals. The instructor also needs to make the class more interesting and hopes that the mask lift will improve performance as well and make him more effective once again in the classroom.

Outcome 14: Depth in an Architectural Engineering Area

Assessment: Direct assessment of ECE 4743 Steel Design.
Evaluation: Assessment results indicated a weighted vector average of 1.17. However, 2 students received an E, 2 received an M, 4 received an M and 4 received a U. Two homework assignments on beam and column design were used to perform the assessment.
Issue: All three red flags for this year were all from the same course and as mentioned, two students worked exceptionally hard and understood the material well. One understood it reasonably well and the rest struggled. The average of Homework 2 and Homework 4 was computed for every student. Prior to evaluating the results, it was decided that an 8.5 /10 or higher is considered exceptional, a 7.0 – 8.4 is considered adequate, a 5.5– 6.9 is considered marginal and lower than a 6.0 is considered unacceptable. The results using this scale were not favorable. Only two students received an "E" score and it was noticed during the semester, that these two students worked together on homework. This was a major issue in that students rely on each other too much to complete homework. Other issues with the class were mentioned in the evaluation of Critical Thinking. Students have interest in other disciplines and were engaged in other obligations such as capstone or graduate level work for two of the students.
Corrective action: See previous discussion on Critical Thinking for more information. However, instructor still needs to do a better job emphasizing the importance of homework and the

importance of trying to do it independently and starting early, when the knowledge is fresh in the minds of the students. He may also want to dedicate more time in class to discussing the homework and how to approach it in relation to the lecture notes.

2.3 Refection of Capstone Project Results

Although multiple faculty members are involved in the capstone sequence, the course coordinator is responsible for the final assignments of the EAMU vector based on the student results. The program director performed the assessment for the fall 2021 semester and Dr. Arpan Guha performed the assessment for the spring 2022 semester. The instructors utilized student work and the evaluation of other faculty on rubrics that were derived to assess course materials. A survey was performed specifically for Lifelong Learning in the spring 2022, which was filled out by subdiscipline advisors for each individual student.

The 2021-2022 academic year was the second year the capstone project was performed similar to that for the BSCE program. The overall performance of the students was favorable. Most of the students put in tremendous effort to have quality projects and quality presentations.

The results demonstrate that there are little outcomes of concern since most of the results show an outcome was flagged as white. However, the capstone project is complicating to assess individual students in that several deliverables are submitted by a team. If only individual student work was evaluated, the results may have been different.

The following outcomes were flagged as **yellow** through the 2021-2022 assessment process.

Outcome # 9 – Project Management

Assessment: Reflection of student work: EAE 4022 AE Capstone 1.
Evaluation: Assessment results indicated a weighted vector average of 1.00. All students were marked as a M (since based on team performance) and the progress report was used.
Issue: It is in the opinion of the program director that neither team did an adequate job when it comes to project management. The team without the construction engineer did a vague job on determining project costs and did not provide any information regarding project scheduling. These were minimum requirements for the team. Overall, the performance is considered marginal considering that they still had a lot of additional work to do for their own disciplines and since they received little guidance when it comes to developing an appropriate cost and schedule management plan. For the team with a construction engineer, the instructor evaluated the construction scope and cost and schedule sections. The construction engineer provided very little regarding the scope of work for the discipline. There was some information on underground utilities and some costs for permits. The cost and schedule section provided a little bit of detail but it's known from the progress presentation that the student was not familiar with some of the line items that are associated with the cost.
Corrective Action: The program director continues to attempt to get students to take construction courses earlier in the flowchart. Some of the students have but it is expected that students that take the construction lead in capstone take ECE 4243 CE Project Management in the fall semester. This has not happened yet for the AE Program but it is a must if quality is going to be improved. It is still being debated if the program should require all teams to have a construction lead.

Outcome # 10 – Engineering Economics

Assessment: Reflection of student work: EAE 4022 AE Capstone 1.
Evaluation: Assessment results indicated a weighted vector average of 1.00. All students were marked as a M (since based on team performance) and the progress report was used.
Issue: As mentioned for Outcome #9 Project Management, only one of the two teams had a construction engineer. This team utilized BNI Square Foot 2022 Costbook to perform a cost estimate and broke the cost down into several categories. However, there need to be several other considerations in the design of the project including costs associated with the land around the building. In addition, the student was not familiar with some of the line items in the cost estimate and therefore, there are concerns regarding how accurate the cost is. The other team used RS Means to perform a cost estimate but the cost of $18 million is very concerning considering the size of the building and comparing that to previous buildings from the civil engineering capstone project. It seems as if the cost estimate was extremely vague and did not consider anything except the cost of the building features.
Corrective Action: See comments for Outcome #9 – Project Management. In addition, cost estimating is being added to the course ECE 3213 in the fall 2022. The construction engineering curriculum has been modified by the course coordinator for ECE 3213 and ECE 4243.

The following outcome was flagged as **green** through the 2021-2022 assessment process.

Outcome # 3 – Social Sciences
Assessment: Reflection of student work: EAE 4032 AE Capstone 2.
Evaluation: Assessment results indicated a weighted vector average of 3.00. All students were marked as a E. The introduction and background section of the final report was used for assessment.
Issue: Since all members received an E, the instructor felt the performance was acceptable. However, the evaluation was based on team performance and it's not clear how much each individual student contributed to the social aspects of the projects. In addition, the students had the full year to work on the social aspects of the project, since assessment was performed as part of the final report. Both teams had strong leadership but may have taken on the social aspects portion with limited assistance.
Corrective Action: The only corrective action to consider is the removal of Outcome 3 from EAE 4032 and focus on it in EAE 4022. In EAE 4022, the students develop a project proposal and that is where the social environment is studied in more detail.

Outcome # 15 – Sustainability
Assessment: Reflection of student work: EAE 4032 AE Capstone 2.
Evaluation: Students received an EAMU evaluation of 3.0 with all students receiving an E mark.
Issue: Per the instructor, "the rubric scores the average score received for the Sustainability attribute were 9.125, 9, and 9 for Tech Report 2, Tech Report 3, and the Final Report respectively. This leads the course coordinator to believe that all sub-discipline advisors involved in grading unanimously agreed that each project team had adequately tackled aspects of sustainability in their respective projects. On careful evaluation of both final reports, the course coordinator echoes the outcome of rubric scores". Therefore, there were no concerns about sustainability.
Corrective action: It appears the course instructor properly used rubrics to evaluate sustainability. The only comment is that since tech reports were reviewed, the evaluation could have been based on individual students. It appears that the EAMU vector was based on team results only. The program director is going to revamp the assessment tools and processes used for capstone in the future. Full actions for this outcome are TBD.

Outcome # 20 – Professional Responsibilities

Assessment: Reflection of student ethical behavior: EAE 4032 AE Capstone 2.
Evaluation: Students received an EAMU evaluation of 2.9 with nine students receiving an E mark and one student receiving an A mark.
Issue: Per the instructor, "Uses of professional codes and standards is emphasized in several of the engineering core courses that are part of the architectural engineering program. Examples include AISC, ACI, ASCE, ASHRAE, and IES and it is expected that these are utilized in the courses and properly referenced. While both teams implemented relevant codes and standards in their proposed design, one team did not include the IES standard in the reference section." Overall, the instructor did not comment on there being an issue with the students' strong performance.
Corrective action: As mentioned herein, the program director is going to be developing new methods and procedures that can assess the capstone more cleanly. Numerical results will be used and likely adjusted over the years. It is recommended that this outcome is assessed individually in the future using technical reports.

Outcome # 21 – Ethical Responsibilities

Assessment: Reflection of student ethical behavior: EAE 4022 AE Capstone 1.
Evaluation: Students received an EAMU evaluation of 3.0 with all students receiving an E mark.
Issue: The instructor did not identify any issues with ethics. There were no complaints from other faculty members associated with the capstone project on plagiarism or other issues regarding the accuracy of student work. Therefore, there is no reason to believe that students do not behave unethically. Professional attitudes and professional responsibilities are similar outcomes that could be used to evaluate ethics as well. But to keep the outcomes separate, this assessment is based on unethical behavior only.
Corrective Action: After witnessing the evaluation of the CE Capstone project, the program director is going to reevaluate how this outcome is assessed in future years, either by targeting specific outcomes on current rubrics or by creating a new rubric/survey for performing the assessment. The AE students do not take an ethics class like the CE students, which makes their understanding of ethics more challenging.

2.4 Graduate Technical Project

Rubrics are used to assess the Graduate Technical Project. The primary purpose of using rubrics and the "dimensions" that are part of them is to evaluate the students' performance as it relates to the program student outcomes. For the oral presentations, a student outcome is assessed by averaging the results of all dimensions in which the outcome applies. For instance, Outcome #14 was assessed using the dimensions; Merits, Complexity, Content/Results and Conclusions. For these dimensions, average results were tabulated for both the average score and the average standard deviation.

Results are shown graphically for the presentation in Figure A. An expectation for the program is to average higher than a 7.0/10 for each student outcome which implies the students "meet expectations" and a goal for the program is to average an 8.0/10. The results in Figure A indicate that students met expectations as all results are higher than 7.0/10. However, students only reached a level of 8.0 in Outcome 7 (Experimental Methods and Data Analysis) and Outcome 16

(Communication). At the same time, all the results are similar, which implies that individual student performance is driving the outcome results (meaning if a student did well on the project, they more than likely did well on all outcomes. If a student did poorly on the project, they more than likely did poor with respect to all outcomes). Overall, the results in Figure A indicate the standard deviation for the outcomes is low. However, the program director is aware that some students did not perform as well as others.

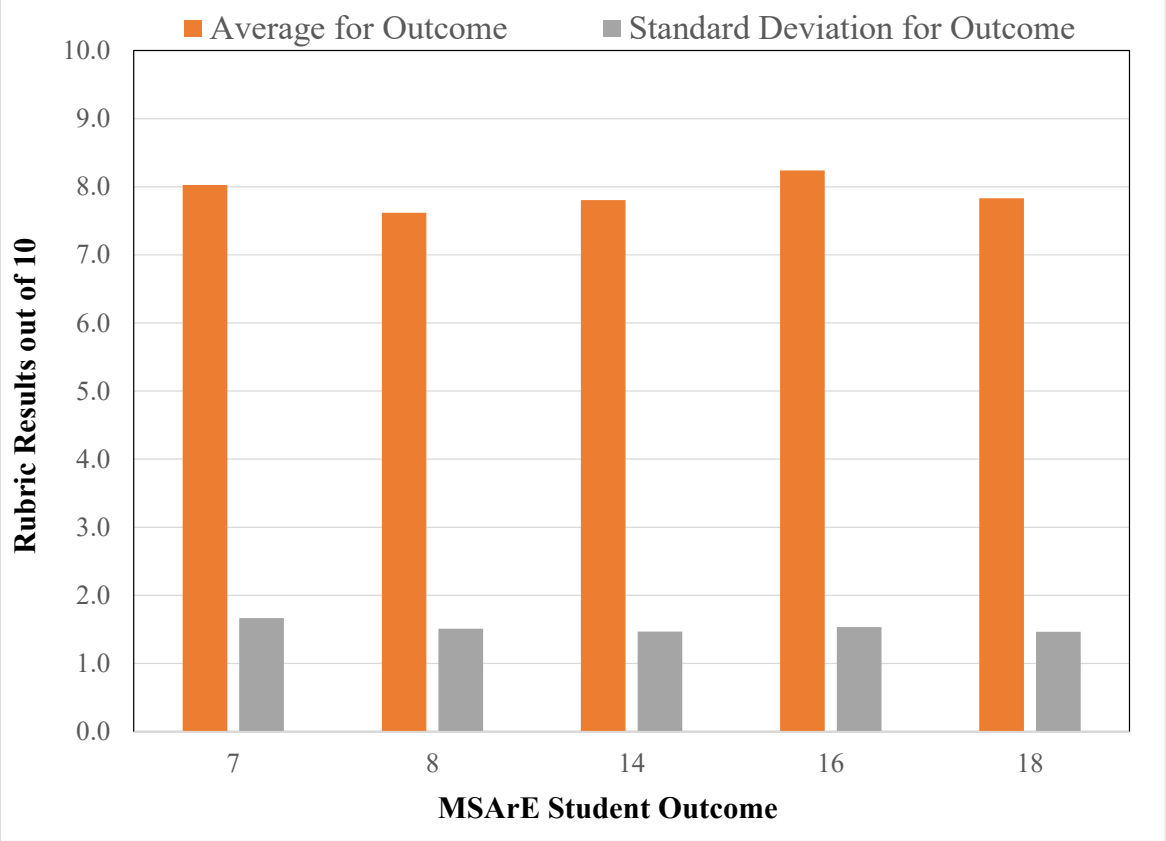


Figure A: Outcome Results Based on Oral Presentations

Similar to the oral presentation, the results of student outcomes were evaluated separately for the final reports. The final reports were evaluated using rubrics that were submitted by the faculty advisor only. Therefore, there are less data points for performing the assessment. Similar to the oral presentation, the student outcomes were linked to the dimensions on the rubric. For each dimension that a student outcome applies, the results were averaged for each outcome. In addition, the standard deviations were averaged for each outcome. The results are shown in Figure B.

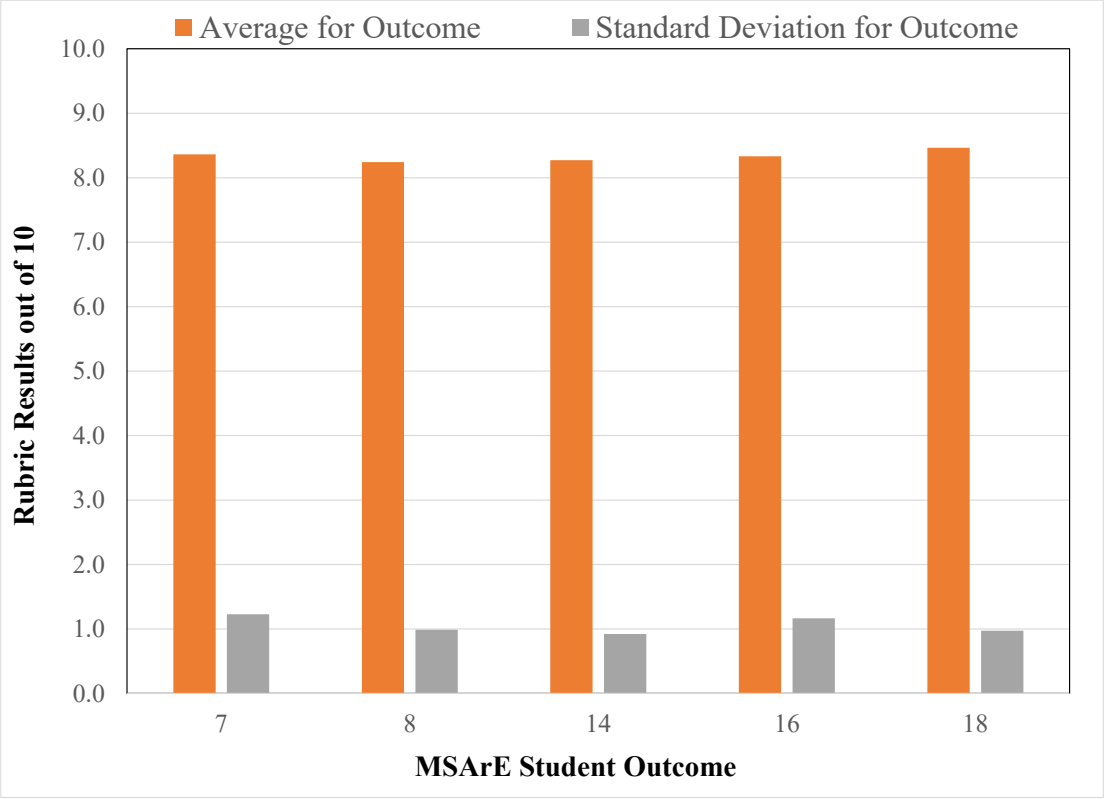


Figure B: Outcome Results Based on Final Reports

Per the rubric, if a student achieves a score higher than 8.0, then the student "exceeds expectations" for that particular dimension. A review of Figure A implies that the average student met or exceeded expectations for the student outcomes. All results indicate that that the students reached the expectation of 7.0/10 for each student outcome. In addition, the results of all standard deviations are relatively low which demonstrates there is not significant scatter in the data. The average results of the student outcomes per the oral presentations are slightly lower than the results from the 2020-2021 academic year. However, the students that were from that year were also required to complete a rigorous capstone project at the same time the program director feels this made the faculty more lenient on the Graduate Project expectations.

Overall, the results of the oral presentations are favorable. However, as mentioned, the average results were a little lower than the previous academic year.

As shown in Figure B, the results of the report are slightly more favorable than the results of the presentations. The results of all outcomes are above 8/10. This indicates that the program goals are obtained. Reasons for differences between the results of the presentations and reports are unclear. However, after looking at the data in more detail, the three students that received the lowest presentation marks overall were graded highest by their advisor for those presentations. Therefore, the advisor appreciated the work that was done during the semester and this was reflected in the final report results.

The results in Tables M and N both indicate that the lowest average for the dimensions was for Conclusions, which influences Outcomes 8, 12, and 18. This was found from the results of the 2020-2021 academic year as well. Therefore, the faculty is not performing adequately enough to ensure the results of the research have value. This observation could also be do to the students

rushing through the project at the end in order to graduate from the university. More importantly, even though the students did the tasks described by the advisor, they still had trouble synthesizing the results and demonstrating what it all means to the profession. This is a concerning issue that needs improvement and the program director will emphasize this requirement as part of the graduate seminar in the fall 2022 semester. The program director will share the assessment results with the class and not include the student names from the previous year.

Table M: Tabulated Rubric Results for Oral Presentations

General Information			Dimensions and Student Outcomes								
			Merits	Complexity	Content / Results	Methodologies	Conclusions	Structure	Visual Aids	Delivery	Audience Questions
Pres. Date	Student	Evaluator	14, 18	8, 14	8, 14	7	8, 14, 18	16	16	16	16
11/16/2021	Hunter Rumball	Guha	9	10	9	9	9	9	8	8	9
11/16/2021	Hunter Rumball	Kowalkowski	9	9	8	8	6	7	8	7	9
11/16/2021	Hunter Rumball	Woo	8	8	8	9	8	8	8	8	9
11/16/2021	Hunter Rumball	Jensen	9	8	7	8	7	7	6	7	8
5/2/2022	Pedro DeLaCruz-Checo	Kowalkowski	8.5	8	7	7.5	7	9	9	8	7
5/2/2022	Pedro DeLaCruz-Checo	Woo	9	8	8.5	9	8.5	9	9	8.5	8.5
5/2/2022	Pedro DeLaCruz-Checo	Guha	9	9	8	8	7	9	10	9	8
5/2/2022	Pedro DeLaCruz-Checo	Jensen	9	7	7	8	7	9	7	9	7
5/4/2022	Jordan Reinhardt	Jensen	8	7	6	7	7	7	7	8	7
5/4/2022	Jordan Reinhardt	Kowalkowski	7	6	6	8	6	8	9	7.5	6.5
5/4/2022	Jordan Reinhardt	Bebawy	9	8	8	9	8	8	9	9	8
5/5/2022	Roark Pargeon	Guha	9	8	8	10	8	9	10	8	8
5/5/2022	Roark Pargeon	Woo	9	9	9	9	8.5	8.5	9	9	9
5/5/2022	Roark Pargeon	Jensen	9	8	8	9	8	9	9	8	9
5/6/2022	Kelcey Heaney	Kowalkowski	10	10	9.5	9.5	9.5	10	10	9.5	10
5/6/2022	Kelcey Heaney	Jensen	10	10	9	9	10	10	9	10	10
5/6/2022	Kelcey Heaney	Woo	9.5	9.5	10	10	9.5	10	10	10	9.5
5/17/2022	Matt Candela	Kowalkowski	9	8	8.5	9.5	7	10	10	9	8
5/17/2022	Matt Candela	Jensen	9	8	8	8	8	9	9	9	9
5/20/2022	Brandon Garcia	Kowalkowski	9	7	8	8	6	8	10	10	9
5/20/2022	Brandon Garcia	Guha	9	8	9	9	8	10	10	10	10
5/20/2022	Brandon Garcia	Hermez	7	7	8	7	6	7	8	9	8
5/20/2022	Brandon Garcia	Goodwin	8	9	8	8	7	8	10	7	9
5/23/2022	Will Fulton	Kowalkowski	9	10	9	9.5	8.5	10	10	9.5	8.5
5/23/2022	Will Fulton	Woo	8.5	9	8.5	10	9	9.5	9	9.5	9
5/23/2022	Will Fulton	Jensen	10	9	9	10	8	10	10	9	10
5/23/2022	John Flesher-McKinney	Kowalkowski	7.5	6	7	7	7	8	8	5	6

5/23/2022	John Flesher-McKinney	Woo	6	8	6	6	6	7.5	8	7.5	6
5/23/2022	John Flesher-McKinney	Jensen	9	8	5	5	5	6	7	7	7
5/23/2022	John Flesher-McKinney	Guha	9	8	6	7	6	6	9	6	7
5/23/2022	John Flesher-McKinney	Nowicki	7	6	7	7	6	6	8	7	7
5/24/2022	Ali Bazzi	Kowalkowski	4	3	3	2	3	3	6	4	2
5/24/2022	Ali Bazzi	Bebawy	6	6	7	6	7	6	8	5	6
5/24/2022	Ali Bazzi	Jensen	5	5	5	5	3	5	5	5	5
5/27/2022	Adam Alger	Jensen	9	8	8	8	8	10	9	9	9
5/27/2022	Adam Alger	Kowalkowski	9	7	8.5	9	8.5	10	9	9.5	9
5/27/2022	Adam Alger	Woo	8.5	9.5	9	9	9	9.5	9	9	9
		Average	8.36	7.89	7.66	8.03	7.30	8.24	8.62	8.09	8.00
		STD Dev	1.35	1.50	1.44	1.67	1.58	1.67	1.28	1.56	1.63

Table N: Tabulated Rubric Results for Final Reports

General Information			Dimensions and Student Outcomes							
Rubric. Date	**Student**	**Faculty Advisor**	**Merits**	**Literature**	**Tech. Writing**	**Structure**	**Methodologies**	**Content / Results**	**References**	**Conclusions/Rec.**
			14, 18	**8, 18**	**16**	**16**	**7**	**8, 14**	**16, 18**	**8, 14, 18**
10/27/2021	Hunter Rumball	Kowalkowski	9	8	8	9	9	7	9	8
5/10/2022	Pedro DeLaCruz-Checo	Woo	9	9	9	9	8.5	8.5	9	8.5
6/2/2022	Jordan Reinhardt	Bebawy	8	8	7	9	8	9	8	9
6/2/2022	Roark Pargeon	Guha	9	8	6	7	9	9	8	8
5/23/2021	Kelcey Heaney	Kowalkowski*	10	10	9.5	9.5	10	9	10	9
5/19/2022	Matt Candela	Kowalkowski	9	9	9	10	9	8	10	7
5/21/2022	Brandon Garcia	Hermez	9	9	8	8	7	8	8	6
5/23/2021	Will Fulton	Kowalkowski*	9	10	9	8	9	8	9	8.5
6/2/2022	John Flesher-McKinney	Guha	7	6	6	6	7	8	8	7
6/2/2022	Ali Bazzi	Bebawy	7	8	7	6	6	7	8	7
	Adam Alger	Woo	9	9	9	9.5	9.5	9.5	9.5	9
		Average	8.64	8.55	7.95	8.27	8.36	8.27	8.77	7.91
		STD Dev	0.92	1.13	1.27	1.40	1.23	0.82	0.82	1.02

* Filled out by Dr. Kowalkowski but students co-advised by Dr. Woo.

2.5 Exit Interviews

Exit interview questionnaires were sent to all graduating students in the MSArE program. A total of 9 students responded to the survey (2 in the fall 2021 and 7 in the spring 2022). Due to the identification of individual faculty members and confidentiality of the students, the exit interviews are not shared in this document. A general reflection of comments is as follows:

Positive Comments:

- Seven of the nine students responded "yes" that their education at Lawrence Tech has prepared them to confidently enter the Architectural Engineering profession. One student wrote "No" and indicated that they missed a few key subjects through their structural classes such as: using ASCE 7-16, timber design, and prestressed concrete design. Another student indicated 50/50 and therefore, neutral.
- All students that mentioned the capstone project and student courses all had positive comments regarding them. One student commented that it's great practical experience to design a building from scratch until almost completion. It was noted, that practical software for all disciplines and drafting skills were both a plus of these courses.
- A couple students mentioned that the technical classes were favorable and there was a lot of practical examples contained within and good use of industry software.
- A few students mentioned they liked the variety of courses in multiple disciplines at the early levels, which gave them good exposure and helped them decide which discipline to go into.
- One student mentioned the close-knit group of students which allowed them to work together and keep each other on pace.
- Students discussed the professors and how much they were involved with the students and the one-on-one relationships that they had.
- Multiple students mentioned the advantage of having adjunct faculty members with industry experience. These students found them as the best professors. However, several students also mentioned there should be more of it in the classrooms and in the studio sections. More adjunct faculty may not be feasible due to the requirements to have full-time faculty teaching courses.
- One student indicated that there is a strong ability to understand and design a complete building and each of its associated systems.
- One student indicated skills from the program are applicable to presenting work and completing things to the highest ability. This program has a strong class schedule and improves constantly to bring forth new learning and standards for students.

Negative Comments:

- Although some positive feedback was received for faculty, some students indicated that the professors have issues teaching even though they are clearly experts in their subject manner. One student felt their needed to be more faculty, at least two of each discipline at the university.

- A couple students complained about the mechanical systems or HVAC systems. However, the amount of students that complained about mechanical systems were not a significant as from the exit interviews the year before.
- One student indicated the cost is too high compared to other accredited universities.
- Several students complained about the graduate curriculum and courses that are not valuable to them. This was particularly true from the structural engineering students that would have preferred taking more courses in structural engineering but other students mentioned it as well.
- Multiple students either complained about the graduate technical project or indicated that more time (semesters) should be dedicated to it. For instance, one student indicated that "Having students think about and select their Master's project in the semester prior to their last year or over the summer. I think the project should be introduced sooner and the proposal should be accepted midway or ¾ way through the first semester." Another student indicated that a better product could be achieved if they were prompted at a minimum 1 semester in advance and had the ability to start experimentation at the beginning of the graduate year.
- Multiple students complained about program changes that occurred over the years, either due to ABET or other reasons.
- One student complained about the prerequisite requirements for various AE courses.

Neutral Comments:

- Two students indicated there should be a specific class on plumbing and fire protection.
- Two students indicated that every subdiscipline should have a studio class like the lighting studio.
- This was also related to a negative comment but multiple students suggested hiring more faculty that have experience in industry. This would offer students the opportunity to learn from many perspectives.

Summary of the comments regarding where students see themselves professionally/academically are as follows:

- Only one of nine students indicated they would still like to be in academia performing research.
- All students indicated they want to be working in industry and performing professional designs.
- Six of nine students indicated they would have a PE or are working towards a PE.
- The participants mentioned three of the four disciplines working in either structural engineering, mechanical engineering or electrical/lighting engineering. None indicated they see themselves working in multiple subdisciplines, although one student indicated they see themselves as a registered architect as well.

3. Assessment Plan for 2022-2025 Academic Years

At this time of writing this report, the program is in transition of the assessment plan for 2022-2023. The program has recently developed PIs for the student outcomes and have recently developed a curriculum map for relating the student outcomes/PIs to the different courses. The specific items that will be used to evaluate each of the outcomes is currently unclear. However, it is anticipated that direct assessment will still be performed using student homework, projects, exams and quizzes. Other courses such as capstone and graduate technical project will use rubrics to evaluate student work.

Courses that are targeted for each of the student outcomes are provided in Table 1 and in Table 2.

The MSArE program has employed common rubrics for assessment of the senior design sequence in EAE 4022 and EAE 4032 (AE Capstone). They were originally developed by modifying existing rubrics from the BSCE student capstone (ECE 4022 and ECE 4032), which have evolved over the years. These rubrics are used to evaluate oral and poster presentations, team progress reports, teamwork and leadership, as well as acquire and utilize new knowledge. Faculty also develop subdiscipline specific rubrics for assessment of the individual technical reports focusing on design and communication. These rubrics will be revisited to align them with the descriptions of levels of student performance for each performance indicator. The faculty will evaluate if generic or task specific rubrics are preferred. In January and February of 2023, the faculty will revise and develop rubrics for assessment of Student Outcomes (2), (3) and (5). The rubrics will be piloted using past student evidence such as individual technical reports, team progress reports and recorded progress presentations. The faculty will deploy the final rubrics in the senior design course EAE 4032.

For EAE 6013 AE Graduate Project, the program faculty has rubrics established to assess the final oral presentations and final reports. These rubrics will be revised in January 2023 and February 2023 for assessment of Student Outcomes (3), (7) and (9) at the highest level per the proposed performance indicators. The rubrics will be piloted using past student evidence from spring 2022 to summer 2022. The faculty will deploy the final rubrics at the end of the spring 2023 semester.

In non-capstone or non-graduate project courses, traditionally, the faculty has employed task specific rubrics for evaluating the student evidence. The course coordinator will coordinate with faculty to review if generic or target rubrics should be developed and if common exam problems should be developed in subjects taught by multiple faculty members. This later activity will be rolled out during spring of 2023 and in the coming academic year of 2023-24.

BS in Audio Engineering Technology

1. Assessment Plan and Summary

ABET does not have specific criteria for assessing Audio Engineering/Technology programs. ABET suggests that the general criteria should be used for the assessments of such programs.

The plan has changed to reflect the new ABET criteria of 1-5 instead of a-k.

Accordingly, the Student Outcomes 1 through 5 are used in designing the assessment plan.

1) an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;
2) an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;
3) an ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;
4) an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and
5) an ability to function effectively as a member as well as a leader on technical teams.

The program level assessment plan is presented in Table 1. Each outcome is assessed when respective courses are offered on a biennial basis. Loop-closing occur biennially.

Table 1: Assessment Plan for the BS in Audio Engineering Technology

Undergraduate Program Level Learning Outcomes	BSAET Outcomes	Assessment Strategy	Metrics/ Indicators**
TECHNOLOGY 1. Apply advanced technologies to practical and theoretical problems. (Bloom's 3) 2. Design and conduct experiments. (Bloom's 4) 3. Analyze and interpret data using appropriate tools (e.g., Excel, Minitab) (Bloom's 3)	1 4 2	Assignments in TAS4103, TIE4115 Assignments in TME3113, TEE4224 Assignments in TAS4103, TEE4214	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives
ETHICS 1. Demonstrate critical thinking with respect to ethical dilemmas (Bloom's 3) 2. Discern between personal and professional ethical responsibilities (Bloom's 2) 3. Identify the ethical codes adopted by relevant professional associations. (2) 4. Predict possible social consequences of engineering/science ethical decisions. (3)	5	Assignments in EGE3022	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives
LEADERSHIP 1. Identify theories, models, and practices as they pertain to a personal style and philosophy of leadership. (Bloom's 1) 2. Explain the difference between leadership and management. (Bloom's 2) 3. Differentiate the characteristics of effective and ineffective leadership. (Bloom's 3)	5	Assignments in EGE3022	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives
TEAMWORK 1. Discuss various types of conflict and methods of resolution. (Bloom's 2) 2. Practice tools and techniques for team consensus building. (Bloom's 3) 3. Identify and integrate personal team player style in a team setting. (Bloom's 3)	5	Assignments in TAS4103, TIE4115	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives
VISUAL COMMUNICATION Demonstrate professional standards in graphical communication (including figures, plots, tables, and posters) by integrating evidence and analysis within a coherent structure. (Bloom's 3 and 4)	3	Graphical assignments in TME3333, TAS4103	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

Between 2019 and 2021, the Engineering Technology program assessed five Undergraduate Discipline-Specific Learning Outcomes:

- **Learning Outcome 1: Technology** was evaluated through TIE4115, TAS4103, TEE4214, TME3113, and TEE4224. Most students met or exceeded expectations (≥75%) across assessed outcomes. A minor shortfall was noted in TEE4214, with only 74% meeting the benchmark; the instructor will incorporate more examples and workshops to address this. Outcome overall deemed satisfactorily met.
- **Learning Outcome 2: Visual Communication** was assessed via final projects in TIE4115 and TAS4103, with over 82% of students scoring above 75%. No issues were reported, and performance was considered strong.
- **Learning Outcome 3: Leadership** is assessed at the College level and was not reported here.
- **Learning Outcome 4: Teamwork** showed consistent high performance (86% scoring ≥75%) in both TIE4115 and TAS4103. No issues were noted; the outcome is fully met.
- **Learning Outcome 5: Ethics** is assessed at the College level and not included in this report.

Overall, four out of five outcomes were directly assessed, and the results confirm that program learning goals are being met with minor adjustments planned to further strengthen student performance.

3. Assessment Plan for 2022-2025 Academic Years

1) Continue assessment plan as shown in Table 1.
2) All syllabi and courses learning objectives are to be reviewed to make sure that they are measurable and address the required performance indicators.
3) One-to-one meetings will be planned with instructors to improve the assessment process.

BS in Biomedical Engineering

1. Assessment Plan and Summary

The assessment plan the BS in Biomedical Engineering (BSBME) program is shown in Table 1. Learning outcomes are assessed each semester courses are offered on a triennial basis, and loop-closing occurs annually. ABET Outcomes were updated for 2019 from a-k (and l, m, n, o for biomedical engineering) to 1-7. The modified BSBME Key Performance Indicators for this new system is mapped in Table 2. The BSBME curriculum was mapped to indicate where Biomedical Engineering Key Performance Indicators were being introduced, reinforced, or emphasized (see Table 3). The course direct assessment plan for 2019-2022 is highlighted in green.

Table 1: Assessment Plan for Biomedical Engineering Program

Undergraduate Program Level Learning Outcomes	Supporting Program learning Objective	Assessment Strategy	Metrics/ Indicators**
ETHICS	4-b (L3) Demonstrate knowledge of the professional code of ethics and government regulations. 4-c (L3) Explain the ethical dimensions of a biomedical engineering problem.	Direct assessment of student assignments from BME 3002 Faculty evaluation of senior design BME 4013, BME 4022 Course objective survey Alumni survey	EAMU target: Green or white flag.
LEADERSHIP	5-c (L3) Demonstrate effective leadership characteristics.	Direct assessment of student assignments from EGE 2123 Faculty evaluation of senior design BME 4013, BME 4022 Course objective survey Alumni survey	EAMU target: Green or white flag.
TEAMWORK	5-a (L3) Demonstrate personal responsibilities in a team. 5-b (L3) Share responsibilities and collaborate in a cross-functional team.	Direct assessment of student assignments from BME 1002, EGE 2123 Faculty evaluation of senior design BME 4013, BME 4022 Course objective survey Alumni survey	EAMU target: Green or white flag.
TECHNOLOGY	1-d (L3) Apply engineering principles to a system, device, or process. 1-f (L3) Employ techniques, skills and tools relevant to biomedical systems. 6-d (L3) Describe the challenges associated with interactions between living tissues or cells and engineered devices or materials.	Direct assessment of student assignments from BME 4103, BME 4203, BME 4801 Faculty evaluation of senior design BME 4013, BME 4022 Course objective survey Alumni survey	EAMU target: Green or white flag.

VISUAL COMMUNICATION	3-a (L3) Construct and deliver a logical and articulate communication based on independent work. 3-b (L3) Create a plan, and document methods, observations, and results of an experiment or a project. 3-c (L3) Organize and represent data collected in a clear and concise format that enhances the ability to interpret it.	Direct assessment of student assignments from BME 3101, BME 3213 Faculty evaluation of senior design BME 4013, BME 4022 Course objective survey Alumni survey	EAMU target: Green or white flag.
KNOWLEDGE IN DISCIPLINE	1-a (L3) Implement mathematical algebra, geometry, calculus, probability techniques, differential equations and/or statistics. 1-b (L3) Apply biology, chemistry, calculus-based physics or human physiology principles. 1-c (L3) Write a problem statement for a biomedical engineering problem. 1-e (L4) Evaluate solutions to a biomedical engineering problem. 2-a (L3) Use the engineering design process to generate potential solutions to a biomedical need. 2-b (L3) Examine realistic constraints related to the proposed solution. 2-c (L3) Implement, test, and demonstrate an engineered solution that meets design specifications. 4-a (L3) Recognize the contribution of science, technology, engineering and/or mathematics to society. 4-d (L3) Describe state-of-the-art and new trends in biomedical engineering. 6-a (L3) Conduct experimental procedures to measure and record data. 6-b (L3) Examine data using appropriate analytical techniques. 6-c (L3) Compose a scientific hypothesis and test the hypothesis using experimental data. 7-a (L3) Collect relevant technical information, data, and ideas from multiple sources. 7-b (L3) Recognize opportunities that enhance professional career development.	Direct assessment of student assignments from BME 1002, BME 3301, BME 3101, BME 3103, BME 3113, BME 3213, BME 3301, BME 3303, BME 3703, BME 4103, BME 4113, BME 4201, BME 4203, BME 4313, BME 4801, BME 4803 Faculty evaluation of senior design BME 4013, BME 4022 Course objective survey Alumni survey	EAMU target: Green or white flag.

[1]: Each ABET outcome is assessed using a combination of several assessment tools. Each assessment tool may involve evaluation/analysis of multiple courses or other components. Details of this approach can be found in the *BME program annual assessment report 2016-2017*.

The target level of attainment is quantified using Bloom's taxonomy:
Level 1 (L1) – Knowledge

Level 2 (L2) – Comprehension
Level 3 (L3) – Application
Level 4 (L4) – Analysis
Level 5 (L5) – Synthesis
Level 6 (L6) - Evaluation

[2]: Each key performance indicator is assessed using an "excellent, Adequate, Minimal, Unsatisfactory" (EAMU) vector. The description and nominal measurement ranges for each level are set as appropriate to the task associated with the key performance indicator. The performance vectors are classified into four categories: "Red flag", "Yellow flag", "White flag" and "Green flag" as described below:

- Red flag: Below 2.0 average performance vector and more than 10% of the class demonstrating unsatisfactory performance
- Yellow flag: Below 2.0 average performance vector and less than 10% of the class demonstrating unsatisfactory performance; or above 2.0 average performance vector and more than 10% of the class demonstrating unsatisfactory performance
- White flag: Not under Red, Yellow or Green flag classifications
- Green flag: Above 2.75 average performance vector and no indication of any unsatisfactory performance

Details of the KPI assessment method can be found in the *BME program annual assessment report 2016-2017.*

[3:] The 3-year staggered rotation schedule was decided by all BME faculty in order to achieve a more meaningful and sustainable direct assessment process. If assessment on one course shows lower than accepted level of achievement on a particular KPI, it will be re-assessed the following year based on proposed actions for improvement. In the course direct assessment report each instructor produces, a general observation will be made on the overall student achievement of all relevant KPIs to capture any abnormalities.

Table 2: Curriculum Map for BME Program

Course	Biomedical Engineering Program Key Performance Indicator	1-a (L3)	1-b (L3)	1-c (L3)	1-d (L3)	1-e (L4)	1-f (L3)	2-a (L3)	2-b (L3)	2-c (L3)	3-a (L3)	3-b (L3)	3-c (L3)	4-a (L3)	4-b (L3)	4-c (L3)	4-d (L3)	5-a (L3)	5-b (L3)	5-c (L3)	6-a (L3)	6-b (L3)	6-c (L3)	6-d (L3)	7-a (L3)	7-b (L3)
		Math	Science	Problem statement	Engineering principles	Evaluate solutions	Apply Tools	Engineering design process	Realistic constraints	Engineered solution	Articulate Communication	Document project	Organize data	STEM in society	Regulations	Ethics	State-of-the-art	Team responsibilities	Collaborate	Leadership	Experimental procedures	Analyse data	Scientific hypothesis	Bio-material interactions	Collect information	Recognize opportunities
EGE 1001	Fund. Eng. Design Proj.			I	I	I	I	I	I	I	I	I		I		I	I	I	I	I					I	I
BME 1002	Intro to BME		I	I	I		I	I			I	I	I	I	I		I	I		I	I		I	I	I	I
BME 1201	Graphics Lab						R		R		I	R	R													
BME 1202	Comp. App. Lab	I			R		R				I							I				I				
EGE 2123	Ent. Eng. Design Studio			R	R	R	R	R	R	R	R	R						R	R	R						R
EGE 2013	Statics	R	R		R																					
EGE 3012	Eng. Cost Analysis					R			R						R											
EGE 3022	Lead. & Prof. Dev. For Eng.													R	R	R		E	E	E						
EEE 2123	Circuits & Electronics	R	R		R																					
BME 3002	Best Practices										R			E	E	E	R									R
BME 3103	BioInstrum.	E	E										R								R	R		R	R	
BME 3101	BioInstrum. Lab						E						E					R				E	R			
BME 3213	Biomat.		R		R	R					E						E							E	R	
BME 3303	Biomech	E	R		R			R			R			R											R	
BME 3301	Biomech Lab	R	R		E	R	E				R	R	R				R	R			E	E	E		R	
BME 3703	Biotransp	E	R		E	R					R													R		
BME 3113	Wearable Tech Studio			R	R	R	R	E	R	R	E	R		R			E	R	E	R					E	R
BME 4113	Med. Dev Design	R	E	R	E	R	R	E	E	R	R	R		R	E		E				R			E	R	R
BME 4103	Fnd. Med. Imaging			E			R																	E		
BME 4203	MEMS	R	R	E	E	E		R	E	E	R						R								R	R
BME 4201	MEMS Lab				E	R	E	R	R	R		E	E								E	E			R	
BME 4313	Tissue Mech.	E	E			E					R			R	E		E							E	R	
BME 4803	Tissue Eng.		E	E	E	E			E		R			R		E	E							E	R	E
BME 4801	Tissue Eng. Lab		R	E	E		E						E					R			E	E	E	E		
BME 4013	Projects I	R	R	E	E	E	E	E	E	R	E	E	E	E	E	R	E	R	R	E	R	R	R	E	E	E
BME 4022	Projects 2	R	R	E	E	E	E	E	E	E	E	E	E	E	E	R	E	E	E	E	E	E	E	E	E	E

Green highlights indicates course will be assessed for KPI during 2020-2022

Introduce (I): corresponds to instances where the student outcomes are supported at an introductory level in a course.
Reinforce (R): achieved when a course serves to reinforce the attainment of a student outcome that was supported previously at an introductory level in another course.
Emphasize (E): achieved when a student outcome is supported at a more focused and advanced level.

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

The BME program assessed multiple ABET-aligned outcomes from 2019–2021, using direct assessments, course evaluations, and exit interviews. The outcomes generally showed strong student performance, with a few noted areas for improvement.

- **Outcome 1 (Math, Science, and Engineering Knowledge):** Assessed through courses like Biotransport, Tissue Mechanics, and Medical Imaging. Most KPIs were met, though Biotransport presented recurring difficulties with mathematical derivations (KPI 1-a). Instructors responded with hybrid learning improvements, more in-class examples, and simulation tools.
- **Outcome 2 & 3 (Engineering Design):** Assessed through project-based courses (e.g., Medical Device Design, Wearable Tech, Senior Projects). While performance was generally strong, challenges during the pandemic impacted group collaboration and access to LTU resources. Actions included improved planning, smaller group sizes, and more structured online support.
- **Outcome 4 (Societal Impact & Ethics):** Evaluated in courses such as Tissue Mechanics and Biomedical Best Practices. Students demonstrated strong engagement with ethical and contextual considerations, aided by activities like IRB projects and journal clubs.
- **Outcome 5 (Teamwork):** Students collaborated effectively using contracts, peer evaluations, and teamwork exercises. This outcome was supported through dedicated project-based courses and structured early-semester team-building.
- **Outcome 6 (Experimentation & Data Analysis):** Students were generally successful in labs such as Bioinstrumentation and Medical Imaging, although some struggled with interpreting open-ended questions related to MRI in BME 4103. Planned revisions will shift more time to this topic.
- **Outcome 7 (Lifelong Learning):** Students showed the ability to acquire new knowledge via targeted assignments (e.g., job-market research and BioMEMS). Some course objectives lacked clarity, prompting planned revisions to learning goals and expectations.

Senior Design Projects:
Senior design projects from 2020–2022 showed improvement in quality and integration of industry collaboration (e.g., Lear ISP). Challenges included supply chain delays and varying familiarity with tools like 3D printing. The flipped classroom structure for BME Projects I was effective and will be continued, with refinements in scheduling and group formation.

Exit Interviews:
Most students felt well-prepared for careers or graduate study. Many praised hands-on learning, mentorship, and the tight-knit culture of the department. Key areas for enhancement included:

- Stronger instruction in circuits, programming, and CAD
- More sub-discipline-specific electives
- Expanded connections to industry for internships
- Better support for student-athletes

Action Plans Across Years:
Ongoing improvements include:

- Revising course objectives for clarity and relevance
- Integrating more hands-on activities post-COVID

- Enhancing early exposure to technical skills (e.g., programming)
- Encouraging IRB preparation in all senior projects
- Strengthening industry and alumni engagement

3. Assessment Plan for 2022-2025 Academic Years

Table 3: 2022-2025 Direct Assessment Plan

SO	KPI		Course	Instructor
(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	1-a	a-1 (L3): Implement mathematical algebra, geometry, calculus, probability techniques, differential equations and/or statistics	**BME 3703** Biotransport	Li (Fall 2022)
			BME 3303 Biomechanics	Meyer (Fall 2022)
	1-b	a-2 (L3): Apply biology, chemistry, calculus-based physics or human physiology principles	**BME 4313** Tissue Mechanics	Meyer (Spring 2023)
			BME 4803 Tissue Eng	Li (Fall 2022)
	1-c	e-1 (L3): Write a problem statement for a biomedical engineering problem	**BME 3213** Biomaterials	Lancina (Spring 2023)
	1-d	a-3 (L3): Apply engineering principles to a system, device, or process	**BME 4203** Intro to MEMS	Li (Spring 2023)
	1-e	e-2 (L3): Evaluate solutions to a biomedical engineering problem	**BME 4113** Medical Device Design	Jiang (Spring 2023)
	1-f	k-1 (L3) Employ techniques, skills and tools relevant to biomedical systems	**BME 3101** Bioinstrum Lab	Peponis (Spring 2023)
(2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	2-a	c-1 (L3): Use the engineering design process to generate potential solutions to a biomedical need	**BME 3113** Wearable Tech Studio	Meyer (Fall 2022)
	2-b	c-2 (L4): Examine realistic constraints related to the proposed solution	**BME 4103** Medical Imaging	Jiang (Fall 2022)
	2-c	c-3 (L3): Implement, test, and demonstrate an engineered solution that meets design specifications	**BME 4022** Senior Projects 2	Lancina (Spring 2023)

1. Indirect assessment of course leaning objective survey: to be conducted for all BME courses.
2. Senior design: both faculty evaluation and IAB evaluation to be conducted.
3. Exit interview: to be conducted by Dr. Li in Spring 2023.

BS in Civil Engineering

1. Assessment Plan and Summary

The assessment plan for the program is shown in Table 1. Table 2 shows the mapping of courses onto the program assessment outcomes. Learning outcomes assessed for the 2019-2021 academic years are listed in Section 2 of this report, including a detailed description of loop closing evaluation.

The ABET Self-Study Report was prepared for submission on June 30, 2022. The BSCE program utilized the Civil Engineering Body of Knowledge 3 (CEBOK3) the Student Outcomes (1) through (21). As part of the ABET SSR process these were mapped to ABET Criterion 3 Student Outcomes (1) through (7). The assessment plan, curriculum map and the discussion to the extent to which the outcomes are attained are presented using Criterion 3 Student Outcome (1) through (7). A number of the CEBOK3 Student Outcomes do not match to the ABET Student Outcomes (1) through (7) and are not evaluated in this round. This report reports on the summative assessment of each student outcome.

E, A, M, U indicate performance levels on an indicator. The list below describes the strategy for assigning E, A, M and U ratings to student work.

Vector Designation	Measure of attainment	Description
E	≥ 90%	**Excellent:** students applied knowledge with little or no conceptual or procedural errors
A	75% to 89%	**Acceptable:** students applied knowledge with no significant conceptual errors and only minor procedural errors
M	60% to 74%	**Minimal:** students applied knowledge with occasional conceptual errors and minor procedural errors
U	≤ 59%	**Unsatisfactory:** students applied knowledge and made significant conceptual and/or procedural errors
NA		**Not Applicable:** outcome was not addressed during the semester

The first component of the EAMU Performance Target is a weighted average calculated using the following formula and where N is the number of respective designations within the vector.

$$Weighted\ Average = \frac{3N_E + 2N_A + N_M + 0N_U}{N_E + N_A + N_M + N_U}$$

The second component of the performance target is a threshold that a maximum of 20% of the evidence may be assigned the designation U.

The overall student performance on an indicator (evidence) is evaluated based on the average vector value and the % of students at the level Unsatisfactory. The table below shows the evaluation guide (EAMU performance target) by which each set of evidence is evaluated.

EAMU Performance Target Triggers	
Green	≥ 2.75
White	No Flag
Yellow	< 2.0 OR Unsatisfactory ≥ 20%
Red	< 2.0 & Unsatisfactory ≥ 20%

The annual Civil & Architectural Engineering Close-the-loop meeting took place in May 15, 2022. Department Chair, Elin Jensen, prepared this assessment report.

Table 1: Assessment Plan for BS in Civil Engineering Program

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
DESIGN	SO (2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors (Bloom's 5)	Assessment and Evaluation (direct measures) Math (ECE4032, ECE 4051)	EAMU Vector weighted average of 2.0 or above; < 20% scored at U.
ETHICS	SO (4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts (Bloom's 4)	Assessment and Evaluation (direct measures) Ethics (ECE4051)	EAMU Vector weighted average of 2.0 or above; < 20% scored at U.
EXPERIMENTAL	SO (6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (Bloom's 4)	Assessment and Evaluation (direct measures) Experiments (ECE4761, ECE3324, ECE3424, ECE3821) Critical Thinking & Solving (ECE3324, ECE 3821O	EAMU Vector weighted average of 2.0 or above; < 20% scored at U.
LEADERSHIP	SO (4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts (Bloom's 4)	Performance Appraisal (direct measure) Leadership (ECE 4032) Self- & Peer Evaluation (indirect measure) Leadership (ECE 4032)	EAMU Vector weighted average of 2.0 or above; < 20% scored at U.
MATH, SCIENCE & ENGINEERING PRINCIPLES	SO (1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (Bloom's 4)	Assessment and Evaluation (direct measures) Math (ECE3523 & ECE3723) Natural Science (ECE 3013, ECE 4544) Engr Mechanics (ECE3723) Critical Thinking & Solving (ECE4243, ECE 4544, ECE4743)	EAMU Vector weighted average of 2.0 or above; < 20% scored at U.

TEAMWORK	SO (5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives (Bloom's 3)	Performance Appraisal (direct measure) Team work (ECE 4032) Self- & Peer Evaluation (indirect measure) Team work (ECE 4032)	EAMU Vector weighted average of 2.0 or above; < 20% scored at U. A score of 4 on a 5-point Likert Scale
TECHNOLOGY	SO (7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies (Bloom's 4)	Faculty Appraisal (direct measure) Life- long Learning (ECE4032)	EAMU Vector weighted average of 2.0 or above; < 20% scored at U.
VISUAL COMMUNICATION	SO (3) an ability to communicate effectively with a range of audiences (Bloom's 5)	Performance Appraisal (direct measure) Written & Oral (ECE 4032) Self- & Peer Evaluation (indirect measure) Team work (ECE 4032)	EAMU Vector weighted average of 2.0 or above; < 20% scored at U.

The eight LTU Undergraduate Program Level Assessment Outcomes maps to the ABET Criterion 3 Student Outcomes (denoted learning objectives at LTU). The list below is used to interpret both Table 1 and Table 2. Assessment is only reported at the summative level (indicated by the highest Bloom's level of learning)

DESIGN → SO (2)
ETHICS → SO (4)
EXPERIMENTAL → SO (6)
LEADERSHIP → SO (5)
MATH, SCIENCE & ENGINEERING PRINCIPLES → SO (1)
TEAMWORK → SO (5)
TECHNOLOGY → SO (7)
VISUAL COMMUNICATION → SO (3)

Table 2: BSCE Curriculum Map of ABET SO (1) through (7) to CEBOK: SO1, 2, 3, 4, 6, 7, 8, 10, 13, 15, 16, 17, 18, 20, 21.

ABET /	SO(1)				SO(2)					SO(3)	SO(4)			SO(5)	SO(6)		SO(7)
BSCE	SO1	SO2	SO6	SO8	SO3	SO4	SO10	SO13	SO15	SO16	SO10	SO20	SO21	SO17	SO7	SO8	SO18
Required Civil Engineering Subjects																	
1011	1			3	2	2		3		4		3	3	3		3	2
1013	3			3						3				3	3#	3	
1101				2#				1								2#	
1102	1			2#												2#	
1413		3	2	3				3		4		2	2	3	3	3	
3011	2	1		3				1							3#	3	
3013	3	3	3	3												3	
3211	2			3				1		3						3	
3213			1				2	2	2	3	2						
3324	3	1		3				3		4					4#	3	
3424	2	1	3	3				1		4				3	4#	3	
3523	3		3	3												3	
3723	3		4#	3				3#								3	
3821	2	1		3				1		4				3	4#	3	
3823	3			3	2			3		4				3	3	3	
4022			3	3	3	3		4	3	5		4	4	3		3	4
4032					3	3		5#	3	5		4	4	3			4
4051						3			2	4		4	4				3
4243				4			2	4#		4	2			3		4	
4544	3	3	4	4				4		4				3	4#	4	
4743	3		3	4				4		4						4	
4761	3		4							4				3	4#		
LEVEL	L3	L3	L4	L4	L3	L3	L2	L5	L3	L5	L2	L4	L4	L3	L4	L3	L4

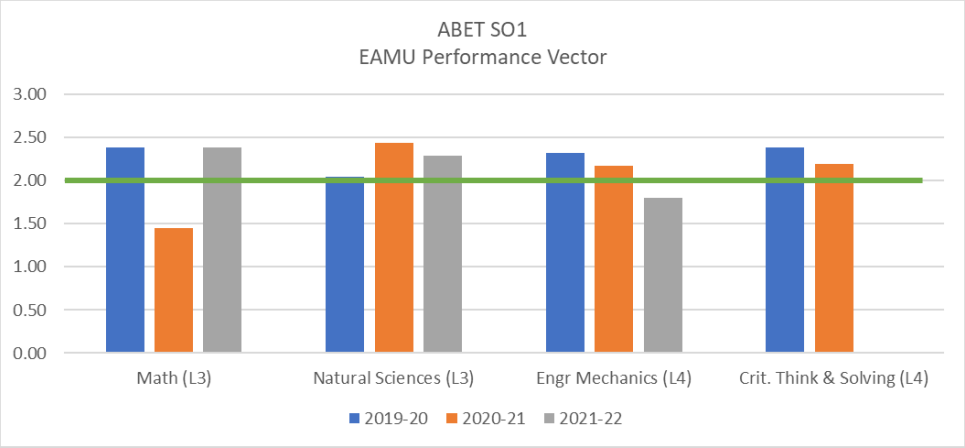
The Level (LX) represents the level of cognitive achievement (level of attainment) for a particular outcome in a particular course.

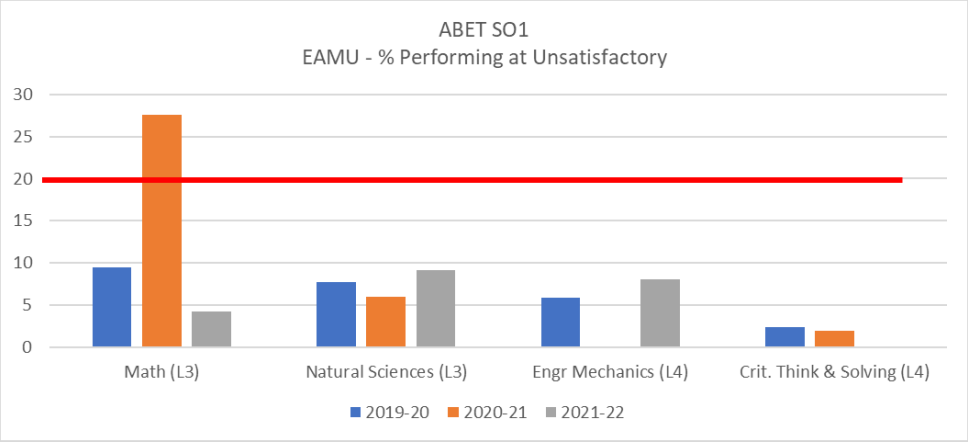
Level 1 (**L1**): Remember
Level 2 (**L2**): Comprehend
Level 3 (**L3**): Apply
Level 4 (**L4**): Analyze
Level 5 (**L5**): Synthesize
Level 6 (**L6**): Evaluate

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

Learning Outcome: ABET Student Outcome (1) – ABET SO(1)

ABET Student Outcomes	BSCE Student Outcomes
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	1. **Mathematics**: Apply mathematics, including differential equations to solve engineering problems. (L3) 2. **Natural Sciences**: Apply principles of natural science to solve engineering problems (L3) 6. **Engineering Mechanics**: Apply concepts and principles of solid and fluid mechanics to solve engineering problems (L4) 8. **Critical Thinking and Problem Solving**: Use a critical thinking process to formulate an effective solution to a complex civil engineering problem (L4)





Assessment and Evaluation:
Mathematics (L3) was assessed in ECE 3523 Hydromechanics and ECE 3723 Theory of Structures. The threshold for EAMU Performance Target was met. The student evidence scored demonstrated students

the ability to solve the velocity field of a given fluid using the technique of separation of variables and the finite difference method to solve differential equations.

Natural Sciences (L3) is measured by the students' ability to apply propriate science principles to solve engineering problem with no conceptual errors. In ECE 3013 students demonstrate the ability to establish the free body diagram of internal forces acting on axial member system, a shaft or a beam. In ECE 4544 students demonstrate the ability to apply the Continuity Equation, the Modified Bernoulli Equation, Specific Energy and the Momentum Equation. The threshold for EAMU Performance Target was met for Natural Sciences.

Engineering Mechanics (L4) is measured by the students' ability to apply engineering mechanics in the solution of a civil engineering problem. In ECE 3723 Theory of Structures students establish M-function, determine internal stresses and identify beam boundary conditions for the determining deflection of transverse loaded beam. The threshold for EAMU Performance Target was not met for Engineering Mechanics in ECE 3723 Theory of Structures.

Critical Thinking and Problem Solving (L4) is measured by the students' ability to apply critical thinking skills to solve a complex engineering problem. Data was not collected in 2021-22 at the level of L4.

Issue:
Previous year's concern in mathematics was likely related to the changes in delivery mode during the COVID 19 Pandemic. Faculty will to monitor the student performance

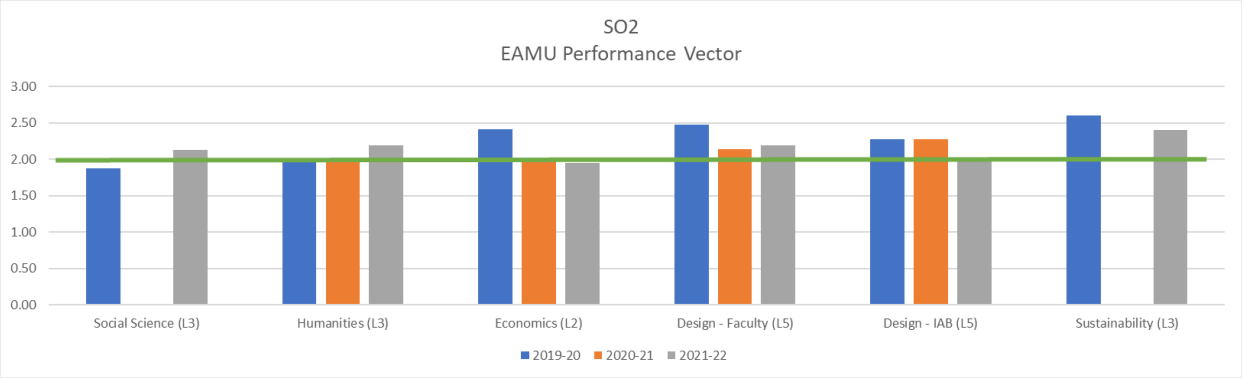
Current/Future Actions:
Assessment of Concrete Design, Hydraulic Engineering and Construction Project Management will be added to the coming assessment cycle.

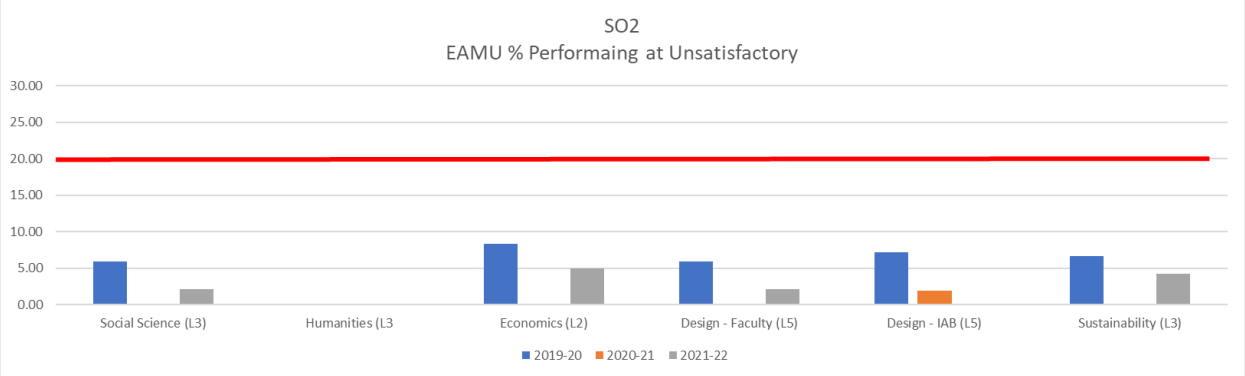
Responsibility: course coordinators and instructor

University/College Support for Learning Outcome: none

Learning Outcome: ABET Student Outcome (2) – ABET SO(2)

ABET Student Outcomes	BSCE Student Outcomes
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	***3. Social Sciences****: Apply concepts and principles of social sciences relevant to civil engineering (L3)* ***4. Humanities****: Apply aspects of the humanities to the solution of civil engineering problems (L3)* 10. **Engineering Economics**: Apply engineering economics concepts and principles to make civil engineering decisions (L2) 13. **Design**: Apply an engineering design process to complex engineering problems in a minimum of two civil engineering technical area (L5) 15. **Sustainability**: Apply principles of sustainability in the solution of civil engineering problems (L3)





Assessment & Evaluation:
Social Science (L3) demonstrate the students' ability to identify societal needs and social impact of a civil engineering project. Assessment in ECE 4022 CE Design Project 1 and ECE 4032 CE Design Project 2 showed that student demonstrated attainment Social Sciences by the development, delivery, and evaluation of civil engineering project in societal context.

Humanities (L3) was assessed in ECE 4051 Ethics and Professional Issues and ECE 4032 CE Design Project 2 (in place of 1). Two assignments were scored in ECE 4051 to assess the human aspects of

engineering including social justice, DEI, and education. In CE Design Project, Humanities was assessed using evidence demonstrating the students' ability to develop a civil engineering solution to positively impact people; the human condition; and support community growth.

Engineering Economics (L2) was assessed in ECE 4243 Construction Project Management. The performance fell just below the threshold of 2.0. The students' knowledge was assessed by measuring their ability to convert present and monthly worth into future worth.

Design (L5) is assessed in ECE 4032 CE Design Project 2 by faculty and IAB. IAB assess the design based on the final project presentation and/or the final poster presentation. The faculty assess design based on the last technical report (Tech Report #3). The performance threshold was met.

Sustainability is assessed in ECE 4022 CE Design Project 1 and ECE 4032 CE Design Project 2. Student demonstrate attainment of BSCE SO 15 Sustainability at the target of (L3) by applying LEED scoring system to their preliminary design, and sustainability metric applied in each subdiscipline and application of LEED scoring system for the final design. The performance threshold was met.

Issue:
This outcome has not raised any flags in recent years.

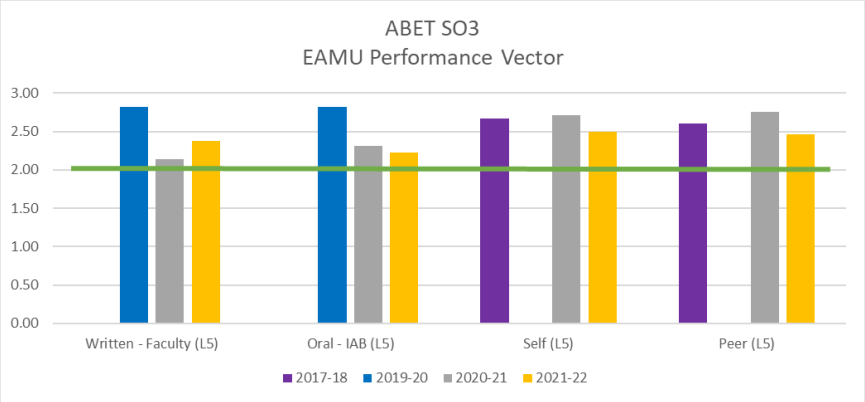
Current/Future Actions:
For economics: Additional real-life examples should be provided to improve the overall comprehension of this topic. In addition, more time should be allocated. Construction faculty recommended the topic be moved to ECE3213 Construction Engineering. Construction Engineering has been revised to include this topic beginning Fall 2022. The topic will also be covered in ECE4243 this transition year. Faculty will continue to monitor indicator.

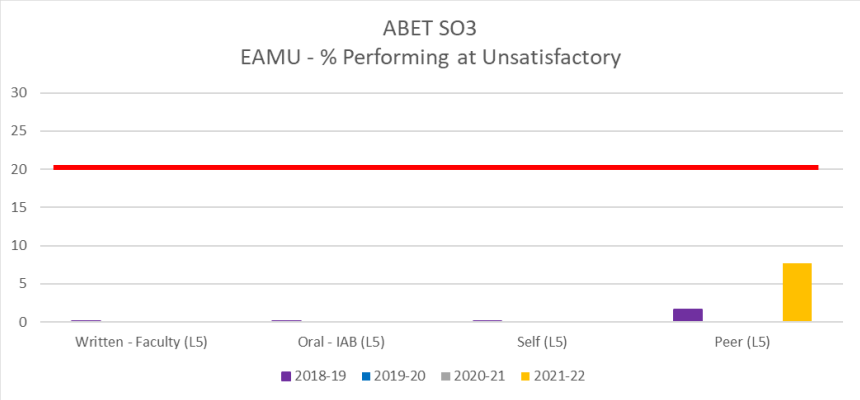
Responsibility: course coordinators and instructor

University/College Support for Learning Outcome: none

Learning Outcome: ABET Student Outcome (3) – ABET SO(3)

ABET Student Outcomes	BSCE Student Outcomes
3. an ability to communicate effectively with a range of audiences	16. **Communication**: Prepare and present technical content to both specialized and general audiences in an effective manner within verbal, written, and graphical formats (L5)





Assessment & Evaluation:

Communication (L5) is assessed in ECE 4022 CE Design Project 1 and ECE 4032 CE Design Project 2 by faculty, IAB as well as self and peer evaluation. These groups represents three different audiences. Technical reports are assessed by faculty, oral poster presentations are assessed by the IAB, and the students ability to communicate with peers is assessed in the peer evaluations. The performance threshold was met.

Issue: none

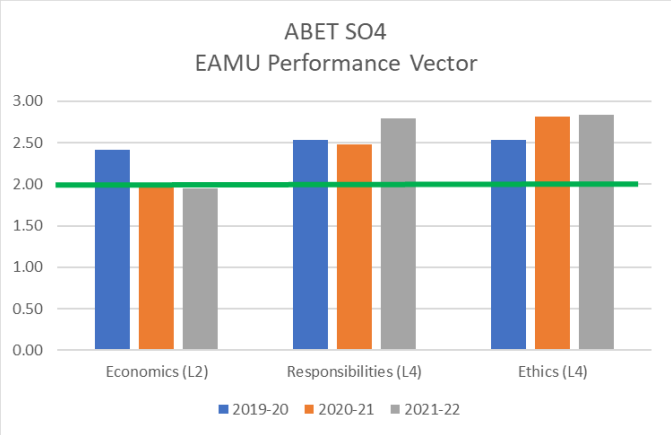
Current/Future Actions: assess and evaluate per regular assessment cycle.

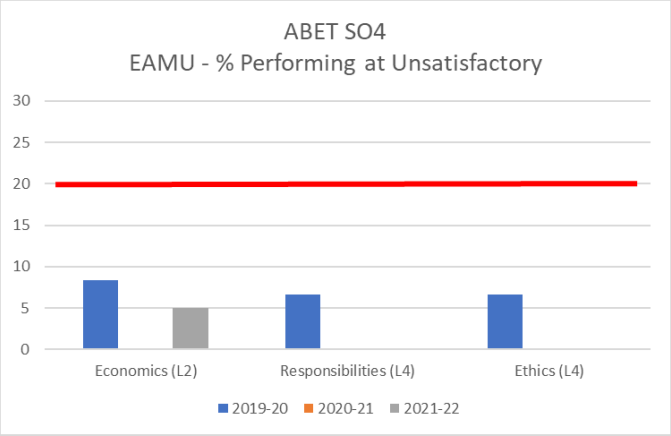
Responsibility: none

University/College Support for Learning Outcome: none

Learning Outcome: ABET Student Outcome (4) – ABET SO(4)

ABET Student Outcomes	BSCE Student Outcomes
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	10. **Engineering Economics**: Apply engineering economics concepts and principles to make civil engineering decisions (L2) 20. **Professional Responsibilities**: Explain professional expectations relevant to the practice of civil engineering (L4) 21. **Ethical Responsibilities**: Analyze ethical dilemmas to recommend and justify a course of action (L4)





Assessment & Evaluation:

Engineering Economics (L2) – details provide in ABET Student Outcome (2). The performance threshold was not met.

Professional Responsibilities (L4) met the performance threshold as demonstrated by student evidence in ECE 4051. The evidence collected from ECE 4051 were three different homework assignments addressing professional ethics as related to global engineering practices, ethical decision making and analyzing case studies, and ASCE and the Profession.

Issue:

This outcome has not raised any flags in recent years.

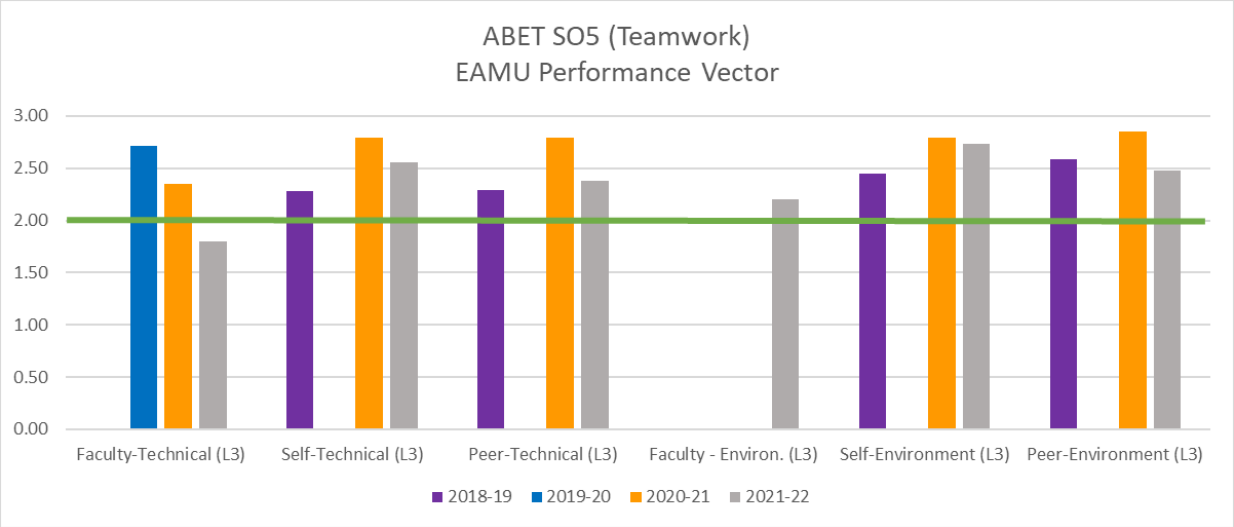
Current/Future Actions:
For economics: Additional real-life examples should be provided to improve the overall comprehension of this topic. In addition, more time should be allocated. Construction faculty recommended the topic be moved to ECE3213 Construction Engineering. Construction Engineering has been revised to include this topic beginning Fall 2022. The topic will also be covered in ECE4243 this transition year. Faculty will continue to monitor indicator.

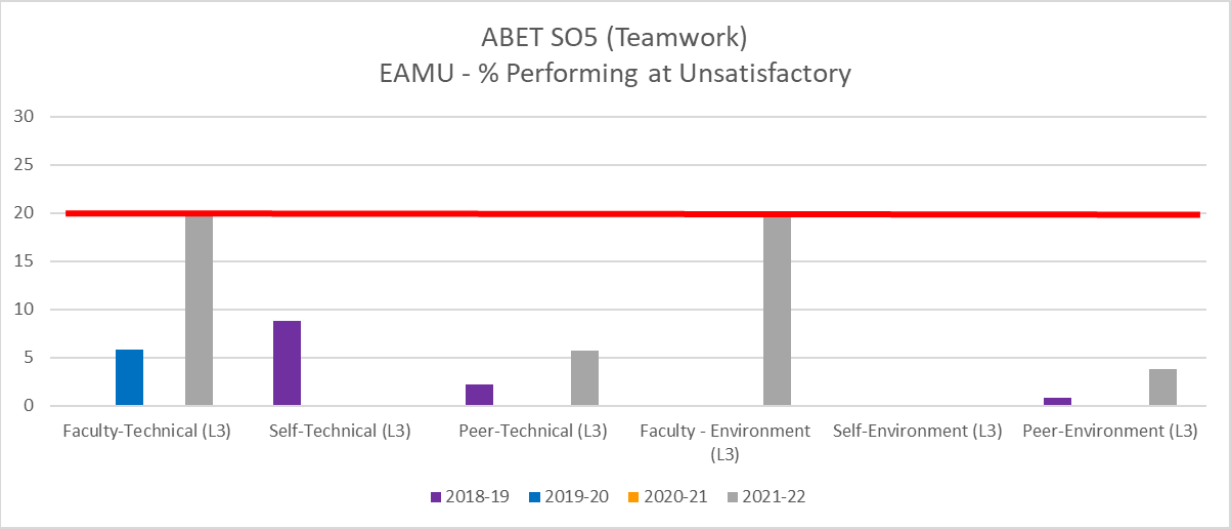
Responsibility: course coordinators and instructor

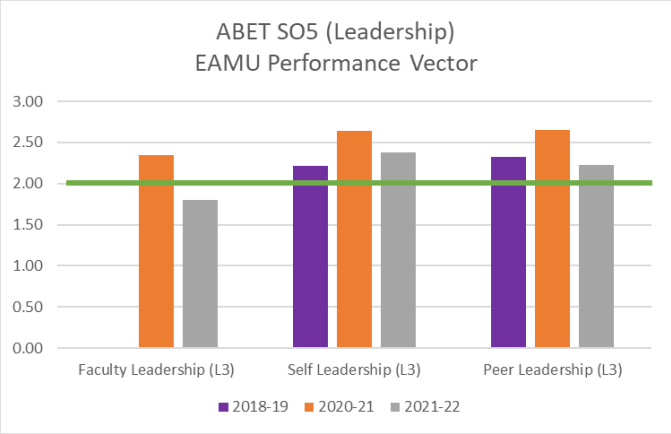
University/College Support for Learning Outcome: none

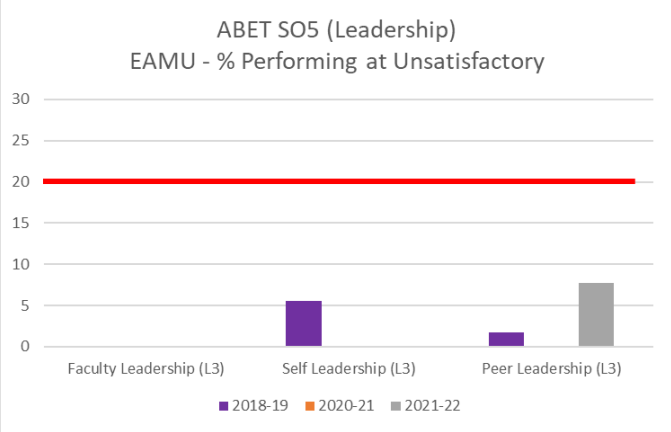
Learning Outcome: ABET Student Outcome (5) – ABET SO(5)

ABET Student Outcomes	**BSCE Student Outcomes**
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	17. **Teamwork and Leadership**: Apply concepts and principles of teamwork and leadership, including inclusion, in the solution of civil engineering problems (L3)









Assessment & Evaluation:
Teamwork (L3) is assessed at the end of the major design experience in ECE 4032 CE Design Project 2 by faculty as well as students. The student self and peer evaluations met the performance targets. The faculty evaluation in the dimension of technical (preparation and participation) fell below the threshold

limit. Two of five teams struggled to demonstrate they were working together effectively to meet the objectives. This was also noted by some IAB members after the poster presentations.

Leadership (L3) is assessed at the end of the major design experience in ECE 4032 CE Design Project 2 by faculty as well as students. The performance threshold was met by the student self and peer evaluation. The performance target was not met by the faculty evaluation.

Issue:
Past year's data collection and evaluation concerns have been resolved.

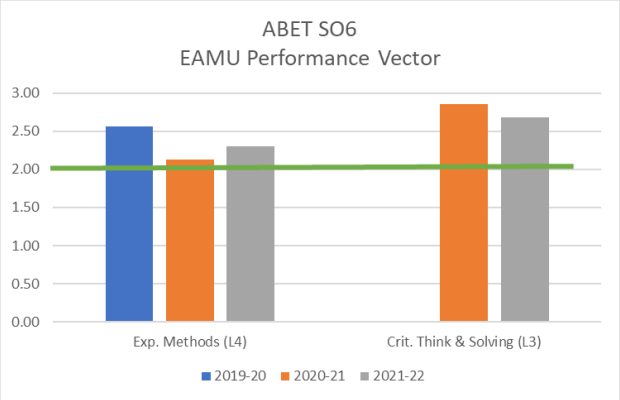
Current/Future Actions: assess and evaluate per regular assessment cycle.

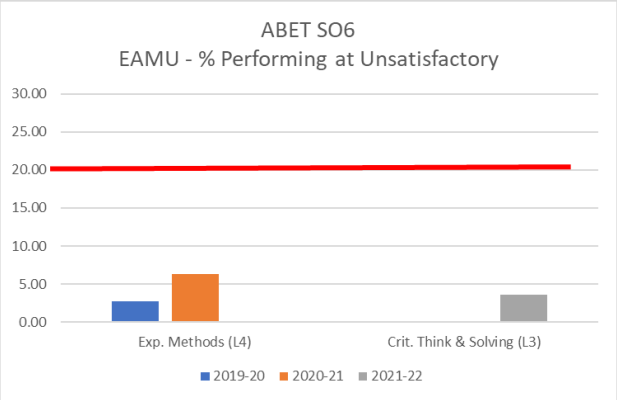
Responsibility: none

University/College Support for Learning Outcome: none

Learning Outcome: ABET Student Outcome (6) – ABET SO(6)

ABET Student Outcomes	**BSCE Student Outcomes**
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	7. **Experimental Methods and Data Analysis**: Develop and conduct civil engineering experiments in at least four technical areas, and analyze and report on the experimental data (L4) 8. **Critical Thinking and Problem Solving**: Use a critical thinking process to formulate an effective solution to a complex civil engineering problem (L3)





Assessment & Evaluation:

Experimental Methods (L4) is assessed in ECE3324 Environmental Engineering 1, ECE3424 Soil Mechanics, ECE3821Transportation Engineering Lab and ECE4761 Structural Design and Test Lab. The performance threshold was met.

Critical Thinking and Problem Solving (L3) is assessed in ECE3324 Environmental Engineering 1 and ECE3821Transportation Engineering Lab. The performance threshold was met. Critical Thinking and Problem Solving was mapped to ABET SO(6) during the data analysis of the 2020-21 data. Use of data to determine design input parameters or to identify a need for improvement/redesign is the application of engineering judgement (critical thinking) to draw conclusions. As an example, in ECE 3821 "Black Spot Analysis using Geographical Information Systems (GIS)" was used for this outcome at L3. The students were asked to analyze Oakland County traffic crash data for one year to identify most accident prone locations (black spots) in the county. The students performed different analysis tasks to identify and map accident data on GIS and used advanced analysis tools to identify the black spots.

Issue:
Past year's data collection and evaluation concerns have been resolved.

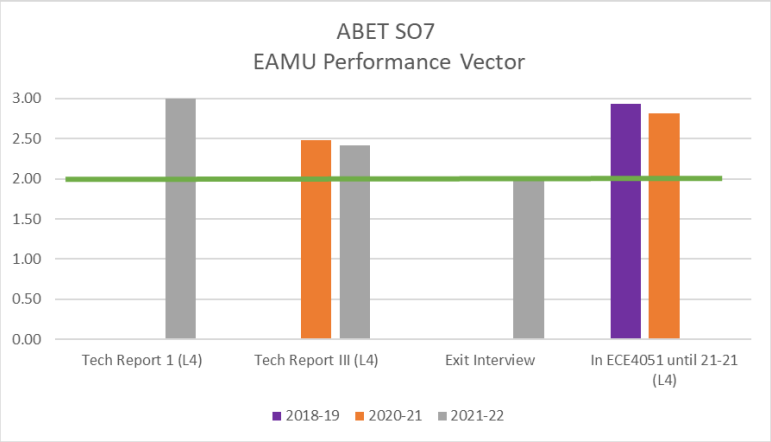
Current/Future Actions: assess and evaluate per regular assessment cycle.

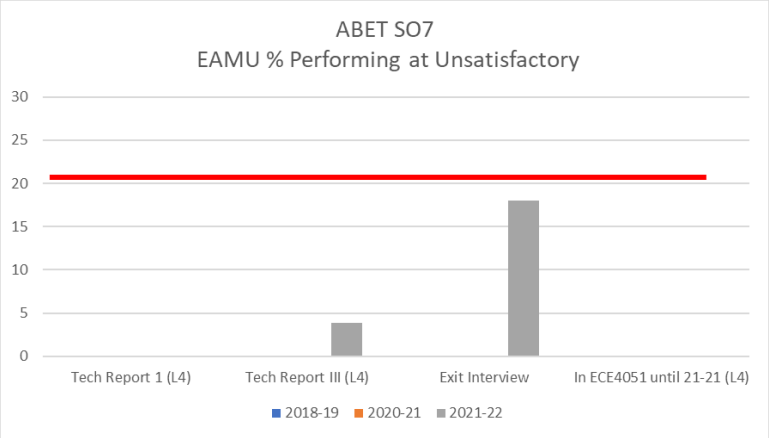
Responsibility: none

University/College Support for Learning Outcome: none
Assessment:
Evaluation:
Issue:
Current/Future Actions:
Responsibility:
University/College Support for Learning Outcome:

Learning Outcome: ABET Student Outcome (7) – ABET SO(7)

ABET Student Outcomes	BSCE Student Outcomes
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	18. **Lifelong Learning**: Acquire and apply new knowledge as needed, using appropriate learning strategies (L4)





Assessment & Evaluation:

Lifelong learning (4) meet the performance target in ECE 4032 CE Project 2. During the project sequence, students demonstrated their willingness to analyze new knowledge, skills, and attitudes relevant to civil engineering by self-learning various software programs, industry standards, and manuals. They researched new knowledge to incorporate into their designs.

3. Assessment Plan for 2022-2025 Academic Years

The assessment process was redesigned to adopt the Criterion 3 Student Outcome (1) – (7) and discontinue the use to CEBOK3. The BSCE Program developed performance indicators for each outcome. New rubrics will be developed to align with the performance indicators. The target threshold for performance will be established based on the data evaluation in May 2023. All student outcomes and associated performance indicators will be assessed and evaluated in 2022-2023 (summative level).

BS in Computer Engineering

1. Assessment Plan and Summary

The assessment plan for the program is shown in Table 1. Table 2 shows the mapping of courses onto the program assessment outcomes. Learning outcomes assessed for the 2019-2021 academic years are listed in Section 2 of this report, including a detailed description of loop closing evaluation.

Dr. Jinjun Xia wrote this report.

Table 1: Assessment Plan for BSCE

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ETHICS	- Demonstrate knowledge of the professional code of ethics (ABET PI 4-(2))	EEE3011 Intro to Capstone Project	60%/70%
LEADERSHIP	- Exhibit leadership traits such as: accountability, listening, initiative, vision, and motivation (ABET PI 5-(1))	EEE3231 Microprocessors Lab EEE4812 Capstone Project I EEE4822 Capstone Project II	60%/70% 60%/70% 60%/70%
TEAMWORK	- Collaborate to establish goals, plan tasks, and meet objectives (ABET PI 5-(3))	EEE2114 Circuits 1 EEE3124 Circuits 2 EEE3121 Circuits 2 Lab EEE4812 Capstone Project I EEE4822 Capstone Project II	60%/60% 60%/60% 60%/60% 60%/70% 60%/70%
TECHNOLOGY	- Ability to verify engineering solution using technological tools (cf, ABET PI 1-(4))	EEE 4514 Control Systems and Lab, Lab 7	80%/80%
VISUAL COMMUNICATION	- Use appropriate visual aids in both oral and written communications (cf. ABET PI 3-(2))	EEE3223 Advanced Digital Electronics, project based Exam 2 and VHDL in homework EEE4812 ECE Capstone Project 1, Final Report, Presentation and Poster	80%/80% 60%/70%

2.

Table 2: Curriculum Map for the BSCE

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**		ETHICS	LEADERSHIP	TEAMWORK	TECHNOLOGY	VISUAL COMMUNICATION
Control Systems and Lab	EEE4514	**E(S)**			**E(S)**	
Advanced Digital Electronics	EEE3223					**I(S)**
ECE Capstone Project 1	EEE4812		**E(S)**	**E(S)**		**E(S)**
ECE Capstone Project 2	EEE4822		**E(S)**	**E(S)**		
Intro to Capstone Projects	EEE3011	**I(S)**				
Microprocessors Lab	EEE3231		**E(S)**			
Circuits 1	EEE2114			**I(S)**		
Circuits 2	EEE3124			**I(S)**		
Circuits 2 Lab	EEE3121			**I(S)**		

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

The BSCE program evaluated multiple learning outcomes over three academic years, using course-embedded assessments, project reports, presentations, and reflective activities. Key findings and actions are summarized by learning outcome below:

Technology

- Courses Assessed:
  - *2019–2020:* EEE 5534 Digital Control Systems
  - *2021–2022:* EEE 3223 Advanced Digital Electronics
- Evaluation Results:
  In both years, 100% of students met or exceeded the 80% target on tasks involving the use of MATLAB and Simulink to design digital controllers for simulated real systems. Students effectively determined appropriate controller types (PI, PD, PID) and adapted to new technologies as needed.
- Issues & Actions:
  No issues were found. Continued monitoring will ensure students maintain proficiency with emerging tools and methods.
- Responsibility: Dr. Gary Lowe

Visual Communication

- Courses Assessed:
  - *2019–2020:* EEE 4812 Capstone Project 1
  - *2020–2021:* Exam 2 and VHDL homework
  - *2021–2022:* EEE 3223 Advanced Digital Electronics
- Evaluation Results:
  Capstone project reports and presentations showed that 85–88% of students met performance indicators. Challenges included formatting errors, lack of clarity in writing, and poor slide design. VHDL communication improved in later years due to earlier exposure and added instructional support.
- Issues & Actions:
  - Early introduction of VHDL and homework assignments improved outcomes.
  - Capstone corrective actions included weekly feedback meetings, sample reports, and presentation workshops.
  - In 2021–22, new collaboration with LTU's Humanities faculty emphasized writing improvement through peer review and revision opportunities.
- Responsibility: Dr. Lisa Anneberg, Dr. George Pappas
- Support: Humanities Department (Writing Across the Curriculum grant), LTU Helpdesk

Ethics

- Courses Assessed:
  - *2020–2021:* EEE 4822 Senior Projects

- Evaluation Results:
  84% of students met the 80% target. Most reports addressed ethical considerations, with strong examples of teamwork, responsibility, vendor evaluation, and documentation practices.
- Issues & Actions:
  Some reports lacked acknowledgment sections or adequate reflection on global impact. Corrective action included personalized feedback during team meetings and emphasis on engineering ethics.
- Responsibility: Dr. George Pappas

Leadership

- Courses Assessed:
  - *2020–2021:* EEE 4822 Senior Projects
- Evaluation Results:
  89% of students achieved the 80% target. Reports and reflections showed teams organized meetings, tracked goals, and delegated responsibilities effectively.
- Issues & Actions:
  Some documentation lacked clarity on team member roles. Future actions include requiring responsibility tables and enhanced project tracking.
- Responsibility: Dr. George Pappas

Teamwork

- Courses Assessed:
  - *2020–2021:* EEE 4822 Senior Projects
- Evaluation Results:
  84% of students achieved the 80% target. Teams demonstrated collaborative planning, division of labor, and effective communication.
- Issues & Actions:
  Similar to leadership, a few reports omitted team structure and responsibilities. Corrective actions mirror those for leadership—emphasizing shared documentation and clarity.
- Responsibility: Dr. George Pappas

3. Assessment Plan for 2022-2025 Academic Years

Continue assessment plan as shown in Table 1.

BS in Construction Engineering Technology and Management

1. Assessment Plan and Summary

Table 1 shows the details of the assessment plan for Bachelor of Science in Construction Engineering Technology and Management (BSCETM) program using the new LTU undergraduate program level learning outcomes. Each learning outcome shown in Table 1 is assessed each semester respective courses are offered, and loop-closing occurs on a biennial basis for each learning outcome assessed during the academic year.

Although ABET does not have specific criteria for assessing this program, the Engineering Technology Accreditation Council (ETAC) suggests the following general criteria a through i should be used in designing the assessment plan:

Listed here are the BSCETM outcomes shown in Table 1:

a. utilize techniques that are appropriate to administer and evaluate construction contracts, documents, and codes;
b. estimate costs, estimate quantities, and evaluate materials for construction projects;
c. utilize measuring methods, hardware, and software that are appropriate for field, laboratory, and office processes related to construction;
d. apply fundamental computational methods and elementary analytical techniques in sub-disciplines related to construction engineering.
e. produce and utilize design, construction, and operations documents;
f. perform economic analyses and cost estimates related to design, construction, and maintenance of systems associated with construction engineering;
g. select appropriate construction materials and practices;
h. apply appropriate principles of construction management, law, and ethics, and;
i. perform standard analysis and design in at least one sub-discipline related to construction engineering.

Table 1: Assessment Plan for the BS in Construction Engineering Technology and Management

Undergraduate Program Level Learning Outcomes	ETAC Outcomes	Assessment Strategy	Metrics/ Indicators**
TECHNOLOGY 1. Apply advanced technologies to practical and theoretical problems. (Bloom's 3) 2. Design and conduct experiments. (Bloom's 4) 3. Analyze and interpret data using appropriate tools (e.g., Excel, Minitab) (Bloom's 3)	Outcome c, d, e	Assignments in TCE1023, TCE2073, TCE3013, TCE3093, TCE4133, TIE3163, TIE4133, TME3333	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives
ETHICS 1. Demonstrate critical thinking with respect to ethical dilemmas (Bloom's 3) 2. Discern between personal and professional ethical responsibilities (Bloom's 2) 3. Identify the ethical codes adopted by relevant professional associations. (2) 4. Predict possible social consequences of engineering/science ethical decisions. (3)	College of Engineering	Assignments in EGE1001, EGE3022	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives
LEADERSHIP 1. Identify theories, models, and practices as they pertain to a personal style and philosophy of leadership. (Bloom's 1) 2. Explain the difference between leadership and management. (Bloom's 2) 3. Differentiate the characteristics of effective and ineffective leadership. (Bloom's 3)	College of Engineering	Assignments in EGE1001, EGE3022	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives
TEAMWORK 1. Discuss various types of conflict and methods of resolution. (Bloom's 2) 2. Practice tools and techniques for team consensus building. (Bloom's 3) 3. Identify and integrate personal team player style in a team setting. (Bloom's 3)	Outcome h, i	Assignments in TCE3053, TCE4113, TIE4115, TME4113	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives
VISUAL COMMUNICATION Demonstrate professional standards in graphical communication (including figures, plots, tables, and posters) by integrating evidence and analysis within a coherent structure. (Bloom's 3 and 4)	Outcome a, f	Graphical assignments in TCE2143, TCE4113, TCE4213	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives

2. Report on 2019-2021 Academic Year and Action Plan (Loop Closing)

The BSCETM program assessed five discipline-specific learning outcomes aligned with ABET and program goals. Courses were evaluated through project work, exams, and rubric-based analysis. The findings, issues, and actions taken are summarized below by learning outcome.

Learning Outcome 1: Technology

Student Outcome c – Measurement Tools and Methods

- Courses Assessed: TCE3013, TCE3093
- 2020–2021 Results: 100% (TCE3013), 77% (TCE3093) scored ≥75%
- 2021–2022 Results: 94% (TCE3013), 79% (TCE3093) scored ≥75%
- Issue: TCE3013 (2020–2021) had inflated results due to unclear learning objectives.
- Action: Review and revise learning objectives and provide instructor support.
- Responsibility: Dr. Sabah Abro

Student Outcome d – Computational & Analytical Techniques

- Courses Assessed: TIE3163, TME3333
- 2020–2021 Results: 77% (TIE3163), 75% (TME3333) scored ≥75%
- 2021–2022 Results: 78% (TIE3163), 73% (TME3333) scored ≥75%
- Issue: TME3333 fell short in 2021–2022
- Action: Increase in-class workshops in TME3333
- Responsibility: Dr. Sabah Abro

Student Outcome e – Design and Operations Documentation

- Courses Assessed: TCE4133, TIE4115
- 2020–2021 Results: 78% (TCE4133), 81% (TIE4115) scored ≥75%
- 2021–2022 Results: 80% (TCE4133), 83% (TIE4115) scored ≥75%
- Issue: None
- Action: Maintain current instruction and outcomes
- Responsibility: Dr. Sabah Abro

Learning Outcome 2: Visual Communication

Student Outcome a – Contract Administration and Codes

- Courses Assessed: TCE4133, TCE4213
- 2020–2021 Results: 78% (TCE4133), 90% (TCE4213) scored ≥75%
- 2021–2022 Results: 79% (TCE4133), 89% (TCE4213) scored ≥75%
- Issue: TCE4213 objectives lack clarity and measurability
- Action: One-on-one training and departmental support for revision
- Responsibility: Dr. Sabah Abro

Student Outcome f – Economic Analysis and Cost Estimating

- Courses Assessed: TIE3163, TCE3123
- 2020–2021 Results: 77% (TIE3163), 100% (TCE3123) scored ≥75%

- 2021–2022 Results: 78% (TIE3163), 100% (TCE3123) scored ≥75%
- Issue: TCE3123 objectives need to be rewritten for clarity
- Action: Department to assist instructor in revising objectives
- Responsibility: Dr. Sabah Abro

Learning Outcome 3: Ethics / Leadership

- Assessment: Conducted at the College of Engineering level

Learning Outcome 4: Teamwork

Student Outcome h – Construction Management and Ethics

- Courses Assessed: TCE4133, TCE4213
- 2020–2021 Results: 78% (TCE4133), 90% (TCE4213) scored ≥75%
- 2021–2022 Results: 79% (TCE4133), 89% (TCE4213) scored ≥75%
- Issue: TCE4213 objectives need clearer measurability
- Action: Continue supporting instructor with assessment tools and revisions
- Responsibility: Dr. Sabah Abro

Student Outcome i – Sub-Discipline Analysis and Design

- Courses Assessed: TIE4115, TCE3093
- 2020–2021 Results: 81% (TIE4115), 77% (TCE3093) scored ≥75%
- 2021–2022 Results: 84% (TIE4115), 79% (TCE3093) scored ≥75%
- Issue: None
- Action: Maintain course content and assessment practices
- Responsibility: Dr. Sabah Abro

3. Assessment Plan for 2022-2025 Academic Years

1) Follow Table 1 assessment plan.
2) All syllabi and courses learning objectives are to be reviewed to make sure that they are measurable and address the required performance indicators.
3) One-to-one meetings will be planned with instructors to improve the assessment process.

BS in Electrical Engineering

1. Assessment Plan and Summary

The assessment plan for the program is shown in Table 1. Table 2 shows the mapping of courses onto the program assessment outcomes. Learning outcomes assessed for the 2019-2021 academic years are listed in Section 2 of this report, including a detailed description of loop closing evaluation.

Dr. Jinjun Xia wrote this report.

Table 1: Assessment Plan for the BS in Electrical Engineering

Undergraduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ETHICS	- Demonstrate knowledge of the professional code of ethics (ABET PI 4-(2))	EEE3011 Intro to Capstone Project	60%/70%:
LEADERSHIP	- Exhibit leadership traits such as: accountability, listening, initiative, vision, and motivation (ABET PI 5-(1))	EEE3231 Microprocessors Lab EEE4812 Capstone Project I EEE4822 Capstone Project II	60%/70%. 60%/70% 60%/70%
TEAMWORK	- Collaborate to establish goals, plan tasks, and meet objectives (ABET PI 5-(3))	EEE2114 Circuits 1 EEE3124 Circuits 2 EEE3121 Circuits 2 Lab EEE4812 Capstone Project I EEE4822 Capstone Project II	60%/60 60%/60% 60%/60% 60%/70% 60%/70%
TECHNOLOGY	- Ability to verify engineering solution using technological tools (cf, ABET PI 1-(4))	EEE 4514 Control Systems and Lab, Lab 7	80%/80%
VISUAL COMMUNICATION	- Use appropriate visual aids in both oral and written communications (cf. ABET PI 3-(2))	EEE3223 Advanced Digital Electronics, project based Exam 2 and VHDL in homework EEE4812 ECE Capstone Project 1, Final Report, Presentation and Poster	80%/80% 60%/70%

Table 2: Curriculum Map for the BS in Electrical Engineering

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**		ETHICS	LEADERSHIP	TEAMWORK	TECHNOLOGY	VISUAL COMMUNICATION
Control Systems and Lab	EEE4514				**E(S)**	
Advanced Digital Electronics	EEE3223					**I(S)**
ECE Capstone Project 1	EEE4812		**E(S)**	**E(S)**		**E(S)**
ECE Capstone Project 2	EEE4822		**E(S)**	**E(S)**		
Intro to Capstone Projects	EEE3011	**I(S)**				
Microprocessors Lab	EEE3231		**E(S)**			
Circuits 1	EEE2114			**I(S)**		
Circuits 2	EEE3124			**I(S)**		
Circuits 2 Lab	EEE3121			**I(S)**		

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

Between 2019 and 2021, the Bachelor of Science in Electrical Engineering (BSEE) program assessed key student learning outcomes including Technology, Visual Communication, Ethics, Leadership, and Teamwork. These outcomes were evaluated using a variety of assessments such as lab activities, exams, capstone reports, presentations, and reflective documentation across multiple required courses.

The **Technology** outcome was assessed through Lab #7 in EEE5534: Digital Control Systems in Fall 2019 and again in Fall 2021. Students used industry-standard tools including MATLAB and Simulink to analyze nonlinear systems and design digital controllers. All students successfully selected and implemented appropriate controller types (PI, PD, or PID), with 100% achieving the benchmark of 80% or higher. As all students performed well, no corrective actions were required beyond continued monitoring. Dr. Gary Lowe led this assessment.

The **Visual Communication** outcome was assessed through VHDL-based homework and Exam 2 performance, along with the EEE4812: Capstone Project 1 final report and presentation. In earlier evaluations, challenges were noted with the complexity of simulation tools, prompting instructors to introduce VHDL earlier in the semester and integrate it into homework. In capstone evaluations, although 85% of students met the report benchmark and 88% met the presentation benchmark, several areas for improvement were identified. These included formatting issues, inconsistent figure numbering, limited visual design experience, and ineffective presentation techniques. In response, faculty implemented weekly one-on-one feedback sessions, provided annotated report examples, and facilitated workshops on professional presentation skills. These continuous improvement efforts were led by Drs. Lisa Anneberg and George Pappas.

The **Ethics** outcome was evaluated in EEE4822: Senior Projects during Fall 2020. Students demonstrated understanding of ethical principles through reflection in reports, acknowledgment of contributions, responsible data practices, and ethical sourcing of components. While 84% met the target, a few groups omitted key acknowledgments and underdeveloped their discussion of global impact. These issues were addressed through personalized team meetings emphasizing professional ethical standards. Dr. George Pappas facilitated this process.

The **Leadership** and **Teamwork** outcomes were also assessed in EEE4822 during Fall 2020 and Spring 2021. Students documented group roles, meeting frequency, and task distribution. Most teams exceeded expectations, with 89% meeting the leadership benchmark and 84% meeting the teamwork benchmark. However, some reports lacked detailed breakdowns of individual responsibilities. As a corrective measure, instructors stressed the importance of responsibility tables and provided feedback during scheduled meetings. These efforts reinforced collaborative skills and project management practices.

3. Assessment Plan for 2022-2025 Academic Years

Continue with the assessment plan shown in Table 1.

BS in Industrial Engineering

1. Assessment Plan and Summary

Listed here is an interpretation of the second column for Table 1:

ABET Criterion 3: B.S. Industrial Engineering Program Outcomes

Upon successful completion of the B.S.I.E. degree program, the graduate will have

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Table 1 shows the details of the assessment plan for Bachelor of Science in Industrial Engineering (BSIE) program. LTU undergraduate learning outcomes are related to program learning objectives which are ABET program outcomes. Various assessment tools and metric/indicators are used. Table 1 depicts timelines for data collection, analysis and closing the loop. An assessment plan and data collection for selected BSIE courses is given. Some outcomes will be direct assessment and some will have indirect assessment.

Table 1: Assessment Plan for the BS in Industrial Engineering

Undergraduate Program Level Learning Outcomes	ABET Outcomes	Assessment Strategy	Metrics/ Indicators
TECHNOLOGY 1. Apply advanced technologies to practical and theoretical problems. (Bloom's 3) 2. Design and conduct experiments. (Bloom's 3) 3. Analyze and interpret data using appropriate tools (e.g., Excel, Minitab) (Bloom's 3)	Outcome 1 (an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics) Outcome 2 (an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions)	1. Evaluation of application of technology in EIE 4252 – Senior Project Fundamentals and EME 4253 - Sr. Capstone Project 2. Exam/homework questions on experimental design in operations research, work design, statistical methods for process improvement, simulation and occupational ergonomics curses) 3. Exam questions on industrial engineering laboratory technique (new IE Lab course)	1. Checklist to apply technologies, all students use a certain of technologies (which vary by project) 2. 70% of students receive a score of 60% or higher 3. 70% of students receive a score of 60% or higher
ETHICS 1. Demonstrate critical thinking with respect to ethical dilemmas (Bloom's 3) 2. Discern between personal and professional ethical responsibilities (Bloom's 2) 3. Identify the ethical codes adopted by relevant professional associations. (2) 4. Predict possible social consequences of engineering/science ethical decisions. (3)	Outcome 4 (an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts)	1. Homework assignment in EGE 3022 2. Homework (or classroom) assignment in EGE 3022 3. Homework assignment in EGE 1001 4. Team classroom assignment in EGE 3022	1. Grading rubric (Metrics TBD) 2. Grading rubric 3. Grading rubric 4. Evaluation rubric
LEADERSHIP 1. Identify theories, models, and practices as they pertain to a personal style and philosophy of leadership. (Bloom's 1) 2. Explain the difference between leadership and management. (Bloom's 2) 3. Differentiate the characteristics of effective and ineffective leadership. (Bloom's 3)	Outcome 4 (an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts)	1. Homework assignment in EGE 3022 2. Homework assignment in EGE 3022 3. Team Project rubric in EGE 3022	1. Grading rubric (Metrics TBD) 2. Grading rubric 3. Evaluation rubric

TEAMWORK 1. Discuss various types of conflict and methods of resolution. (Bloom's 2) 2. Practice tools and techniques for team consensus building. (Bloom's 3) 3. Identify and integrate personal team player style in a team setting. (Bloom's 3)	Outcome 5 (an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives)	1. Homework assignment in EGE 3022 2. Team assignment in EGE 3022 3. Homework assignment in EGE 3022	1. Grading rubric (Metrics TBD) 2. Evaluation rubric 3. Grading rubric
VISUAL COMMUNICATION Demonstrate professional standards in graphical communication (including figures, plots, tables, and posters) by integrating evidence and analysis within a coherent structure. (Bloom's 3 and 4)	Outcome 3 (an ability to communicate effectively with a range of audiences)	Graphical assignments from statistical control of process improvement, operations research projects, simulation project reports, work design and measurement projects, human factors projects and sr. capstone project reports. Poster rubric in senior projects courses.	Graphical elements of written rubric: (80% will receive 70%) Projects Posters: 80% of students will score 80% or higher.

Table 2A: Curriculum Map of BSIE with ABET Outcomes 1-7

		Tools/Measures	
	Assessment	**Courses**	**Semester**
1	Evaluate exam problems using problem solving rubrics	EIE 3123, EIE 3353, EIE 4013, EIE 3043, EIE 3453, EIE 4453	Based on course scheduling and graduation
2	Faculty advisor evaluate written proposals using proposal rubric	EIE 4252, EIE 4253	
	Faculty advisor evaluate final reports using final report rubric	EIE 4252, EIE 4253	
3	Evaluate oral presentations using presentation rubric Evaluation of technical report writing using writing rubric	EIE 3043, EIE 3453 EIE 3753, EIE 4013	
4	10 multiple choice ethics questions	EGE 3022	
	Case study assignment on ethics	EIE 4013	
	Ethics/integrity statement on final report	EIE 4252, EIE 4253	
	Mandatory attendance at seminar series/workshops	EIE 4252, EIE 4253	
	Assignment on how engineering solutions impact global, economic, environmental and societal issues	EIE 4013, EIE 4252, EIE 4253	
5	Students evaluate teammates using peer evaluation form/rubric	EIE 4252, EIE 4253	
	Faculty Advisor meeting with team to discuss team functionality	EIE 4252, EIE 4253	
	Faculty & IAB evaluation of teamwork at final presentation	EIE 4252, EIE 4253	
6	Evaluate exam problems using problem solving rubrics	EIE 3753	
7	Literature review in production planning and control	EIE 3043	
	Evaluate project paper Statistical Methods for Process Improvement	EIE 3453	

Table 2B: Curriculum Map of BSIE with ABET Outcomes 1-7

Course Student Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**
EEE 2123 Circuits & Electronics	R	-	-	R	R	-	-
EGE 1001 Fund. of Eng. Design Proj.	I	I	I	I	I	I	I
EGE 1023 Engineering Materials	I	I	I	I	I	I	I
EGE 1102 Engineering Computer Application Lab	I	I	-	-	-	-	-
EGE 2013 Statics	E	R	-	-	-	R	-
EGE 2123 Entrepreneurial Engineering Design Studio	I	I	I	I	I	I	I
EGE 3003 Thermodynamics	R	R	R	-	-	R	-
EME 2011 Materials Lab	R	I	R	I	R	E	-
EIE 3023 Manufacturing Processes	R	R	R	I	-	R	-
EIE 3033 Engineering Numerical Methods	R	-	-	-	-	-	-
EIE 1011 - Foundations of Industrial Engineering	I	I	I	I	I	I	I
EIE 3043 - Production, Planning & Control	R	I	R	I	-	I	-
EIE 3123 - Plant Layout	R	I	R	I	-	I	-
EIE 3353 - Operations Research Techniques	E	I	R	-	-	R	-
EIE 3453 - Stat Methods for Process	E	R	-	-	-	R	-
EIE 3653 - Stochastic Modeling	R	R	R	I	-	R	-
EIE 3753 - Simulation in System Design	E	R	E	I	-	R	R
EIE 4013 - Work Design and Measurement	R	R	R	R	-	R	R
EIE 4252 - Senior Project Fundamentals	E	E	E	E	E	R	E
EIE 4253 - Senior Capstone Project	E	E	E	E	E	R	E
EIE 4453 - Applied Operations Research	E	R	E	R	-	E	E
EIE 4553 - Occupational Ergonomics	R	R	E	I	-	E	R
EIE 4653 - Industrial and Engineering Finance	R	E	R	-	-	R	-

Note. Introduce (I): corresponds to instances where the student outcomes are supported at an introductory level in a course. Reinforce (R): achieved when a course serves to reinforce the attainment of a student outcome that was supported previously at an introductory level in another course. Emphasize (E): achieved when a student outcome is supported at a more focused and advanced level.

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

Between Fall 2019 and Spring 2021, the BSIE program continued to implement and refine its assessment process, collecting data for the fourth consecutive cycle and closing the loop for a second time. Not all core courses are offered annually, so assessment was conducted using available course offerings during this period. The assessment covered ABET's 1–7 outcomes, with findings presented to the A. Leon Linton Department of Mechanical Engineering. Both ABET- and HLC-aligned syllabi were developed for major courses. LTU joined the Council of Industrial Engineering Department Academic Heads (CIEDAH), and students engaged in professional development through IISE and SME student chapters.

In **Fall 2019 and Spring 2020**, assessment data were collected from courses including EIE 3043 (Production, Planning & Control), EIE 3123 (Plant Layout), EIE 3453 (Statistical Methods), EIE 3653 (Stochastic Modeling), EIE 3753 (Simulation), EIE 4013 (Work Design), and the Senior Project sequence (EIE 4252 and 4253). In **Fall 2020 and Spring 2021**, additional data were gathered from EIE 4553 (Occupational Ergonomics), EIE 3353 (Operations Research Techniques), and the Senior Project sequence.

Knowledge in Discipline was assessed through exams, homework, and projects in courses like Work Design, Operations Research, and Occupational Ergonomics. Results consistently met performance targets. The Siemens Electro-Matic Lab was integrated for line balancing and human factors activities, with plans to expand lab-based experiments in future cycles.

Technology skills were evaluated through software use in courses such as Production Planning (Minitab, LINDO), Simulation (Witness, Arena), and Senior Projects. Students applied tools to real-world problems, including projects at CINTAS and Henry Ford Health System. Despite some disruptions caused by the pandemic, targets were met, and faculty adapted by facilitating remote validations via Zoom.

Communication skills—oral, written, and visual—were assessed using project reports and presentations in courses like Statistical Methods and Capstone Projects. Rubrics were applied, and student performance met expectations. Some presentations during the pandemic were conducted virtually, but in-person presentations are expected to resume.

Leadership development was primarily supported by College of Engineering programming, including the Third-Tuesday Seminar Series and the IE Seminar Series. These opportunities supplemented course-based experiences.

Teamwork was assessed through group-based senior design projects. Student teams collaborated on real-world projects despite pandemic constraints. Advisors monitored team coordination, particularly for projects conducted remotely. Rubrics will be updated to better capture teamwork dynamics.

Ethics was evaluated via assignments in the Senior Capstone course. Most students met performance benchmarks. Future plans include embedding ethics more explicitly in earlier courses such as the Foundations of Industrial Engineering.

Across all outcomes, assessment targets were largely met. The program has responded to pandemic-related challenges through instructional flexibility, remote collaboration, and targeted curricular adjustments. Dr. Ali coordinated assessment tracking and rubric updates, while course instructors and advisors implemented assessment activities and supported student learning outcomes.

3. Assessment Plan for 2022-2025 Academic Years

Follow assessment of courses as shown in Table 1.

BS in Mechanical Engineering

1. Assessment Plan and Summary

This assessment cycle saw the final transition for the BSME program to adjust from the discontinued ABET assessment outcomes “a through k” list to the new “1 through 7” outcomes. Outcomes “a” through “k” were correlated to “1” through “7” as shown in Table 3.

A curriculum map for ABET 1 through 7 is still under development, so the BSME curriculum map is presented in Tables 1 and 2 to indicate where ABET a through k outcomes were being introduced, reinforced, or emphasized. For reference, before Fall 2019, the University Outcomes were assessed as follows from ABET assessment: Technology (b and k), Graphical Communication (g), Leadership (h), Teamwork (d), Ethics (f).

Table 1: Assessment Plan for the BS in Mechanical Engineering

BSME Learning Outcomes	BSME ABET Outcomes	Assessment Tools	Metric/Indicators	Administration Timeline	Loop-Closing Timeline
TECHNOLOGY 1. Apply advanced technologies to practical and theoretical problems. (Bloom's 3) 2. Design and conduct experiments. (Bloom's 3) 3. Analyze and interpret data using appropriate tools (e.g., Excel, MATLAB) (Bloom's 3)	#6: An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.	A. Exam questions on laboratory technique in EME4412 (Thermal Science Lab) B. Rubric to evaluate assignment in EME 3653 (Measurement Systems)	A. 75% of students receive a score of 70% or higher B. 75% of students score at least "marginal" for all indicators	Every Semester Spring	3-year cycle
GRAPHICAL COMMUNICATION Demonstrate professional standards in graphical communication (including figures, plots, and tables) by integrating evidence and analysis within a coherent structure. (Bloom's 3 and 4)	#3: An ability to communicate effectively with a range of audiences	Rubric for graphical assignments from Dynamics and Heat Transfer courses.	Graphical elements of written rubric: (Dynamics: 60% will receive 80%; Heat Transfer: 70% will receive 80%)	Dynamics: Fall Heat Transfer: Spring	3-year cycle
LEADERSHIP 1. Identify theories, models, and practices as they pertain to a personal style and philosophy of leadership. (Bloom's 1) 2. Explain the difference between leadership and management. (Bloom's 2) 3. Differentiate the characteristics of effective and ineffective leadership. (Bloom's 3)	#4: An ability to recognize professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts #5: an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	1. Homework assignment in EGE 3022 2. Homework assignment in EGE 3022 3a. Team Project rubric in EGE 3022 3b. Teamwork evaluation survey containing leadership questions used in Competition Projects 1 and 2 and ISP A and B.	1. Grading rubric (70% of students will score 80% or above) 2. Grading rubric (see 1) 3a. Evaluation rubric 3b. Competition Projects 1 & 2: 80% of students will meet all of the desired outcomes ISP A: 80% of students	1, 2, 3a. Every Semester 3b. Competition Projects 1 and ISP A: Fall. Competition Projects 2 and	3-year cycle

			will score 70% or above. ISP B: 80% of students will score 70% or above	ISP B: Spring.	
TEAMWORK An ability to function on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	#5: an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Teamwork survey and project completion/milestones targets in EME 4212 (Comp Proj 1), 4312 (ISP A), 4221 (Comp Proj 2) , 4321 (ISP B) Note: these are Capstone Projects 1 and 2 which are split between Competition Projects and Industry Sponsored Projects.	Competition Projects 1 & 2: 80% of students will meet all of the desired outcomes ISP A: 80% of students will score 70% or above. ISP B: 80% of students will score 70% or above.	Competition Projects 1 and ISP A: Fall. Competition Projects 2 and ISP B: Spring.	3-year cycle
ETHICS 1. Demonstrate critical thinking with respect to ethical dilemmas (Bloom's 3) 2. Discern between personal and professional ethical responsibilities (Bloom's 2) 3. Identify the ethical codes adopted by relevant professional associations. (Bloom's 2) (May not keep this) 4. Predict possible social consequences of engineering/science ethical decisions. (Bloom's 3)	#4: an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	1. Homework assignment in EGE 3022 2. Homework (or classroom) assignment in EGE 3022 3. Homework assignment in EGE 1001 4. Team classroom assignment in EGE 3022	1. Grading rubric (Metrics TBD) 2. Grading rubric 3. Grading rubric 4. Evaluation rubric NOTE: These are under development.	Every Semester Every Semester Every Fall Every Semester	3-year cycle

Table 2: Mapping of the BSME Engineering Core Classes to the ABET Outcomes

	Student Outcomes										
Course	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
EEE 2123 Circuits & Electronics	R	-	-	R	-	R	-	R	-	-	-
EGE 1001 Fund. of Eng. Design Proj.	I	I	I	I	I	I	I	I	I	I	I
EGE 1023 Engineering Materials	I	I	I	I	I	I	I	I	I	I	I
EGE 1102 Engineering Computer Application Lab	I	-	I	-	I	-	-	-	-	-	I
EGE 2013 Statics	E	R	R	-	I	-	-	-	-	-	I
EGE 2123 Entrepreneurial Engineering Design Studio	I	I	I	I	I	I	I	I	I	I	I
EGE 2233 Entrepreneurial Mindset for Engineers	I	I	I	I	I	I	I	I	I	I	I
EGE 3003 Thermodynamics	R	R	R	-	E	-	R	-	-	-	R
EGE 3012 Engineering Cost Analysis	R	I	-	-	R	-	-	-	-	-	R
EME 1011 Foundations of Mech. Eng.	I	I	I	I	I	I	I	I	I	I	I
EME 2011 Materials Lab	R	E	I	R	I	I	R	-	-	-	I
EME 2012 Mechanical Eng. Graphics	I	-	I	-	I	-	-	-	-	-	I
EME 3011 Introduction to Eng. Projects	R	-	R	E	E	R	E	E	-	R	R
EME 3013 Mechanics of Materials	E	I	R	-	R	-	-	-	-	-	R
EME 3023 Manufacturing Processes	R	R	R	-	R	I	R	-	-	-	R
EME 3033 Engineering Numerical Methods	R	-	-	-	-	-	-	-	-	-	E
EME 3043 Dynamics	R	R	R	-	R	I	R	I	-	I	R
EME 3123 Fluid Mechanics	E	R	R	-	E	-	R	-	-	-	E
EME 3133 Kinematics & Dynamics of Machines	E	R	E	-	E	-	-	-	-	-	E
EME 3214 Mechatronics	E	R	R	R	E	-	R	R	R	R	E
EME 4003 Design of Machine Elements	E	R	E	R	E	E	R	R	R	R	R
EME 4013 Heat Transfer	E	-	R	-	E	-	R	-	-	-	R
EME 4212 Engineering Projects 1	E	R	E	E	E	E	E	E	R	E	E
EME 4222 Engineering Projects 2	E	E	E	E	E	E	E	E	E	E	E
EME 4252 Senior Project Fundamentals	E	R	E	E	E	E	E	R	-	R	E
EME 4253 Sr. Capstone Project	E	R	E	E	E	E	E	E	-	R	E
EME 4402 Mechanics Lab	R	E	-	-	-	-	R	-	-	-	E
EME 4412 Thermal Science Lab	R	E	R	E	E	R	E	R	R	R	E

Table 3: ABET Outcome Assessment Mapping

	a	b	c	d	e	f	g	h	i	j	k
EGE 1102 Engineering Computer Applications Lab											I
EGE 2103 Statics					I						
EGE 3003 Thermodynamics					R						
EME 2011 Engineering Materials Lab							I				
EME 2012 Mechanical Engineering Graphics											I
EME 3013 Mechanics of Materials					R						
EME 3123 Fluid Mechanics					R						
EME 3033 Engineering Numerical Methods	R										R
EME 3133 Kinematics and Dynamics of Machines	E										
EME 3043 Dynamics	R						R				
EME 3214 Mechatronics										E	E
EME 4003 Design of Machine Elements					E						
EME 4013 Heat Transfer					E		E				
EME 4212 Engineering Projects 1				E				R		R	
EME 4222 Engineering Projects 2			E	E		E					
EME 4252 Senior Project Fundamentals			E	E				R		R	
EME 4253 Senior Capstone Project			E	E		E					
EME 4412 Thermal Science Lab		E					E				
Alumni Survey									x		
Registrar's Data									x		
Exit interview									x	x	

Note. Introduce (I): corresponds to instances where the student outcomes are supported at an introductory level in a course. Reinforce (R): achieved when a course serves to reinforce the attainment of a student outcome that was supported previously at an introductory level in another course. Emphasize (E): achieved when a student outcome is supported at a more focused and advanced level.

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

From Fall 2019 through Spring 2022, the Mechanical Engineering (BSME) program at Lawrence Technological University maintained a rigorous annual assessment process for all ABET outcomes and university-mandated program-specific outcomes. Led by Associate Chair Dr. Chris Riedel and Assistant Chair Dr. Andy Gerhart, the department coordinated outcome tracking and data analysis through a centralized, web-based assessment management system. Faculty convened each summer for loop-closing discussions, with additional checkpoints during Assessment Day and department meetings throughout the academic year.

Technology skills were assessed using indicators across multiple courses, including EME 4412 and EME 3653. In 2019–2020, targets were fully met, and faculty introduced new assessments aligned with the recently developed Measurement Systems course (EME 3653). In 2020–2021, targets were again met in most cases (93% in Fall and 80% in Spring for EME 4412), with EME 3653 achieving 100% success except for one case at 75%. The department plans to revise rubric scoring levels and continue monitoring this outcome without major changes.

Graphical communication is evaluated through embedded criteria in written communication rubrics. Both academic years revealed that target thresholds were met in courses such as Dynamics and Heat Transfer. However, results specific to graphical communication were not extracted separately. Moving forward, faculty will isolate and analyze graphical elements more intentionally to better inform future loop-closing actions.

Leadership development was assessed primarily via ABET outcomes and tools in the EGE 3022 course and capstone experiences. In 2019–2020, a new leadership course (EGE 3022) was piloted, with tools under development. By 2020–2021, EGE 3022 data showed that targets were met. However, ISP (Industry Sponsored Projects) courses missed leadership targets slightly, potentially due to unclear survey instructions and isolated team member issues. For 2021–2022, a standardized survey will be used across both ISP and Competition Projects, and faculty will be encouraged to intervene early with struggling teams.

Teamwork was assessed using ABET outcome #5 in both Competition and ISP project sequences. While targets were met in 2019–2020 using legacy assessment strategies, the 2020–2021 data showed areas needing improvement, especially regarding meeting internal project timelines. Although teams successfully completed deliverables, adjustments are planned, including standardized surveys and increased faculty monitoring. A new peer-review tool was successfully introduced, and rubrics for teamwork evaluation are under development in EGE 3022.

Ethics and professional responsibility were not directly assessed in 2019–2020, as the EGE 3022 course and related rubrics were still in development. By 2020–2021, three of the four intended ethics outcomes were assessed, with students meeting expectations. The fourth outcome, which targets freshmen-level learning, remains under consideration due to concerns over reliability. To ensure all ABET expectations are covered, a new rubric will be applied to Capstone Projects in future assessment cycles.

Overall, the BSME program met or exceeded most performance targets for 2019–2021. Assessment practices were continuously refined through faculty collaboration and data-informed adjustments. Leadership for assessment remains strong, with Dr. Riedel and Dr. Gerhart coordinating results, faculty implementing classroom-level tools, and the Engineering College Leadership Assessment Team supporting ongoing rubric development and data collection.

3. Assessment Plan for 2022-2025 Academic Years

Continue with the assessment plan shown in Table 1.

BS in Mechanical and Manufacturing Engineering Technology

1. Assessment Plan and Summary

Table 1 shows the details of the assessment plan for Bachelor of Science in Mechanical and Manufacturing Engineering Technology (BSMMET) program. Each learning outcome shown in Table 1 is assessed each semester respective courses are offered, and loop-closing occurs on a biennial basis for each learning outcome assessed during the academic year. Table 2 shows the mapping of BSMMET program outcomes onto the ETAC, ASME and SME outcomes.

ABET outcomes:

a) an ability to apply knowledge of mathematics, science, and engineering;
b) an ability to design and conduct experiments, as well as to analyze and interpret data;
c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
d) an ability to function on multidisciplinary teams;
e) an ability to identify, formulate, and solve engineering problems;
f) an understanding of professional and ethical responsibility;
g) an ability to communicate effectively;
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues;
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Table 1: Assessment Plan for the BS in Mechanical and Manufacturing Engineering Technology

Undergraduate Program Level Learning Outcomes	BSMMET Program Criteria	Assessment Strategy	Metrics/ Indicators**
TECHNOLOGY 1. Apply advanced technologies to practical and theoretical problems. (Bloom's 3) 2. Design and conduct experiments. (Bloom's 4) 3. Analyze and interpret data using appropriate tools (e.g., Excel, Minitab) (Bloom's 3)	1. Geometric dimension and tolerance; computer aided drafting and design 2. Selection, set-up, and calibration of instrumentation 5. Materials Science, Selections and Strength of Materials 8. Electrical Circuits and Control	Assignments in TEE3103, TEE4193, TEE4214, TEE4224, TIE4115, TIE4193, TIE4214, TME1023, TME4103, TME4113	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives
ETHICS 1. Demonstrate critical thinking with respect to ethical dilemmas (Bloom's 3) 2. Discern between personal and professional ethical responsibilities (Bloom's 2) 3. Identify the ethical codes adopted by relevant professional associations. (2) 4. Predict possible social consequences of engineering/science ethical decisions. (3)	College of Engineering	Assignments in EGE1001, EGE3022	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives
LEADERSHIP 1. Identify theories, models, and practices as they pertain to a personal style and philosophy of leadership. (Bloom's 1) 2. Explain the difference between leadership and management. (Bloom's 2) 3. Differentiate the characteristics of effective and ineffective leadership. (Bloom's 3)	College of Engineering	Assignments in EGE1001, EGE3022	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives
TEAMWORK 1. Discuss various types of conflict and methods of resolution. (Bloom's 2) 2. Practice tools and techniques for team consensus building. (Bloom's 3) 3. Identify and integrate personal team player style in a team setting. (Bloom's 3)	9. Product Design, Tooling and Assembly	Assignments in TIE3063, TIE3203, TIE4115	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives
VISUAL COMMUNICATION Demonstrate professional standards in graphical communication (including figures, plots, tables, and posters) by integrating evidence and analysis within a coherent structure. (Bloom's 3 and 4)	9. Product Design, Tooling and Assembly 10.Statistics, Quality, Continuous Improvement, and Industrial Management	Graphical assignments in TCE2143, TCE4113, TCE4213	At least 70% of students will score 75% on questions designed to directly address each of the course Learning Objectives

Table 2: Curriculum Map of BSMMET Program

Mapping of BSMMET Program Outcomes to ETAC, ASME and SME Outcomes

BSMMET Program Criteria	ABET Student's Outcomes											Mechanical Eng. Tech Outcomes								Manuf. Eng. Tech. Outcomes				Supporting Courses*
	a	b	c	d	e	f	g	h	i	j	k	a	b	c	d	e	f	g	h	a	b	c	d	
1. Geometric dimensioning and Tolerancing; computer aided drafting and design	X	X										X							X					***TIE4193 GD&T***, TME1023 Tech Graphics, TME4113 Design Graphics
2. Selection, set-up, and calibration of instrumentation	X	X			X	X							X											**TEE4224** Transduces and Instrumentation
3. Engineering Mechanics, Statics and Dynamics			X		X	X								X		X								**TME3113** Engineering Mechanics
4. Differential and Integral Calculus	X	X													X									MCS2313 Technical Calculus, MCS3324 Applied Calculus & Diff. Eq.
5. Materials Science, Selections and Strength of Materials					X	X		X		X			X			X				X				**TIE4413** Engineering Materials, TIE 4115 Senior Project
6.Manufacturing Processes and Systems			X	X				X	X	X		X				X			X	X	X	X		TME 4413, Lean Manufacturing, **TIE 3063** Engineering Manufacturing Process, ***TIE 4193 Machininh Processes***
7. Thermal Sciences			X			X											X							TME3204 Applied Termal Fluid
8. Electrical Circuits and Control			X	X		X							X					X						TEE3103 DC/AC Curcuts, TEE4214 Embeded Processes
9. Product Design, Tooling & Assembly			X		X				X												X			TIE4115 Senior Project, TME4113 Design Graphics
10. Statistics, Quality, Continuous Improvement, and Industrial Management	X	X				X	X	X		X	X												X	TME3333 Six Sigma 1, TME4343 Six Sigma 2, TIE3203 Tec Project Management
11. Technical Communications, Oral and Written					X		X												X					TIE 3203 Tech Project management, TIE4115 Senior Project, COM2103 Technical Communications, Comm 300 (writing Profficency Exam)

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

Between Fall 2020 and Spring 2022, the BSMMET program at Lawrence Technological University assessed five undergraduate discipline-specific learning outcomes in alignment with program-level goals and mapped student outcomes. Assessments were conducted across multiple courses using course-embedded assignments, final projects, and team evaluations. Data was reviewed annually to identify strengths and areas for improvement, and actions were taken accordingly to close the loop.

Learning Outcome 1 (Technology) was assessed through four student outcomes. For *Geometric Dimensioning and Tolerancing and CAD* (Student Outcome 1), students in TME1023 and TME4113 consistently exceeded performance targets in both years, with achievement rates ranging from 80% to 87%. No issues were identified, and current instructional practices will be maintained (Lead: Dr. Sabah Abro). For *Instrumentation setup and calibration* (Student Outcome 2), students in TEE4224 performed well (87–89%), while those in TEE4214 showed year-over-year improvement (72% in 2020–2021 to 76% in 2021–2022). To support continued progress, instructors are increasing hands-on lab experiments and supplemental materials (Lead: Ken Cook). For *Materials Science and Strength of Materials* (Student Outcome 5), students consistently exceeded the 75% target in TME4013 (83–100%). The assessment tools are being reviewed to ensure clearer measurability (Lead: Dr. Nikolina Samardzic). For *Electrical Circuits and Control* (Student Outcome 8), performance improved slightly across both years in TEE3103 and TEE4214, though the 75% target was narrowly missed in some sections. Additional lab experiments and practical examples are being added to improve performance (Lead: Prof. Ken Cook).

Learning Outcome 2 (Visual Communication) was assessed through TME3333 and TME4343 (Student Outcome 10), which cover topics in statistics, quality, and industrial management. Student performance exceeded the 75% benchmark in both courses across both years, with final exam scores ranging from 73% to 79%. Instructors plan to offer certification exams and continue strengthening student engagement and outcome clarity (Lead: Dr. Sabah Abro).

Learning Outcome 3 (Leadership) and **Learning Outcome 5 (Ethics)** were assessed at the College of Engineering level and are supported by broader institutional efforts and shared assessment tools.

Learning Outcome 4 (Teamwork) was assessed via Student Outcome 9 through team projects in TIE4115 and TIE3063. In both 2020–2021 and 2021–2022, students consistently exceeded the 75% target, with team performance scoring between 81% and 86%. No major issues were identified. The department will continue to monitor team performance in future course offerings (Lead: Ken Cook).

Overall, the BSMMET program demonstrated steady improvement across key outcomes with targeted adjustments, especially in instrumentation and electrical circuits. Loop-closing actions were implemented as needed, and outcome targets were generally met or exceeded. Faculty leads remain actively involved in refining assessments and instructional strategies to maintain academic rigor and student success.

3. Assessment Plan for 2022-2025 Academic Years

1) We will continue to improve the assessment process for the program.
2) All syllabi and courses learning objectives are to be reviewed to make sure that they are measurable and address the required performance indicators.
3) One-to-one meetings will be planned with instructors to improve the assessment process.

BS in Robotics Engineering

1. Assessment Plan and Summary

Table 1 provides a mapping of the university-wide undergraduate learning outcomes to the BSRE program-specific learning outcomes, in addition to the corresponding assessment techniques, metrics, and loop closing information employed.

The BSRE program learning outcomes, which were adopted from the new "1 through 7" ABET engineering outcomes are:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The new ABET assessment plan for the BSRE program is shown in Table 2.

a)

Table 1: Assessment Plan for the BS in Robotics Engineering

Undergraduate Program Level Learning Outcomes	ABET Outcomes	Assessment Strategy	Metrics/ Indicators
TECHNOLOGY 1. Apply advanced technologies to practical and theoretical problems. (Bloom's 3) 2. Design and conduct experiments. (Bloom's 3) 3. Analyze and interpret data using appropriate tools (e.g., Excel, Minitab) (Bloom's 3)	1. Outcome k (an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice) 2 and 3. Outcome b (an ability to design and conduct experiments, as well as to analyze and interpret data)	1. Term project grade in MRE3114 2. Rubric to grade take-home MATLAB assignment in MRE4113 3. Term project grade in MRE2024, MRE3024	70% of students will score 80% or above
ETHICS 1. Demonstrate critical thinking with respect to ethical dilemmas (Bloom's 3) 2. Discern between personal and professional ethical responsibilities (Bloom's 2) 3. Identify the ethical codes adopted by relevant professional associations. (2) 4. Predict possible social consequences of engineering/science ethical decisions. (3)	Outcome f (an understanding of professional and ethical responsibility)	Writing rubric used for technical paper in EME3043, MRE3024 Oral presentation rubric used in MRE4014	70% of students will score 80% or above
LEADERSHIP 1. Identify theories, models, and practices as they pertain to a personal style and philosophy of leadership. (Bloom's 1) 2. Explain the difference between leadership and management. (Bloom's 2) 3. Differentiate the characteristics of effective and ineffective leadership. (Bloom's 3)	Outcome h (the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context)	1. Homework assignment in EGE 3022 2. Homework assignment in EGE 3022 3. Team Project rubric in EGE 3022	1. Grading rubric (Metrics TBD) 2. Grading rubric 3. Evaluation rubric
TEAMWORK 1. Discuss various types of conflict and methods of resolution. (Bloom's 2) 2. Practice tools and techniques for team consensus building. (Bloom's 3) 3. Identify and integrate personal team player style in a team setting. (Bloom's 3)	Outcome d (an ability to function on multidisciplinary teams)	Peer evaluations of teamwork projects in EME4252, EME4253 Teamwork peer evaluation form in MRE3024	80% of students achieve a score of 75% or higher

VISUAL COMMUNICATION Demonstrate professional standards in graphical communication (including figures, plots, tables, and posters) by integrating evidence and analysis within a coherent structure. (Bloom's 3 and 4)	Outcome g (an ability to communicate effectively)	Ethics quiz (multiple choice) in EME4253	70% of students will achieve a score of 70% or higher

Table 2: New ABET assessment plan for BSRE program

New Student Outcomes (1 – 7)	Assessment Method	Timeline
1. an ability to identify, formulate, and solve *complex* engineering problems by applying principles of engineering, science, and mathematics *Complex is defined as having one of the following:* • *involving wide-ranging or conflicting technical issues* • *having no obvious solution* • *addressing problems not encompassed by current standards and codes* • *involving diverse groups of stakeholders* • *including many component parts or sub-problems* • *involving multiple disciplines* • *having significant consequences in a range of contexts.*	• Final exam problem in Statics, Mechanics of Materials, Unified Robotics III, Unified Robotis IV • Evaluate design problem (exam or project) in System Modeling and Control and Discrete Control	Start Fall 2019 Start Spring 2020
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	• Rubric for feasibility study in Unified Robotics III • Rubric for design in Unified Robotics IV • Rubric for final report in Capstone Projects 2	Start Spring 2020
3. an ability to communicate effectively with a range of audiences	• Rubric for technical paper evaluation in Unified Robotics II (written) • Rubric for presentatin in Capstone Projects 2 (oral) • Rubric to score project in Dynamics (graphical)	Start Spring 2020
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	• Rubric for feasibilty study in Unified Robotics III • Evaluate student's work in EGE 3022 Leadership and Professional Development for Engineers	Start Spring 2020
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	• Peer evaluation in Unified Robotics III • Teamwork survey and evaluation in Capstone Projects 1 and 2	Start Spring 2020
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	• Rubric for experimental in Unified Robotics I • Rubric for experimental in Unified Robotics III	Start Fall 2019
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	• Evaluate literature survey in Unified Robotics II • Evaluate literature review in Unified Robotics III • Rubric on contemporary issues in Unified Robotics IV	Start Fall 2019

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

From 2019 through 2022, the BSRE program consistently collected and analyzed assessment data aligned with university outcomes. These assessments were reviewed annually during the MRIE Department's close-the-loop meetings. Since there has been no dedicated faculty from ECE or MCS on the Mechatronics and Robotics Curriculum Committee, BSRE-specific findings were summarized independently but informed by the broader departmental review process.

Technology outcomes were evaluated in courses such as MRE 2024 and MRE 3024 across all three years. In 2019–2020, 80% of students met targets in MRE 2024 and 100% in MRE 3024. Similar success was observed in 2020–2021, with 82% meeting targets in MRE 2024 and 100% across six detailed subcomponents in MRE 3024 (experimental planning, development, execution, analysis, interpretation, and conclusion). In 2021–2022, slight declines were noted in a few MRE 3024 subcategories (e.g., experimental planning and data interpretation at 67%), but performance remained strong overall. MRE 2024 has been identified as too early in the curriculum for meaningful assessment of this outcome. As a result, the program plans to shift focus to junior/senior-level courses and will incorporate EME 3653 starting Fall 2023.

Graphical Communication was assessed through EME 3043. In Fall 2019 and Spring 2020, 78% of students met targets, though the data pooled BSME and BSRE students without disaggregation. Similar limitations applied in Fall 2020 (71% met target) and Fall 2021 (73%). Ongoing actions include ensuring data isolation for BSRE students and consistent semester collection.

Leadership development was measured in capstone courses MRE 4902 and MRE 4912 using a teamwork and leadership rubric. In 2019–2020, MRE 4912 students met all targets. In 2020–2021, leadership scores ranged from 89–100% in MRE 4902 and MRE 4912. By Spring 2022, leadership was still strong (86–100%), though no data was available for Fall 2021. These assessments are supported by inclusive environment metrics, also measured via survey.

Teamwork was also assessed using the capstone rubric, focusing on planning tasks, setting goals, and meeting objectives. In 2019–2020 and 2020–2021, collaboration and planning consistently met or exceeded targets. However, in Fall 2020, only 46% met the "meeting objectives" target, which prompted closer monitoring. By Spring 2022, all teamwork dimensions reached 100% except "meeting objectives" (78%). The program continues to track these results carefully to support student collaboration and project management skill development.

Ethics was assessed in both EGE 3022 and MRE 3024. Students consistently met or exceeded targets across all years, including 100% performance in Spring 2020, 2021, and 2022. EGE 3022 data collection was finalized and aligned with the assessment framework beginning in 2021.

In summary, the BSRE program has shown strong performance in key outcome areas. Adjustments to data collection practices, course alignment, and timing of assessments have been made where needed. Loop-closing actions have focused on shifting evaluations to more appropriate course levels, improving data granularity, and reinforcing instructional strategies to ensure all students meet or exceed learning targets.

3. Assessment Plan for 2022-2025 Academic Years

Continue assessment as planned according to Table 1..

MS in Automotive Engineering

1. Assessment Plan and Summary

The assessment plan for the MSAE program is shown in Table 1. Each graduate program learning outcome is assessed on a semester basis when respective courses are offered, and loop-closing occurs on a three-year cycle.

Table 1: Assessment Plan for MSAE

University Graduate Learning Outcomes	Supporting Program Learning Objectives	Assessment Tools	Metrics/ Indicators
ADVANCED KNOWLEDGE	Graduate students will analyze, evaluate, and/or develop advanced knowledge in specialized areas in their discipline.	Final oral presentation or written report in EME6373 (Powertrain Systems 1). Use the "Project Elements" rubrics.	75% of the students will score 85% or better.
ETHICS	Graduate students will recognize ethical expectations for dissemination of engineering work and evaluate ethical issues relevant to the impact of advancing technology in their discipline	Mandatory attendance at a minimum of three seminars per semester: EME5XX0 (M.E. Graduate Seminar) Students must submit a one page summary of each seminar. Use the "Graduate Seminar" rubric.	80% of the students will score 85% or better.
COMMUNICATION	Graduate students will analyze, evaluate and create communication consistent with their discipline.	Final oral project presentation in EME5573 (Automotive HVAC 1). Use the "Oral Presentation Evaluation" rubric.	80% of students will score 85% or better.
TECHNOLOGY	Graduate students will analyze, evaluate and/or create technologies consistent with their discipline.	"Understeer Gradient" project in EME5433 (Vehicle Dynamics 1). Use the "Analyze & Interpret" rubric.	80% of the students will score 85% or better.

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

From 2019 to 2022, the MSAE program assessed graduate student learning across four key program outcomes: Advanced Technology, Ethics, Communication, and Technology. Assessments were conducted annually using course-embedded assignments, rubrics, and faculty evaluation, with results informing ongoing improvements and confirming student proficiency.

Advanced Technology was assessed through the final oral presentation in EME6373 (Powertrain Systems 1), using the "Project Elements" rubric. In Spring 2020, 100% of students (13 of 13) met the target of scoring 85% or better. This trend continued in Spring 2021 (8 of 8 students) and Spring 2022 (17 of 17 students), with perfect achievement each year. Since the program's performance exceeded the benchmark of 75% scoring at least 85%, no corrective actions were required.

Ethics was targeted through proposed participation in the M.E. Graduate Seminar course (EME5XX0), where students would attend at least three seminars per semester and submit one-page summaries evaluated using a dedicated rubric. However, the graduate seminar course had not been developed during the three-year period. As a result, no direct assessments were conducted for this outcome. The program identified the development and implementation of the seminar course as an ongoing action item across all years.

Communication skills were assessed through final oral project presentations in EME5573 (Automotive HVAC 1), using the "Oral Presentation Evaluation Form." In Summer 2020, 86.4% (19 of 22) met the benchmark. Performance declined slightly in Spring 2021, where only 78.6% (11 of 14) met the threshold—falling just one student short. The shortfall was attributed to inadequate visual aids. The program responded by continuing to monitor this outcome and reassessing when the course is next offered. By Summer 2022, 100% (8 of 8) of students met the benchmark, confirming the temporary nature of the previous dip and requiring no further action.

Technology application was assessed via the "Understeer Gradient" project in EME5433 (Vehicle Dynamics 1), using the "analyze and interpret information" rubric. Assessment results were consistently strong, with 96.4% (27 of 28) meeting the benchmark in Fall 2019, 90% (27 of 30) in Fall 2020, and 100% (17 of 17) in Fall 2021. As performance consistently exceeded the target of 80%, no actions were required.

Overall, the MSAE program demonstrated consistent achievement of learning outcomes related to advanced knowledge and technical application. While communication outcomes briefly fell below the benchmark in 2021, subsequent assessment confirmed recovery. The primary area needing attention remains the Ethics outcome, where the implementation of the graduate seminar course continues to be a pending task. Dr. Kingman Yee, Director of the M.S. in Automotive Engineering program, remains responsible for implementing all aspects of the assessment plan and tracking results.

3. Assessment Plan for 2022-2025 Academic Years

Continue with assessment activities as shown in Table 1.

Master of Civil Engineering/MS in Civil Engineering

1. Assessment Plan and Summary

The student outcomes of the Master of Science in Civil Engineering (MSCE) degree program are listed below (a-f). They have been adapted from the Civil Engineering Body of Knowledge 3 (CEBOK3) promulgated by the American Society of Civil Engineers (ASCE). The outcome titles based on CEBOK3 are given in parenthesis along with the expected level of achievement. Outcome (f) is only assessed for those performing a thesis or graduate project.

(a) *Analyze* a possible solution to a complex problem, question, or issue relevant to civil engineering. (CEBOK3: Critical Thinking and Problem Solving, Level 4: Analyze)

(b) *Develop* an appropriate design alternative for a complex civil engineering project that considers realistic requirements and constraints. (CEBOK3: Design, Level 5: Synthesize)

(c) *Integrate* solutions to complex problems that involve multiple specialty areas appropriate to the practice of civil engineering. (CEBOK3: Breadth in Civil Engineering Areas, Level 5: Synthesize)

(d) *Integrate* advanced concepts and principles into the solutions of complex problems in a specialty area appropriate to the practice of civil engineering. (CEBOK3: Depth in a Civil Engineering Area, Level 5: Synthesis)

(e) *Analyze* effective and persuasive communication to technical and nontechnical audiences. (CEBOK3: Communication, Level 4: Analyze)

(f) *Develop* new experimental methods and/or integrate the results of multiple experiments for the solution of civil engineering problems. (CEBOK3: Experimental Methods and Data Analysis)

The assessment plan for the program is shown in Table 1. Table 2 shows the mapping of courses onto the program assessment outcomes. However, not all graduate courses are offered on a yearly basis and not all students take the graduate classes and therefore, all classes are mapped to all outcomes with the exception of Outcome f.

This report has been drafted by Dr. Keith Kowalkowski, Assistant Chair of the Department of Civil and Architectural Engineering and the Director of Civil Engineering Graduate Programs. Close-the-loop meetings for all programs in the department occurred on August 15, 2022.

Student assessment is conducted using the following tools:

Direct Assessment of Courses: Direct assessment of student learning is performed in select courses. The select courses cover the different concentrations including transportation, structural, geotechnical, water resources, and environmental. Most courses are offered once in two years with some exceptions.

Presentations: Formal presentations are delegated in some courses of the MSCE program. A rubric is filled out by the course instructor evaluating the graphical and oral communication skills as well understanding of technical content. The presentations are meant to serve one of the university graduate learning goals in communication.

Assessment of Thesis and Graduate Projects: The members of the defense committee for a thesis or graduate project are to provide their evaluations outlining the quality of the thesis or project using the rubric provided to them. The rubric performs assessment of the final presentation and final report.

Exit Interviews: The objective of the exit interview is to receive a summative view of what is happening in the department and an indication of overall student satisfaction. The program director conducts exit interviews. The process includes a survey form to be filled out by students regarding their education at LTU and specific graduate program outcomes. To encourage participation, the program director allows the students to simply use the forms or to use the forms and then conduct a verbal interview.

Direct assessment is performed by the course instructor. The governing document of assessment data collection and subsequent evaluation is the Assessment Summary Form. The Assessment Summary Forms are provided for each individual course that is being assessed for the term. The form may be altered by the course instructor depending on whether or not the student outcome is appropriate for the course. The form is comprised of the following components:

- Summary Table: a listing of the assessed outcomes for a quick view of their vectors.
- Grade Distribution: although this component is not used for assessment, instructors may record their grades in the table for a visual depiction of the distribution.
- Instructions for Completing the Form: a discussion of the goals of the Vector Designation (rubric) and how to complete the form.
- Vector Rubric Table: a rubric that provides the measurements and descriptions of the vector designations (see Table A).
- Instructor Review and Reflection Log: there is a text box (see Figure A) for each of the assessed outcomes which includes:
  - the full title and description of the student outcome;
  - an explanation regarding the input of the instructor's reflective thoughts and observations on how and why the level of achievement was/was not attained;
  - an area for the supporting evidence where the instructor describes the instruments used for student work (tests, projects, lab reports, etc.); and
  - a line to record the vector for that SO.
- Final Reflection Log: a text box for the instructor to record final thoughts on the SOs and continuous improvement ideas; instructors are encouraged to input any suggestions for revisions to the course content and course objectives.

Table A: Vector Rubric Table

VECTOR DESIGNATION	MEASUREMENT	DESCRIPTION
E	**≥ 90%**	**Excellent:** students applied knowledge with little or no conceptual or procedural errors
A	**75% to 89%**	**Acceptable:** students applied knowledge with no significant conceptual and only minor procedural errors
M	**60% to 74%**	**Minimal:** students applied knowledge with occasional conceptual errors and minor procedural errors
U	**≤ 59%**	**Unsatisfactory:** students applied knowledge and made significant conceptual and/or procedural errors
NA		**Not Applicable:** Outcome was not addressed during the semester

Breadth in Civil Engineering Areas: Integrate solutions to complex problems that involve multiple specialty areas appropriate to the practice of civil engineering.

[Instructor reflection regarding how this outcome was addressed and whether students attained the appropriate level of achievement; if students have fallen below the appropriate level, the instructor should discuss potential corrective actions for implementation when the course is offered in the future]

Supporting Evidence
[Specific description of the test question(s), project(s), etc. that support this outcome]

Final Reflections and Continuous Improvement

[It is valuable to the Program when Instructors insert observations and comments about the course, including suggestions for improvement. Instructors may include input from their own experience and reflections, from Course Evaluations completed by students, from industry practitioners and Advisory Board members, etc. Also, Instructors should insert any suggested revisions/additions/deletions to the course objectives.]

Figure A: Instructor Review and Reflection Log

Based on the Program's assessment process, the Program Director collaborates with the Course Instructors/Coordinators to identify the student work targeted for assessment. Course instructors retain copies of the work and review them for assessment and evaluation at the end of the semester. In the annual close-the-loop meeting, a summary of all the data and the results is shared with all faculty members of the department.

Table 1: Assessment Plan for Master of Science in Civil Engineering

Graduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ADVANCED KNOWLEDGE	(a) *Analyze* a possible solution to a complex problem, question, or issue relevant to civil engineering (b) *Develop* an appropriate design alternative for a complex civil engineering project that considers realistic requirements and constraints. (c) *Integrate* solutions to complex problems that involve multiple specialty areas appropriate to the practice of civil engineering. (d) *Integrate* advanced concepts and principles into the solutions of complex problems in a specialty area appropriate to the practice of civil engineering.	-Direct assessment of assignments or exams in ECE 6743, ECE 5703, ECE 5473, ECE 5523, and ECE 5813. -Evaluation of Thesis and Graduate Project Reports using a rubric.	80% should reach the highest expected achievement level defined in Section 1 for each outcome based on CEBOK3.
COMMUNICATION	(e) *Analyze* effective and persuasive communication to technical and nontechnical audiences.	- Oral Presentation rubrics in various classes per department brochure. - Evaluation of Thesis and Graduate Project Reports using a rubric.	80% should average meet expectations for oral and graphical content
ETHICS	(b) Develop an appropriate design alternative for a complex civil engineering project that considers realistic requirements and constraints. (d) Integrate advanced concepts and principles into the solutions of complex problems in a specialty area appropriate to the practice of civil engineering. (f) Develop new experimental methods and/or integrate the results of multiple experiments for the solution of civil engineering problems.	-Direct assessment of assignments or exams in ECE 6743, ECE 5703, ECE 5433, ECE 5523, and ECE 5813. -Evaluation of Thesis and Graduate Project Reports using a rubric.	80% should reach the highest expected achievement for each outcome based on CEBOK3.
TECHNOLOGY	(d) Integrate advanced concepts and principles into the solutions of complex problems in a specialty area appropriate to the practice of civil engineering. (f) Develop new experimental methods and/or integrate the results of multiple experiments for the solution of civil engineering problems.	-Direct assessment of assignments or exams in ECE 6743, ECE 5703, ECE 5433, ECE 5523, and ECE 5813. -Evaluation of Thesis and Graduate Project Reports using a rubric.	80% should reach the highest expected achievement for each outcome based on CEBOK3.

Table 2: Curriculum Map for the Master of Science in Civil Engineering

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**		ADVANCED KNOWEDLGE	COMMUNICAITON	ETHICS	TECHNOLOGY
ECE5323	Environmental Cleanup				
ECE5333	Air Pollution Control				
ECE5343	Advanced Environmental Engineering				
ECE5353	Environmental Management				
ECE5363	Surface Water Quality Management				
ECE6313	Industrial Water and Wastewater Treatment				
ECE5413	Shallow and Deep Foundation Design				
ECE5423	Geoenvironmental Engineering				
ECE5433	Ground Improvement Methods				
ECE5443	Designing with Geosynthetics				
ECE5473	Earth Retaining Structures	**R (S)**	**R (S)**	**R (S)**	**R (S)**
ECE6413	Engineering Properties of Soils				
ECE6423	Geotechnical Earthquake Engineering				
ECE5703	Design of Timber Structures	**R (S)**	**R (S)**	**R (S)**	**R (S)**
ECE5713	Analysis and Design of Prestressed Concrete				
ECE5723	Advanced Analysis and Design of Structures				
ECE5733	Structural Masonry Design				
ECE5753	Advanced Concrete Design				
ECE5763	Advanced Comp. Materials				
ECE5773	Advanced Steel Design				
ECE5783	Bridge Design I				
ECE6723	Structural Design and Analysis for Fire Safety				
ECE6733	Finite Element Analysis for Struct. Engineering				
ECE6743	Structural Dynamics	**R (S)**	**R (S)**	**R (S)**	**R (S)**
ECE5813	Pavement Analysis and Performance	**R (S)**	**R (S)**	**R (S)**	**R (S)**
ECE5823	Pavement Management Systems				

ECE5833	Traffic Engineering				
ECE5843	Highway Safety Engineering				
ECE5853	Airport Pavement Design and Management				
ECE5523	River Engineering				
ECE5533	Coastal Engineering				
ECE5543	Design of Stormwater Management Systems				
ECE5553	Ports and Harbors Engineering				
ECE5593	Special Topics in Hydraulic Engineering				
ECE6513	Groundwater Modeling				
ECE5103	Applied Geographic Information Systems				
ECE5113	Sustainable Construction Practices				
ECE6053	Graduate Project				
ECE6083	Thesis II	**R (S)**	**R (S)**	**R (S)**	**R (S)**
ECE6113	Concrete Engineering				

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

The assessment activities that were originally planned for the 2021-2022 academic year were not all performed. There was a significant issue with performing formal presentations in regular classes due to the COVID-19 pandemic. In addition, this caused issues with asking the faculty to perform formal assessment at the graduate level during the 2021-2022 academic year, with the necessary assessment they had to perform at the undergraduate level for ABET purposes and for the MSArE and BSCE programs. In addition, the program director is also the program director of the MSArE program and had to serve as assessment coordinator and had to draft the self-study for the upcoming ABET visit in Fall 2022.

The program director taught ECE 5733 Structural Masonry Design in the fall of 2021 and performed assessment of this course as planned. Assessment was also added for ECE 5723 Advanced Structures in the summer of 2022.

Below is a summary of the assessment activities performed. The list includes the specific outcomes targeted as well as a description of activities planned but not performed.

1. **Direct assessment in ECE 5733 and ECE 5723.** *Outcomes (a), (b), (c) and (d)*. Originally, 5 classes were deemed to be assessed. However, as mentioned above, the program director did not feel comfortable making faculty perform assessment during the academic year with the stress of COVID-19 and because he lacked the time to focus on assessment of the graduate programs (other than the MSArE).
2. **Exit Interviews**. *Outcomes (d) and (f)*. Exit interview survey was sent to all students graduating fall 2020 and spring 2021. A total of 4 students completed the survey for the MSCE program.
3. **Student Class Presentations**. *Outcomes (b), (c) and primarily (e)*. No assessment done in this area.
4. **Student Thesis/Graduate Project.** *Outcomes (d) and (f)*. One student completed a thesis in the fall 2021 and one student completed a graduate project in the fall 2021.

Item 1: Direct assessment in ECE 5733 and ECE 5723

Direct assessment was performed to evaluate Outcomes (a), (b), (c), and (d). A general description of how assessment was performed is discussed in last year's assessment report, Section 2b. In addition, the assessment summary forms are included in the Appendix.

ECE 5733 contained MSCE and MSArE students. However, since the MSArE students are not assessed for this class as part of the assessment report for the MSArE program, they are included in the assessment results presented herein. Results of the student outcomes using the EAMU vector described earlier in the report are shown below.

Outcome Number (BOK3) & Title	VECTOR			
	E	A	M	U
CEBOK3: Critical Thinking and Problem Solving, Level 4: Analyze	2	4	0	0
CEBOK3: Design, Level 5: Synthesize	1	4	1	0
CEBOK3: Breadth in Civil Engineering Areas, Level 5: Synthesize	3	3	0	0
CEBOK3: Depth in a Civil Engineering Area, Level 5: Synthesis	1	2	1	2

A review of the results in the table above demonstrates that the students performed well with respect to Student Outcomes (a), (b), and (c). However, they did not perform well in Outcome (d) Depth in a Civil Engineering Area. The assessment was performed using homework assignments that were complicating.

For one assignment, the students performed very poorly. The topic of P-M interaction curves using the ASD approach, in particular, is complicating and there is a breakdown of the theory in the transformation of material properties. The instructor has problems describing this and this is related to the issues students had with the assignment.

An overall assessment of all grades reveals that more than 80% of the students receive the desired mark (A or higher) with respect to all outcomes besides Outcome (d). Overall, direct assessment needs to be performed more effectively in the future. All faculty needs a plan at the beginning of the semester to execute proper assessment methods.

The results for ECE 5723 are shown below. When the class began, there were 6 students enrolled. However, that number dropped to 3 students.

Outcome Number (BOK3) & Title	VECTOR			
	E	A	M	U
CEBOK3: Critical Thinking and Problem Solving, Level 4: Analyze	0	3	0	0
CEBOK3: Design, Level 5: Synthesize	2	1	0	0
CEBOK3: Breadth in Civil Engineering Areas, Level 5: Synthesize	3	0	0	0
CEBOK3: Depth in a Civil Engineering Area, Level 5: Synthesis	0	3	0	0

An overall evaluation of the results show that the students performed adequately in the class. There really is not too much to reflect on. For both classes assessed, the results are little lower for Depth in a Civil Engineering Area as opposed to other outcomes.

Item 2: Exit Interviews

As discussed, a total of 4 exit interview responses were obtained from the students in the last academic year.

A specific question in the exit interview survey is related to one of the program outcomes. The following summarizes the results of these questions.

- 4/4 students clearly indicated that "LTU gave them the ability to analyze a possible solution to a complex problem, question, or issue relevant to civil engineering". Some additional comments were provided (typical).
- 4/4 students indicated that "LTU gave them the ability develop an appropriate design alternative for a complex civil engineering project that considers realistic requirements and constraints".
- 2/4 students indicated that "gave them the ability to integrate solutions to complex problems that involve multiple specialty areas appropriate to the practice of civil engineering". One student commented that they only learned about structural engineering since this was the focus of their degree. Another student left the question blank.
- 3/4 students indicated that "LTU has gave them the ability to integrate advanced concepts and principles into the solutions of complex problems in a specialty area appropriate to the practice of civil engineering". One student indicated there was not enough practical examples in class and more practical discussions should be utilized by the faculty.
- 2/4 students indicated that "LTU gave them the ability to analyze effective and persuasive communication to technical and nontechnical audiences". The program director feels that their comments were always positive. In reality, students that graduated in the last academic year did not spend much time in the classroom due to COVID-19. They were not able to do formal presentations or have in person interactions with the faculty.

As an overall reflection of this year's survey results, the program director is pleased with the amount of participation. This is dissimilar from recent academic years. The overall results are favorable. The only negative comments found in the exit interviews was the lack of practical examples in the classroom, the qualifications of some faculty and responses to the question regarding communication.

Item 3: Student Class Presentations

In regards to Item 3, formal presentations were not assessed in the previous academic year. This is primarily due to the COVID-19 pandemic but classes are starting to be on ground once again and formal presentations, evaluated with rubrics, will be encouraged.

Item 4: Student Thesis/Graduate Project

In regards to Item 4, 1 student completed the thesis in the previous academic year and 1 student completed a graduate project in the previous academic year.

Jordan Britz completed his graduate project in the fall of 2021. Three faculty members filled out the rubric shown in the Appendix. The results for the "dimensions" in the rubrics were averaged from the three reviewers. Each dimension is linked to one or two student outcomes. The outcomes that are assessed are (a), (c), (d), (e) and (f). Average results for each outcome are as follows:

- Outcome (a), Critical Thinking and Problem Solving: 8.2/10
- Outcome (c), Breadth in Civil Engineering Areas: 8.5/10
- Outcome (d), Depth in Civil Engineering Areas: 8.7/10
- Outcome (e), Communication 8.7/10
- Outcome (f), Experimental Methods and Data Analysis: 8.6/10

The results shown above are adequate and demonstrate that the student met the expectations of the graduate project. Per Tables 1 and 2, a general target number for student success is 80%. Since there are limited students to reflect on, the program is measuring success is achieving 8/10 on the rubric evaluations. The student in question received at least a 7 from every reviewer on all dimensions. Therefore, his project is considered a success and will hopefully be integrated into something useful by the profession.

Mason Ali defended his thesis in fall 2021. The student was the second to focus on construction engineering and complete a thesis. The program director was present during the presentation itself. Three faculty members filled out the rubric shown in the Appendix. The results for the "dimensions" in the rubrics were averaged from the three reviewers. Each dimension is linked to one or two student outcomes. The outcomes that are assessed are (a), (c), (d), (e) and (f). Average results for each outcome are as follows:

- Outcome (a), Critical Thinking and Problem Solving: 8.7/10
- Outcome (c), Breadth in Civil Engineering Areas: 7.5/10
- Outcome (d), Depth in Civil Engineering Areas: 7.1/10
- Outcome (e), Communication 7.7/10
- Outcome (f), Experimental Methods and Data Analysis: 7.9/10

With the exception of Outcome (a), the scores fall below the target of 8/10. The student did not perform up to the level of expectations for the thesis and primarily struggled with the technical aspects of the project. The students lowest individual dimension score was for Merits with one reviewer marking it as a 3/10. The student evaluated safety at a construction site and overall, the work did not contain any intensive experimental or analytical research.

3. Assessment Plan for 2022-2025 Academic Years

Similar to the previous year, there was not enough participation during the year for assessment at the graduate level. Graduate assessment is not as formal as undergraduate assessment due to the high demands of faculty and since accreditation is not an option.

The assessment plan is shown in Table 1. In the next academic year, five courses will be directly assessed across four disciplines. This includes ECE 6743 and ECE 5703 from structural engineering, ECE 5523 from water resource engineering, ECE 5813 from transportation engineering, and ECE 5473 from geotechnical engineering. At this time, all of the courses listed are expected to be taught by full-time faculty with the exception of ECE 5523 River Engineering, which is expected to be taught by adjunct faculty. This is advantageous since full-time faculty are familiar with the assessment procedures at the undergrad levels and more appropriate measures will be made for various categories. Primarily, Outcomes (a), (b), (c), and (d) will be assessed using direct assessment.

Outcome (e) (CEBOK3: Communication) requires multiple forms of assessment. Oral or verbal and graphical communication skills will be evaluated using rubrics and formal presentations as in previous years. This rubric will be sent to all faculty to see which will be able to provide formal presentations. Outcome (e) will also be assessed using the final presentation and written report (thesis or graduate project) for students completing the thesis option or graduate project option.

Outcome (f) will be assessed as part of the graduate project or as part of the thesis. Only students in this category "Develop new experimental methods and/or integrate the results of multiple experiments for the solution of civil engineering problems."

The specific assessment tools used for Outcomes (a-d) in each class are still being determined for the various courses. An example assessment plan is provided for ECE 6743.

> *Outcome a:* Critical Thinking and Problem Solving, Level 4: Analyze
> *Actions:* In ECE 6743, Problem 1 of Exam 1 and Problem 4 of Exam 2 will be assessed. These problems were chosen simply because they are complex problems and because they are analysis problem that require critical thinking.
>
> *Outcome b:* Design, Level 5: Synthesize
> *Actions:* Most of ECE 6743 is theoretical. However, the end of the class focuses on seismic provisions per ASCE 7. Homework 12 focuses on this and one question on the final exam (Problem 3). These will be used for the assessment of this outcome.
>
> *Outcome c:* Breadth in Civil Engineering Areas, Level 5: Synthesize
> *Actions:* Breadth is always complicating to evaluate in an individual course in civil engineering since breadth in CEBOK3 is associated with a combination of multiple disciplines that a student learns in civil engineering. For individual classes, breadth is best evaluated by looking at what the students learn over the course of the semester. The final exam is not meant to be cumulative

in ECE 6743. However, as the class progresses, the more advanced topics utilize topics earlier in the class. Therefore, the final exam will be used for assessment of this outcome.

Outcome d: CEBOK3: Depth in a Civil Engineering Area, Level 5: Synthesis
Actions: In ECE 6743, Homework 4 and 9 will be used. These are probably the most complicating homework assignments for the class and that is why they were chosen. Homework 9 utilizes response spectrums, which is an advanced topic in structural dynamics and earthquake engineering.

Master of Construction Engineering Management

1. **Assessment Plan and Summary**

The student outcomes of the Master of Construction Engineering Management (MCEM) program are listed below (a-e). They have been adapted from the Civil Engineering Body of Knowledge 3 (CEBOK3) promulgated by the American Society of Civil Engineers (ASCE). The outcome titles based on CEBOK3 are given in parenthesis.

a) *Integrate* components into a complete project management plan for a complex civil engineering project. (CEBOK3: Project Management, Level 5: Synthesize)

b) *Analyze* effective and persuasive communication to technical and nontechnical audiences. (CEBOK3: Communication, Level 4: Analyze)

c) *Develop* practices and requirements to achieve sustainable performance of complex civil engineering projects from a systems perspective. (CEBOK3: Sustainability, Level 5: Synthesize)

d) *Integrate* professional responsibilities relevant to the practice of civil engineering, including safety, legal issues, licensure, credentialing, and innovation. (CEBOK3: Professional Responsibilities, Level 5: Synthesize)

e) *Analyze* ethical dilemmas to determine possible courses of action. (CEBOK3: Ethical Responsibilities, Level 4: Analyze)

The assessment plan for the program is shown in Table 1. Table 2 shows the mapping of courses onto the program assessment outcomes. Learning outcomes assessed for the 2021-2022 academic year are listed in Section 2 of this report, including a detailed description of loop closing evaluation.

This report has been drafted by Dr. Keith Kowalkowski, Assistant Chair of the Department of Civil and Architectural Engineering and the Director of Civil Engineering Graduate Programs. Close-the-loop meetings for all programs in the department occurred on August 15, 2022.

Student assessment is conducted using the following tools:

Direct Assessment: Direct assessment of student learning is performed in selected courses each year. These courses vary from year to year and include all core courses and some elective courses.

Presentations: Presentations are mandated in various courses. A rubric is filled out by the course instructor evaluating the graphical and oral communication skills as well as understanding of technical content. The presentations are meant to serve one of the university graduate learning outcomes related to communication (copy of rubric in appendix, generic for any class).

Exit Interviews: The exit interview is used to receive a summative view of what is happening in the department and an indication of overall student satisfaction. The program director conducts exit interviews. The process includes a survey form to be filled out by students regarding their education at LTU and specific graduate student outcomes.

Direct assessment is performed by the course instructor. The governing document of assessment data collection and subsequent evaluation is the Assessment Summary Form. The Assessment Summary Forms are provided for each individual course that is being assessed. The form may be altered by the course instructor depending on whether or not the student outcome is appropriate for the course. The form is comprised of the following components:

- Summary Table: a listing of the assessed outcomes for a quick view of their vectors.
- Grade Distribution: although this component is not used for assessment, instructors may record their grades in the table for a visual depiction of the distribution.

- Instructions for Completing the Form: a discussion of the goals of the Vector Designation (rubric) and how to complete the form.
- Vector Rubric Table: a rubric that provides the measurements and descriptions of the vector designations (see Table A).
- Instructor Review and Reflection Log: there is a text box (see Figure A) for each of the assessed outcomes which includes:
  - the full title and description of the student outcome;
  - an explanation regarding the input of the instructor's reflective thoughts and observations on how and why the level of achievement was/was not attained;
  - an area for the supporting evidence where the instructor describes the instruments used for student work (tests, projects, lab reports, etc.); and
  - a line to record the vector for that SO.
- Final Reflection Log: a text box for the instructor to record final thoughts on the SOs and continuous improvement ideas; instructors are encouraged to input any suggestions for revisions to the course content and course objectives.

Table A: Vector Rubric Table

VECTOR DESIGNATION	MEASUREMENT	DESCRIPTION
E	**≥ 90%**	**Excellent:** students applied knowledge with little or no conceptual or procedural errors
A	**75% to 89%**	**Acceptable:** students applied knowledge with no significant conceptual and only minor procedural errors
M	**60% to 74%**	**Minimal:** students applied knowledge with occasional conceptual errors and minor procedural errors
U	**≤ 59%**	**Unsatisfactory:** students applied knowledge and made significant conceptual and/or procedural errors
NA		**Not Applicable:** Outcome was not addressed during the semester

Project Management: Integrate components into a complete project management plan for a complex civil engineering project.

[Instructor reflection regarding how this outcome was addressed and whether students attained the appropriate level of achievement; if students have fallen below the appropriate level, the instructor should discuss potential corrective actions for implementation when the course is offered in the future]

Supporting Evidence
[Specific description of the test question(s), project(s), etc. that support this outcome]

Final Reflections and Continuous Improvement

[It is valuable to the Program when Instructors insert observations and comments about the course, including suggestions for improvement. Instructors may include input from their own experience and reflections, from Course Evaluations completed by students, from industry practitioners and Advisory Board members, etc. Also, Instructors should insert any suggested revisions/additions/deletions to the course objectives.]

Figure A: Instructor Review and Reflection Log

Based on the Program's assessment process, the Program Director collaborates with the Course Instructors/Coordinators to identify the student work targeted for assessment. Course instructors retain copies of the work and review them for assessment and evaluation at the end of the semester. In the annual close-the-loop meeting, a summary of all the data and the results is shared with all faculty members of the department.

Table 1: Assessment Plan for Master of Construction Engineering Management Program

Graduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ADVANCED KNOWLEDGE	(a) *Integrate* components into a complete project management plan for a complex civil engineering project c) *Develop* practices and requirements to achieve sustainable performance of complex civil engineering projects from a systems perspective.	Direct assessment of assignments or exams in courses listed below: Fall: ECE 5113 Spring: ECE 5223 and ECE 5233 Summer: ECE 5273	80% should reach the highest expected achievement for each outcome based on CEBOK3.
COMMUNICATION	(b) *Analyze* effective and persuasive communication to technical and nontechnical audiences.	Direct assessment of assignments or exams in courses listed below. Oral presentations that are available. Fall: ECE 5113 Spring: ECE 5223 and ECE 5233 Summer: ECE 5273	80% should reach the highest expected achievement based on CEBOK3. 80% should average meet expectations for oral and graphical content
ETHICS	d) Integrate professional responsibilities relevant to the practice of civil engineering, including safety, legal issues, licensure, credentialing, and innovation. e) Analyze ethical dilemmas to determine possible courses of action	Direct assessment of assignments or exams in courses listed below: Fall: ECE 5113 Spring: ECE 5223 and ECE 5233 Summer: ECE 5273	80% should reach the highest expected achievement for each outcome based on CEBOK3.
TECHNOLOGY	(a) Integrate components into a complete project management plan for a complex civil engineering project c) Develop practices and requirements to achieve sustainable performance of complex civil engineering projects from a systems perspective..	Direct assessment of assignments or exams in courses listed below: Fall: ECE 5113 Spring: ECE 5223 and ECE 5233 Summer: ECE 5273	80% should reach the highest expected achievement for each outcome based on CEBOK3.

Table 2: Curriculum Map for the Master of Construction Engineering Management Program

		2022-2023				2023-2024			
LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**		ADVANCED KNOWEDLGE	COMMUNICAITON	ETHICS	TECHNOLOGY	ADVANCED KNOWEDLGE	COMMUNICAITON	ETHICS	TECHNOLOGY
Sustainable Const. Pract.	ECE5113	**R (S)**	**R (S)**	**R (S)**	**R (S)**				
Tech. of Prj. Plan. + Cont.	ECE5223	**R (S)**	**R (S)**	**R (S)**	**R (S)**				
Const. Safety Management	ECE5263					**R (S)**	**R (S)**	**R (S)**	**R (S)**
Conceptual Estimating	ECE5283					**R (S)**	**R (S)**	**R (S)**	**R (S)**
Const. Quality Man.	ECE5203					**R (S)**	**R (S)**	**R (S)**	**R (S)**
Prin. of Design-Build	ECE5213					**R (S)**	**R (S)**	**R (S)**	**R (S)**
Adv. Const. Tec. and Met.	ECE5233	**R (S)**	**R (S)**	**R (S)**	**R (S)**				
Fund. of Const. Acc.	ECE5243								
Infrastructure Asset Man.	ECE5253								
Construction Law	ECE5273	**R (S)**	**R (S)**	**R (S)**	**R (S)**				
Risk Management	ECE6223								
Issues in Int. Eng. Man.	ECE6213					**R (S)**	**R (S)**	**R (S)**	**R (S)**

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

Assessment was not carried out as planned in the 2021-2022 academic year. No formal course presentations were held in the 2021-2022 academic year that could be assessed. Although classes have been slowly moving back to on ground, several were still online and students were wearing masks until March, 2022.

Due to the online structure, stress associated with COVID-19 and his responsibilities for assessment and management of the MSArE program, the program director did not press the faculty for assessment results. Therefore, no assessment information is available for the graduate classes. The only information available is the exit interviews.

Exit Interviews:

The exit interview questionnaire that is included in the Appendix was sent out to all graduating students in the spring of 2022 and summer 2022. No MCEM students graduated fall 2021.

Overall, only three students graduated from the program in the previous academic year and only two students completed the exit interview (Daigne Lim and Anaz Alzubi). The responses to four questions related to previous student outcomes are summarized as follows. The fractions are based on a perspective of what was written by the students.

- 2/2 students felt that "LTU gave them the ability to integrate components into a complete project management plan for a complex civil engineering project". The comments were clearly favorable.
- 1/2 students felt that "LTU gave them the ability to perform effective and persuasive communication to technical and nontechnical audiences". One student did not agree with this comment and mentioned that there was limited presentations. Really, due to the lack of presentations the last two years, both students should have responded negatively to this comment.
- 2/2 students felt that "LTU given you the ability to apply techniques to develop practices and requirements to achieve sustainable performance of complex civil engineering projects from a systems perspective". The comments were clearly favorable.
- 1/2 students felt that "LTU gave them the ability to integrate professional responsibilities relevant to the practice of civil engineering, including safety, legal issues, licensure, credentialing, and innovation". One of the student's comments was inconclusive. It did not appear positive and mentioned other topics that should have been covered in the program.

Direct Assessment:

Data not collected this academic year. The program director contacted one adjunct faculty member to pilot the new assessment summary form for the MCEM program in the Summer of 2022 but the action was not carried out.

Course presentations:

NA. No formal presentations this academic year due to COVID-19.

3. Assessment Plan for 2022-2025 Academic Years

In the previous academic year, assessment of the MCEM program was significantly influenced by the remaining issues associated with COVID-19 and due to the program director's obligations to the MSArE program for running assessment and preparing for the ABET visit in Fall 2022. The program director was overwhelmed due to these items and performing assessment of the other graduate programs was cumbersome. The program director dedicated a significant amount of time to the assessment of the MSArE program.

The current year will be assessed by targeting two core classes and two electives. Direct assessment will be used. The core classes that will be assessed include ECE 5113 and ECE 5223. One of these courses is in the fall 2022 and one is in the spring 2023. The elective courses that will be targeted include ECE 5233 and ECE 5273 (projected summer 2023 course).

Not all courses in the program have required presentations especially with some of the courses being online. However, all faculty will be contacted to see if they have presentations and any will be used as part of assessment. This includes classes that are not listed above.

The program director is responsible for motivating students to complete the exit interview responses as a minimum and for conducting the interview. Student feedback is helpful in moving the program forward.

MS in Electrical and Computer Engineering

1. Assessment Plan and Summary

The assessment plan for the program is shown in Table 1. Table 2 shows the mapping of courses onto the program assessment outcomes. Learning outcomes assessed for the 2019-2021 academic years are listed in Section 2 of this report, including a detailed description of loop closing evaluation.

Dr. Jinjun Xia wrote this report. The close-the-loop meeting was held in Fall 2021 presided by Dr. Gary Lowe.

Table 1: Assessment Plan with Mapped Courses for the MSECE Program

Graduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ADVANCED KNOWLEDGE	A. Intellectual curiosity B. Research & scientific approach C. Graduate research report D. Graduate research presentation	EEE5444 Digital Communications EE5654 Digital Signal Processing	70%/70%
COMMUNICATION	A. Produce a publishable document exhibiting MS-level depth/complexity founded on established theory and incorporating suitable background references B. Prepare and deliver graduate level technical talk	EEE5924 Vehicular Communication Systems EEE6144 Smart Grid Communications EEE5924 Vehicular Communication Systems EEE6144 Smart Grid Communications	70%/70%
ETHICS	A. Giving proper credit B. Giving/accepting criticism	EEE5534 Digital Control. EEE5444 Digital Communications	70%/70%.
TECHNOLOGY	A. Apply methods (e.g. simulation, prototyping, numerical solution) or technical tools (e.g. MATLAB, SPICE, VHDL or other programming languages) to make decisions B. Make technologically sound decisions with accurate results, prediction, capability and considerations of future improvement	EEE5924 Vehicular Communication Systems EEE6144 Smart Grid Communications EEE5444 Digital Communications EEE5654 Digital Signal Processing EEE5924 Computer Architecture EEE5924 Vehicular Communication Systems EEE6144 Smart Grid Communications	70%/70%

Table 2: Curriculum Map for MSECE

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**		ADVANCED KNOWLEDGE	COMMUNICATION	ETHICS	TECHNOLOGY
Digital Control	EEE5534		**I(S)**	**E(S)**	**R(F, S)**
Vehicular Communication Systems	EEE5924		**E(F, S)**		**E(F, S)**
Smart Grid Communications	EEE6144		**E(F, S)**		**E(F, S)**
Digital Communications	EEE5444	**E(S)**		**R(S)**	**E(S)**
Digital Signal Processing	EEE5654	**E(S)**			**E(S)**
Computer Architecture	EEE5924				**E(F, S)**

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

Between 2019 and 2021, the MSECE program assessed four primary learning outcomes: Communication, Technology, Ethics, and Advanced Knowledge. These outcomes were evaluated using course-based projects and rubrics aligned with performance indicators, with data collected across multiple semesters.

Communication was assessed in Fall 2019 through a team project in EEE5924 Vehicular Communication Systems. The project focused on simulation efficiency for an OFDM system simulator. Both performance indicators were rated satisfactory, with students demonstrating sound theoretical understanding and clearly communicating their work during presentations. All references were relevant and properly cited. No issues were identified, and the program plans to maintain the current assessment approach. Dr. Nabih Jaber was responsible for this evaluation.

Technology was assessed in two different contexts. First, in Fall 2019 within the same EEE5924 course, students used MATLAB to significantly improve the efficiency of a pre-existing simulator. Performance indicators were rated as satisfactory and developing, respectively, and the instructor noted the success of the project without identifying any issues. Technology was also assessed in Spring 2020 in EEE6144 Smart Grid Communications, where students addressed communication networks for underground cable hot spot detection. Due to the COVID-19 pandemic, students were unable to build a prototype and instead completed simulations. As a result, both performance indicators were rated as developing. Although the pandemic impacted outcomes, no structural issues with the assessment approach were noted, and the current practice will continue.

Ethics was assessed in Fall 2020 in EEE5534 Digital Control. The focus was on proper citation and acknowledgment within team-based final project reports. Of the six teams evaluated, four received an unsatisfactory rating, while two performed slightly better. Most reports lacked citations or reference sections entirely. To address these shortcomings, Dr. Gary Lowe plans to emphasize citation expectations in the project overview and update the grading rubric to include evaluation criteria for proper referencing. This revised approach will embed ethical expectations directly into grading going forward.

Advanced Knowledge was assessed in Spring 2021 using a graduate research project in EEE5444 Digital Communications. Students were evaluated across four indicators: intellectual curiosity, scientific approach, written report, and oral presentation. Scores were averaged for a final assessment, revealing that three out of five students (60%) met the performance threshold. While the sample was small, no significant issues were identified. Dr. Kun Hua will continue to use the current method of evaluation in future cycles.

Overall, the MSECE program demonstrated a strong commitment to assessing student outcomes, with clearly defined metrics and responsive actions to areas needing improvement. The introduction of citation-based grading in Ethics and continued refinement of project-based assessments in Technology and Communication illustrate the program’s dedication to continuous improvement.

3. Assessment Plan for 2022-2025 Academic Years

Follow the new assessment plan as shown in Table 1.

Master of Engineering Management

1. Assessment Plan and Summary

As a quality improvement process of the graduate programs assessment of the Master of Engineering Management (MEM) is conducted on an annual basis. In keeping with the four LTU Graduate Learning Outcomes, Table 1 was developed for the MEM program. Each learning outcome assessed on a semester basis when respective courses are offered, and loop-closing occurs annually.

The specific course selected to administer each assessment tool was picked from the list of core courses of the program so that each student will be included in the assessment process to ensure a consistent process.

Table 1: Assessment Plan for the MEM Program

LTU Graduate Learning Outcomes	Supporting Program Learning Objective	Assessment Tools	Metrics / Indicators	Administration Timeline	Loop-Closing Timeline
LTU graduates will apply and, in accordance with their course of study, develop advanced knowledge within their discipline.	Understand and solve engineering management problems by selecting and applying appropriate management techniques and tools	Course project evaluation rubric for the course projects of advanced engineering management in supply chain management and enterprise productivity	75% of students receive a score of 70% or higher	Annual	3-year cycle
LTU graduates will analyze and interpret information and implement decisions using the latest techniques and technologies.	Utilization of Excel, Word, PPT, CANAVAS in coursework and projects Utilization of Minitab in Supply Chain Mgt., Eng. Mgt. & Tech. Mgt. Courses	Software usage evaluation rubric for the selected course projects and assignment contents (EEM 6803, EEM 6753, EEM 6763, EMS 7613.	75% of students receive a score of 70% or higher	Annual	3-year cycle
LTU graduates will evaluate scholarly literature and, in accordance with their course of study, contribute to the literature.	Identify and critically review the scholarly literature relevant to core course projects.	Evaluate scholarly paper review and literature review section of the course projects (EEM 6803, EEM 6753, EEM 6763, EMS 7613	75% of students receive a score of 70% or higher	Annual	3-year cycle
LTU graduates will communicate effectively using written, oral, graphical, and digital formats.	Demonstrate the communication ability to write and present through course project presentations and reports	Project presentation and project written report evaluation rubric	70% of students receive a score of 70% or higher	Annual	3-year cycle
LTU graduates will develop a broad perspective on professional issues, such as lifelong learning, sustainability, leadership, and ethics.	Analyze and assess these issues	Course project evaluation rubric on ethics / sustainability and Advanced Knowledge	70% of students receive a score of 60% or higher	Annual	3-year cycle

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

The following outcomes are measured in the academic year of 2021-2022 for the following courses: EEM 6753 Engineering Supply Chain Management, - (Fall 2022), EEM 6763 Quality Engineering Systems (Fall 2022), EEM 6803 Engineering Management (Spring 2022) and EMS 7613 Technology Management (Spring 2022).

The following graduate outcomes were measures for MEM program from the above-mentioned courses:

- LTU graduates will apply and, in accordance with their course of study, develop advanced knowledge within their discipline.
- LTU graduates will analyze and interpret information and implement decisions using the latest techniques and technologies.
- LTU graduates will evaluate scholarly literature and, in accordance with their course of study, contribute to the literature.
- LTU graduates will communicate effectively using written, oral, graphical, and digital formats.

Course projects presentations and interactive group discussion in problem solving are used as assessment tool. The results were analyzed using a scale of 1-10 (1-worst, 10-best) from each project for each student. 80% students have scored above 85% for advanced knowledge. It is almost similar to last year". 80% students have scored above 82% for "interpret information and implement decisions using the latest techniques and technologies outcome" which is higher than previous year. More meetings were held with students to provide feedback for interpret information. 83% students have scored above 84% for "evaluate scholarly literature and, in accordance with their course of study, contribute to the literature outcome" which is higher than previous year. A special focus was given for students to prepare literature review for their course project. 75% students have scored above 83% for "communicate effectively using written, oral, graphical, and digital formats outcome". Oral presentation scores are higher though it was done over zoom. Written and graphical areas are improved as well. Course project was a semester long project. One to one zoom meetings were held for needed student. It was a kind of learning in spring 2022 with zoom presentation and assessment.

3. Assessment Plan for 2022-2025 Academic Years

1) Discuss results at the annual departmental retreat and corrective recommendations will be discussed.
2) Collect assessment data according to the assessment plan in Table 1.

MS in Engineering Quality (formerly MSET)

1. Assessment Plan and Summary

The assessment plan for the MSEQ program is shown in Table 1. Graduate program learning outcomes are assessed each time respective courses are offered, and loop-closing occurs biennially.

Table 1: Assessment Plan for MSEQ

University Graduate Learning Outcomes	Supporting Program Learning Objectives	Assessment Tools	Metrics/ Indicators
ADVANCED KNOWLEDGE	1.Apply advanced knowledge of different technologies	TME6343: Current Issues in Technology TEE6333: Wireless Communication Technology EEE5923: Electric Machines and Transformers	85% of students will score 80% or better on final exam
ETHICS	5.Develop a broad perspective on professional issues, such as lifelong learning, sustainability, leadership, and ethics	Exit Survey	85% of students will score 80% or better on final exam
COMMUNICATION	4.Communicate effectively using written, oral, graphical, and digital formats	TIE5343: Engineering Project Management EEM6583: Enterprise Productivity	85% of students will score 80% or better on final exam
TECHNOLOGY	2. Analyze and interpret information and make decisions using the latest techniques and technologies	TIE5013: Technometrics TME5343: Engineering Project Management	85% of students will score 80% or better on final exam

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

The MS in Engineering Quality program assessed student learning across four university-aligned learning outcomes: Advanced Knowledge, Ethics, Communication, and Technology. Each outcome was mapped to corresponding program learning outcomes and assessed through targeted courses using course-embedded measures and rubrics.

Advanced Knowledge was assessed through study reports and final exams in TME6343 (Current Issues in Technology) and TEE6333 (Wireless Technologies). In 2020–2021, 78% of students scored 85% or higher in TME6343, and 80% did so in TEE6333. In 2021–2022, student performance slightly improved, with 82% and 83% of students respectively meeting or exceeding the 85% benchmark. While the results indicate overall success, challenges were noted in TME6343 due to students' limited background in newly introduced technological topics. In response, the instructor plans to enhance instruction with more real-world examples to improve understanding and application.

Ethics was evaluated through a written paper assignment in TME5343 (Engineering Project Management) using a standard rubric. In 2020–2021, 76% of students scored above 85%, with performance affected in part by the challenges faced by a large cohort of international students. To support improved outcomes, students were asked to complete an initial writing assignment on a different topic before being tasked with the ethics paper. By 2021–2022, this adjustment correlated with improved results, as 83% of students scored above the 85% threshold. No further issues were reported.

Communication was assessed through final test essays in TIE5343 and a final project in TIE5013. Across both years, students consistently demonstrated strong performance. In 2020–2021, 84% of students exceeded the 85% benchmark in the essays, and 100% met the target in the final project. Similarly, in 2021–2022, all students surpassed the 85% mark in both assessments. No issues were recorded, and no changes to current practices were recommended.

Technology was assessed through final projects in TIE5013 (Technometrics) and TME5123 (Rapid Prototyping). In both years, 100% of students scored above 85% in the TIE5013 project, and no issues were noted in either course. The results demonstrate strong competency in applying technological tools and techniques to solve complex problems. No changes were deemed necessary.

Dr. Sabah Abro served as the lead faculty member responsible for overseeing assessment and implementing improvement actions. The program’s consistent data collection and refinement of instructional strategies illustrate a strong commitment to continuous improvement and alignment with both program-level and university-level learning goals.

3. Assessment Plan for 2022-2025 Academic Years

Transition assessment from the MSET to the MSEQ program.

MS in Industrial Engineering

1. Assessment Plan and Summary

The assessment plan is shown in Table 1. Graduate program learning outcomes are assessed each semester respective courses are offered, and loop-closing occurs annually.

Table 1: Assessment Plan for MSIE

University Graduate Learning Outcomes	Supporting Program Learning Objectives	Assessment Tools	Metrics/ Indicators
ADVANCED KNOWLEDGE	Understand and solve industrial engineering problems by selecting and applying appropriate techniques and tools	Course project evaluation rubric for the course projects of advanced optimization techniques, quality control and simulation	75% score of 3 or higher on 5 point scale.
ETHICS	Analyze and assess ethical issues.	Course project evaluation rubric on ethics / sustainability	75% score of 3 or higher on 5 point scale
COMMUNICATION	Demonstrate the communication ability to write and present through course project presentations and reports	Project presentation and project written report evaluation rubric	75% score of 3 or higher on 5 point scale.
TECHNOLOGY	Utilization of Excel, Word, PPT, Bb in coursework Utilization of Minitab in QC and Simulation Courses Utilization of ARENA Software in Eng. Sys. Simulation Course Utilization of Lindo / Lingo / Solver Software for Optimization	Software usage evaluation rubric for the selected course projects and assignment contents (EME 5603, EME 6403, EME 6653)	75% score of 3 or higher on 5 point scale.

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

Student learning outcomes for the MS in Industrial Engineering (MSIE) program were assessed during the 2020–2021 academic year using course projects from the following courses:

- EMS 6403: Quality Control (Fall 2020)
- EMS 6713: Production Planning & Control (Spring 2021)
- EIE 6673: Six Sigma Processes (Spring 2021)

The following graduate-level learning outcomes were evaluated:

- LTU graduates will apply and, in accordance with their course of study, develop advanced knowledge within their discipline.
- LTU graduates will analyze and interpret information and implement decisions using the latest techniques and technologies.
- LTU graduates will evaluate scholarly literature and, in accordance with their course of study, contribute to the literature.
- LTU graduates will communicate effectively using written, oral, graphical, and digital formats.

Course projects served as the primary assessment tool. Student performance was evaluated on a scale of 1 to 10 (1 = lowest, 10 = highest). Key findings include:

- Advanced Knowledge: 78% of students scored above 85%, demonstrating strong understanding of advanced concepts in the field.
- Technology and Decision-Making: 77% of students scored above 81%, consistent with the prior year. Students needing additional support received individual mentoring to improve their interpretation skills.
- Literature Evaluation and Contribution: 85% of students scored above 80%, an improvement over the previous year in both performance and participation. A tutorial session was added to guide students on writing literature reviews.
- Communication: 77% of students scored above 80%. However, the shift to Zoom-based instruction slightly impacted the effectiveness of communication-based learning outcomes.

3. Assessment Plan for 2022-2025 Academic Years

Conduct assessment according to the plan shown in Table 1.

MS in Mechanical Engineering

1. Assessment Plan and Summary

The assessment plan is shown in Table 1. Graduate program learning outcomes are assessed each semester respective courses are offered, and loop-closing occurs annually.

Table 1: Assessment Plan for MS in ME

University Graduate Learning Outcomes	Supporting Program Learning Objectives	Assessment Tools	Metrics/ Indicators
ADVANCED KNOWLEDGE	Graduate students will analyze, evaluate, and/or develop advanced knowledge in specialized areas in their discipline.	EME5353 Transport Phenomena I EME5223 Advanced Mechanics of Materials OR EME5333 Advanced Dynamics Analysis and evaluation of scholarly literature in specialized areas in Mechanical Engineering, which is scored using a rubric.	80% of students will score 80% or better on technical portions of a common rubric.
ETHICS	Graduate students will recognize ethical expectations for dissemination of engineering work and evaluate ethical issues relevant to the impact of advancing technology in their discipline.	EME6xx0 (under development) Ethics training modules and quiz	All students will complete the required modules
COMMUNICATION	Graduate students will analyze, evaluate and create communication consistent with their discipline.	EME5353 Transport Phenomena I EME5213 Mechanical Vibrations Written report and oral presentation scored using rubrics.	80% of students will score 80% or better on communication portions of a common rubric.
TECHNOLOGY	Graduate students will analyze, evaluate and/or create technologies consistent with their discipline.	EME5363 Transport Phenomena II EME5213 Mechanical Vibrations Analysis and interpretation using an assigned project.	80% of students will score 80% or better on technical portions of a common rubric.

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

The following outcomes were assessed during the 2019–2021 academic years for the Master of Science in Mechanical Engineering (MSME) program:

Advanced Knowledge was assessed in Fall 2019 through a literature review project in EME5353: Transport Phenomena I. Students worked in teams to analyze and evaluate scholarly literature. All seven teams (100%) scored 80% or higher, meeting the program target.

Ethics was planned to be assessed via ethics training modules and a quiz; however, no data were collected. A zero-credit course (EME6xx0) is under development to include these modules and enable future assessment of this outcome.

Communication was assessed in EME5353 through both written reports and oral presentations based on the same team project. All seven teams (100%) met the target for written communication, and all 29 individual students met the target for oral communication, with scores of 80% or higher.

Technology was assessed in Fall 2019 through a project in EME5213: Mechanical Vibrations. Only 3 of 9 students (33%) met the 80% benchmark. The results will be reviewed in a loop-closing meeting, and revisions to the assessment method or rubric will be considered.

3. Assessment Plan for 2022-2025 Academic Years

The 2022-2025 plan will be to:
1) Review the MSME assessment plan (update Table 1) as needed.
2) Modify the metrics and assessment methods as necessary.
3) Collect data following the assessment plan.

MS in Mechatronics and Robotics Engineering

1. Assessment Plan and Summary

The assessment plan is shown in Table 1. Graduate program learning outcomes are assessed each semester respective courses are offered, and loop-closing occurs annually.

Table 1: Assessment Plan for MS in MRE

University Graduate Learning Outcomes	Supporting Program Learning Objectives	Assessment Tools	Metrics/ Indicators
ADVANCED KNOWLEDGE	Students will learn and apply mechatronic engineering principles and theories.	MRE5323 Exam problem on control system design problem that is scored using a rubric	Using a rubric, 75% of students will score 75% or better on a common control system design problem.
ETHICS	Students will understand the importance of lifelong learning and the professional and ethical responsibilities of the engineering profession.	EME 5323/6183 Mandatory attendance at seminars. Must also submit one page summary of each seminar which is scored using a rubric.	Must attend at least 3 seminars and receive a score of at least 85% for all summaries.
COMMUNICATION	Students will be able to effectively communicate technical information.	MRE 5183/6183 Written report and oral presentation of one of the course projects which is scored using a rubric.	80% of students will score 85% or better for written, oral and graphical communication.
TECHNOLOGY	Students will develop analytical and problem solving skills for mechatronic systems.	MRE 6183 Analysis and interpretation of a peer reviewed technical paper using software which is scored using a rubric.	80% of students will score 85% or better in analysis and interpretation.

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

The following learning outcomes were assessed for the MSMRE program during the 2020–2021 academic year, based on the revised assessment plan established in 2019:

Advanced Knowledge was not assessed during this cycle. Although MRE 5323 was scheduled for assessment in Spring 2021, the adjunct faculty member assigned to the course did not collect the necessary data.
Responsibility: Dr. James Mynderse (Course Coordinator and Program Director)

Ethics has not yet been assessed. The program currently lacks a course or metric dedicated to this outcome. Work is needed to identify a course and develop an appropriate assessment method.
Responsibility: Dr. James Mynderse (Course Coordinator and Program Director)

Analyze and Evaluate Communication was also not assessed in Spring 2021. Although literature review is a desired skill, it is not explicitly taught in any required course. Some students gain exposure through thesis work or electives. A dedicated research methods course is recommended to formally address this outcome.
Responsibility: Dr. James Mynderse (Course Coordinator and Program Director)

Create Communication was assessed through written and oral components of student design projects in MRE 5183 and MRE 6183. Written communication was evaluated using specific rubric dimensions, and oral presentations followed the ME department rubric. All students met expectations.
Responsibility: Dr. James Mynderse (Course Coordinator and Program Director)

Create Technologies was assessed through the technical dimensions of the design project rubrics in MRE 5183 and MRE 6183. While students completed the technical projects successfully, only 47.1% met the documentation standards, leading to an overall failure to meet this outcome. Lack of adequate documentation is attributed to students prioritizing demonstrations over written records. Future emphasis will be placed on documenting the design process throughout the project timeline.
Responsibility: Dr. James Mynderse (Course Coordinator and Program Director)

3. Assessment Plan for 2022-2025 Academic Years

1) Continue with data-collection based on the assessment plan shown in Table 1.

PhD in Civil Engineering

1. **Assessment Plan and Summary**

The student outcomes for the PhD in Civil Engineering program are assessed primarily with research outputs only. PhD students have coursework requirements. However, the assessment of all graduate level civil engineering courses, including the 6000 level courses, is administered within the MCEM and MSCE programs. The primary components for assessing the PhD program are; (i) independent research (ECE 7993), (ii) proposal examination, (iii) final defense, and (iv) exit interviews. The PhD program is assessed yearly although limited output is often available.

The student outcomes associated with all civil engineering programs have been adopted from the Civil Engineering Body of Knowledge 3 (CEBOK3) promulgated by ASCE. The three student outcomes explicitly for the PhD program are shown below (a, b, and c). The three outcomes can still be simplified as (a) Experiments, (b) Technical Specialization and (c) Communication.

(a) *Assess* new experimental methods and/or the results of multiple experiments for the solution of civil engineering problems (CEBOK3: Experimental Methods and Data Analysis)
(b) *Assess* advanced concepts and principles in the solutions of complex problems in a specialty area appropriate to the practice of civil engineering. (CEBOK3: Depth in a Civil Engineering Area)
(c) *Integrate* different forms of effective and persuasive communication to technical and nontechnical audiences. (CEBOK3, Communication)

The assessment plan for the program is shown in Table 1. Table 2 shows the mapping of courses onto the program assessment outcomes.

This report has been drafted by Dr. Keith Kowalkowski, Assistant Chair of the Department of Civil and Architectural Engineering and the Director of Civil Engineering Graduate Programs. Close-the-loop meetings for all programs in the department occurred on August 15, 2022.

Program assessment is conducted using the following methods:

Independent Research: It is common for a PhD student to take ECE 7993 CE Independent Research at least once in the first two years as a means to initiate research. These credits are not assessed at the master's level and need to be assessed as part of the PhD program. A rubric is filled out by the instructor in regards to student performance. The results are meant to assess early research capabilities.

Evaluation of Dissertation Research Components (i.e. Proposal Exam and Final Defense): The members of the committee are to provide their evaluations outlining the quality of the proposal as well as the dissertation and final defense using the rubric provided to them. The final defense and written report (dissertation) are the most important elements when evaluating the performance of the student.

Exit Interviews: The objective of the exit interview is to receive a summative view of what is happening in the department and an indication of overall student satisfaction. The program director conducts exit interviews. The process includes a survey form to be filled out by students regarding their education at LTU and specific graduate student outcomes followed by a brief interview by the program director.

The results of the assessment of the student outcomes are to be presented to the department faculty during the annual close loop meeting in summer.

Table 1: Assessment Plan for Doctor of Philosophy in Civil Engineering

Graduate Program Level Assessment Outcomes	Supporting Program Learning Objective	Assessment Strategy	Metrics/ Indicators
ADVANCED KNOWLEDGE	(a) Assess new experimental methods and/or the results of multiple experiments for the solution of civil engineering problems. (b) Assess advanced concepts and principles in the solutions of complex problems in a specialty area appropriate to the practice of civil engineering.	-Evaluation of Dissertation Proposal and Final Defense using a rubric. -Evaluation of Independent Research Using a Rubric.	85% of graduating students should reach the highest expected achievement level for each outcome as defined in Section 1 based on BOK3.
COMMUNICATION	(c) Integrate different forms of effective and persuasive communication to technical and nontechnical audiences.	-Evaluation of Dissertation Proposal and Final Defense using a rubric	85% of graduating students should reach the highest expected achievement level for each outcome as defined in Section 1 based on BOK3.
ETHICS	(a) Assess new experimental methods and/or the results of multiple experiments for the solution of civil engineering problems. (b) Assess advanced concepts and principles in the solutions of complex problems in a specialty area appropriate to the practice of civil engineering.	-Final defense rubric and exit interview questionnaire.	85% of graduating students should reach the highest expected achievement level for each outcome as defined in Section 1 based on BOK3.
TECHNOLOGY	(a) *Assess* new experimental methods and/or the results of multiple experiments for the solution of civil engineering problems. (b) *Assess* advanced concepts and principles in the solutions of complex problems in a specialty area appropriate to the practice of civil engineering.	-Evaluation of Dissertation Proposal and Final Defense using a rubric. Evaluation of Independent Research Using a Rubric.	85% of graduating students should reach the highest expected achievement level for each outcome as defined in Section 1 based on BOK3.

Table 2: Curriculum Map for the Master of Science in Civil Engineering

		2022-2023			
LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**		ADVANCED KNOWEDLGE	COMMUNICAITON	ETHICS	TECHNOLOGY
ECE7993	Civil Engineering Independent Research	**R (S)**	**R (S)**	**R (S)**	**R (S)**
DIS8713*	Ph.D in Civil Eng Dissertation	**E (S)**	**E (S)**	**E (S)**	**E (S)**
DIS8716*	Ph.D in Civil Eng Dissertation	**E (S)**	**E (S)**	**E (S)**	**E (S)**
DIS8719*	Ph.D in Civil Eng Dissertation	**E (S)**	**E (S)**	**E (S)**	**E (S)**

*Students collectively take these credits to add up to 36 dissertation credits.
There is no specific number required for each. Students take as many credits each semester that they prefer.

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

Multiple forms of assessment are used for the PhD program. The program only had five students in the PhD program in the 2021-2022 academic year with one student completing in the fall 2021. Below is the status of the students in question:

- Andrew Rener – Completed all 24 course credits, qualifying exam and proposal exam. Student has completed 24 of 36 dissertation credits by the end of Summer 2022. *The proposal exam was assessed in previous academic year and discussed herein.*
- Falah Al-Amery – Completed all credits, proposal and qualifying exam, and is still completing research. *Did not perform anything in the previous academic year that is assessed for the PhD program.*
- Mohamed Mohamed – Completed all 24 course credits, all dissertation credits, and all PhD exams. *The proposal exam was assessed in the previous academic year. This was assessed as part of this document. The final exam was completed August 26, 2022. This was technically Fall 2022 but the assessment results are included in this document. An exit interview will be sent to this student as part of Fall 2022.*
- Mubarak Aldossari – Completed all 24 course credits and qualifying exam. As of Summer 2021, he completed 21 dissertation credits.
- Taha Khalaff – Held his final defense in the November of 2020. He did not complete the work until October 2021 and graduated December 2021. *However, his rubrics and his exit interview were part of last year's assessment report.*

In summary, for the assessment methods used for the PhD program, there are two proposal defenses, one final defense, and no exit interviews to reflect on. The results of the exit interview and rubrics are summarized as follows:

Final Defense Rubric Results and Reflection

Proposal defenses were completed for Andrew Rener and Mohamed Mohamed in the previous academic year. A rubric for the proposal defense is shown in the Appendix.

Andrew Rener: Two committee members completed the rubric and sent it to the program director. The proposal defense was facilitated on Zoom on December 16, 2021. To perform a brief assessment, average scores from the two reviewers and for each "dimension" were calculated. The rubric identifies the target student outcomes for each dimension. The weights were not used for this assessment. Instead, the average values for each outcome were calculated and the final scores out of 10 are as follows:

- Outcome (a): 9.0/10
- Outcome (b): 8.8/10
- Outcome (c): 10/10

The results of the proposal defense are favorable. The results of each outcome are above the expectation of the PhD program for each outcome which is 8/10. The student has done an excellent job in the PhD program so far and has a work ethic that is hard to match considering his full-time job as well.

Mohamed Mohamed: Three committee members completed the rubric and sent it to the program director (including program director himself). The proposal defense was on March 3, 2022. The average values for each outcome were calculated and the final scores out of 10 are as follows:

- Outcome (a): 8.5/10
- Outcome (b): 8.4/10
- Outcome (c): 9.3/10

The student has proven himself as an exceptional student in the department. However, the proposal and research seems to lack a common theme. Instead, it covers three fairly diverse topics. The complexity is not a level expected for a PhD student, especially for one that has demonstrated that he can perform rigorous analytical investigations.

Final Defense Rubric Results and Reflection

The final defense for Mohamed Mohamed was held on August 26, 2022. This is after the start of Fall 2022 semester and the student will not graduate until Fall 2022. However, this defense was supposed to be scheduled for Summer 2022 and is therefore discussed in this document.

Four committee members completed the rubric and gave it to the program director (including program director himself). One committee member graded all 10's. The average values for each outcome were calculated and the final scores out of 10 are as follows:

- Outcome (a): 9.5/10
- Outcome (b): 9.2/10
- Outcome (c): 9.6/10

Once again, the student has proven himself as an exceptional student. The program director still thought the work missed a common theme and it appeared to cover three diverse topics. However, the student did a better job in demonstrating how all are related to holes in the research regarding the use of carbon fiber cables as reinforcement in prestressed concrete beams.

Exit Interview Response and Reflection

No students completed an exit interview during the 2021-2022 academic year

3. Assessment Plan for 2022-2025 Academic Years

The assessment plan is provided in Table 1.

Doctor of Engineering in Mechanical Engineering

1. Assessment Plan and Summary

The assessment plan is shown in Table 1. Graduate program learning outcomes are assessed each semester respective courses are offered, and loop-closing occurs annually.

Table 1: Assessment Plan for DEME

University Graduate Learning Outcomes	Supporting Program Learning Objectives	Assessment Tools	Metrics/ Indicators
ADVANCED KNOWLEDGE	Students will demonstrate a mastery of knowledge and understanding in their chosen sub-discipline specialization within mechanical engineering.	Dissertation Assess using rubric	All students will receive 85% or higher from dissertation committee
ETHICS	Students will understand the importance of lifelong learning and the professional and ethical responsibilities of the engineering profession.	Survey of graduating DEME students	All students must explain the importance of lifelong learning and professional respnosibilities,
COMMUNICATION	Students will be able to effectively document and communicate their research.	Dissertation Assess using rubric	All students will receive 85% or higher from dissertation committee
TECHNOLOGY	Students will be able to identify a topic for research in their chosen sub-discipline specialization within mechanical engineering and formulate a proposal for conducting the research.	Dissertation Assess using rubric	All students will receive 85% or higher from dissertation committee

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

Data were collected for one student this academic year (proposal exam completed in December 2019).] The results indicate that the student met the required metrics (received at least "Acceptable" from all committee members).

3. Assessment Plan for 2022-2025 Academic Years

1) Review and update assessment plan as needed
2) Collect data for complete dissertations.

College of Business and Information Technology

BS in Business Administration

1. Assessment Plan and Summary

The assessment plan for the BSBA program is designed according to the new University undergraduate program level learning outcomes. The assessment plan for the BSBA program is provided in Table 1, the curriculum map is shown in Table 2. The assessment plan addresses the set of five LTU undergraduate program level learning outcomes, along with BSBA learning outcome, Knowledge in the Discipline. Learning outcomes except for Knowledge are directly assessed using course embedded rubrics; Knowledge is directly assessed using ETS commercially produced comprehensive standardized Major Field Test in Business. Each learning outcome is assessed each semester in randomly selected respective courses. Loop-closing occurs annually.

Table 1: Assessment Plan for the BSBA Program

Undergraduate Program Level Learning Outcomes	Student Outcomes	Assessment Strategy	Metrics/ Indicators
TECHNOLOGY	(a) Apply technology via media and quality of slides in presentations. (Bloom's 3) (b) Analyze and interpret data using appropriate tools (Bloom's 3)	Direct assessment of assignment using course embedded rubric in ACC2023, INT2103, MGT2203, MKT2013, FIN3103, HRM 3023, MGT3103. MGT3113	Mean score ≥ 3.5 on 6-point scale course embedded rubric: 1, 2 = deficient; 3, 4 = competent 5, 6 = exemplary
ETHICS	(a) Identify the ethical issues implicit in a business situation. (Bloom's 2) (b) Describe and use ethical frameworks application to business situations. (Bloom's 3) (c) Develop a variety of ethical alternatives for resolving or at least addressing a problem in business. (Bloom's 3-4)	Direct assessment of assignment using course embedded rubric in MGT2203, MKT2013, MGT2113, FIN3103, HRM 3023, MGT4213	Mean score ≥ 3.5 on 6-point scale course embedded rubric: 1, 2 = deficient; 3, 4 = competent 5, 6 = exemplary
LEADERSHIP	(a) Explain the difference between leadership and management. (Bloom's 2) (b) Demonstrate effective leadership skills in a team project in terms of motivation, delegation, and conflict resolution. (Bloom's 3)	Direct assessment of assignment using course embedded rubric in MGT2203, MKT2013, HRM3023, MGT4213	Mean score ≥ 3.5 on 6-point scale course embedded rubric: 1, 2 = deficient; 3, 4 = competent 5, 6 = exemplary
TEAMWORK	Demonstrate appropriate group techniques to participate in a team task that results in effective performance in terms of attendance, preparation, contribution, participation, and accountability. (Bloom's 3)	Direct assessment of assignment using course embedded rubric in MGT2203, MKT2013, HRM3023, MGT4213	Mean score ≥ 3.5 on 6-point scale course embedded rubric: 1, 2 = deficient; 3, 4 = competent 5, 6 = exemplary
VISUAL COMMUNICATION	Demonstrate professional standards in graphical communication (including figures, plots, tables, and posters) by integrating evidence and analysis within a coherent structure. (Bloom's 3 and 4)	Direct assessment of assignment using course embedded rubric in MKT2013, FIN3103, MGT3103, HRM 3023, MGT3113, MGT4213	Mean score ≥ 3.5 on 6-point scale course embedded rubric: 1, 2 = deficient; 3, 4 = competent 5, 6 = exemplary
WRITTEN AND ORAL COMMUICATION	Demonstrate professional-standards in written and oral communication (oral presentations, written essays) by integrating evidence and analysis within a coherent structure. (Bloom's 3 and 4)	Direct assessment of assignment using course embedded rubric in MGT2203, MKT2013, HRM3023, MGT3113, MGT4213	Mean score ≥ 3.5 on 6-point scale course embedded rubric: 1, 2 = deficient; 3, 4 = competent 5, 6 = exemplary
KNOWLEDGE IN DISCIPLINE	Demonstrate knowledge and ability to apply facts, concepts, theories and analytical methods in core business administration concepts in accounting, economics, management, quantitative business analysis, finance, marketing, legal and social environment, information systems, and international issues.	A comprehensive standardized examination organized into multiple content areas of business knowledge administered to all seniors in MGT4213.	ETS Major Field Test in Business. Target scaled score ≥ 1 standard deviation (SD) below the standardized scale mean of the annual comparative data.

Table 2: Curriculum Map for the BSBA Program

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**	Intro to Fin Acct	Intro to Manag Acct	Principles of Mgmt	Marketing	Info Tech Mgmt	Intro to Bus Law	Fin Mgmt	Project Mgmt	Int'l Trade	Human Res Mgmt	Opera-tions Mgmt	Strat. Mgmt & Bus Policy
	ACC2013	ACC202	MGT2203	MKT2013	INT2103	MGT2113	FIN3103	MGT3103	MGT3033	HRM3023	MGT3113	MGT4213
TECHNOLOGY	**I (F)**	**I (F)**	**I (F)**		**I (F)**		**R (F)**	**R (F)**		**R (F)**	**R (F)**	
ETHICS			**I (F)**	**I (F)**		**R (F)**	**R (F)**			**E (F)**		
LEADERSHIP			**I (F)**	**R (F)**						**R (F)**		
TEAMWORK			**I (F)**	**R (F)**						**R (F)**		
VISUAL COMMUNICATION				**I (F)**			**R (F)**	**R (F)**		**R (F)**	**R (F)**	
WRITTTEN/ORAL COMMUNICATION			**I (F)**	**R (F)**						**R (F)**		
KNOWLEDGE IN DISCIPLINE												**E (S)**

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

(1) Knowledge in Discipline, based on ETS Major Field Test Business

a. Results: ETS MFT Business Total Score results are shown in Figure 2 (top half). Results of two sample t-test found the Lawrence Tech seniors (Mean = 144, SEM = 1.68) was lower than the Comparative seniors (Mean = 149, SEM = 0.40). After parsing the LTU seniors into national and international students, the LTU national seniors scored similar to the comparison sample (149 vs. 149), and the LTU international students scored lower than the comparison sample (132 vs. 149).

b. Assessment Indicator (Domain) results are shown in Figure 1 (bottom half). Results of two sample t tests found Lawrence Tech seniors were similar to the comparative seniors in the domains of Accounting, Management, Quantitative Business Analysis, and Finance. Lawrence Tech seniors were significantly lower than the comparative seniors in the domains of Economics, Marketing, Legal and Social Issues, and International Issues. Lawrence Tech seniors were significantly higher than the comparative seniors in the domain of Information Systems. After parsing the LTU seniors into national and international students, only the LTU international students scored lower than the comparison sample on all domains except Quantitative Business Analysis and Information Systems.

c. Improvements-Process: Increase student performance through online review modules across the domains. These review modules will help seniors maintain their business knowledge in support of their overall business acumen. Motivate students to perform their best on the exam through course extra credit. Proctor students to use all available test time. Improve English comprehension in international students via Speechcraft and Toastmasters International (annually).

d. Improvements-Curriculum: The ETS Information Report was reviewed to help faculty address specific content areas and sub content areas within the deficient domains to integrate more examples and problems. Faculty will also review the latest version of the ETS MFT in Business at the next Assessment Retreat.

(2) Communication: Oral

a. Results: Improvement needed in the domain of appearance (see Figure 2).

b. Improvements-Process: Referral to College sponsored Speechcraft program of Toastmasters International for mentoring on appropriate business attire. Instructors to encourage business casual attire.

c. Improvements-Curriculum: Present models of appropriate business attire in videos and acknowledge students who are dressed appropriately.

(3) Communication: Written

a. Results: Improvement needed in the domains of organization and grammar (see Figure 2).

b. Improvements-Process: Referral to Horldt Writing Center.

c. Improvements-Curriculum: Provide examples of organized papers.

(4) Critical Thinking

a. Results: Improvement needed in the domains of data relevance and data validity (see Figure 2).

b. Improvements-Curriculum: Augment courses to address data relevance and data validity, and provide critical thinking examples focused on data relevance and validity.

(5) Ethics

a. Results: Improvement needed in the domains of issues and resolutions (see Figure 2).

b. Improvements-Curriculum: Augment course materials to highlight the issues and resolutions relevant to ethical dilemmas in business.

(6) Leadership

a. Results: Competent (see Figure 2).

(7) Teamwork

a. Results: Competent (see Figure 2).

(8) Technology

a. Results: Competent (see Figure 2).

Figure 1. ETS Major Field Test for Business (2022 Comparative Data from 274 Institutions)

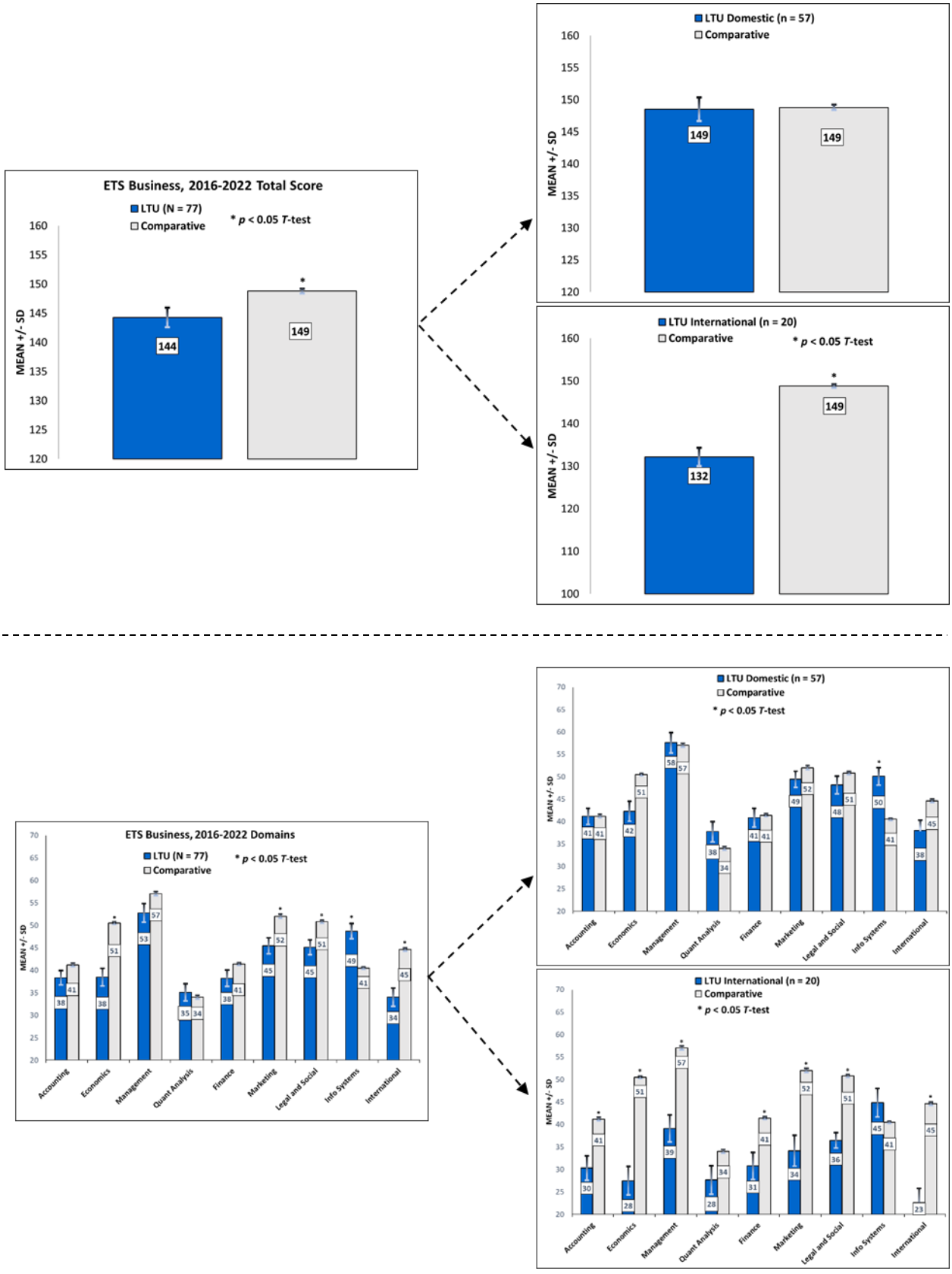
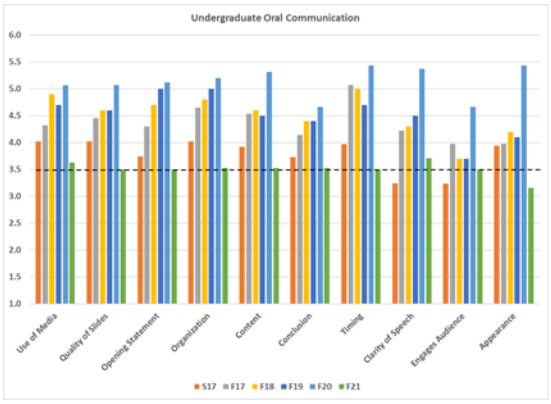
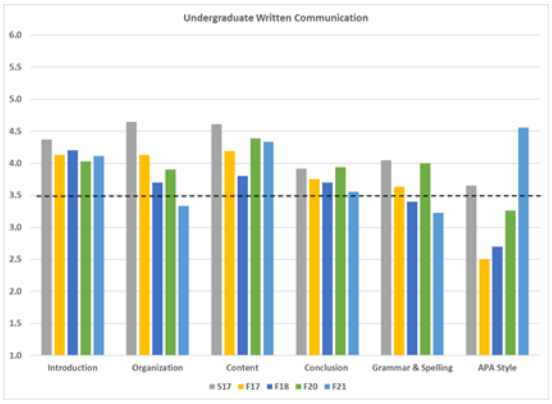
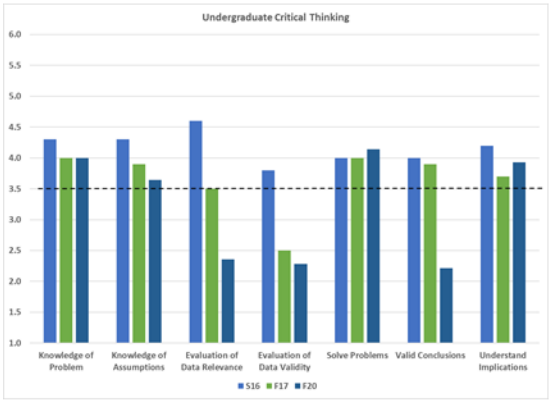
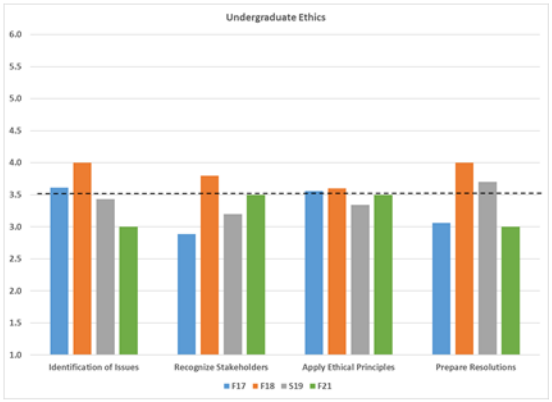


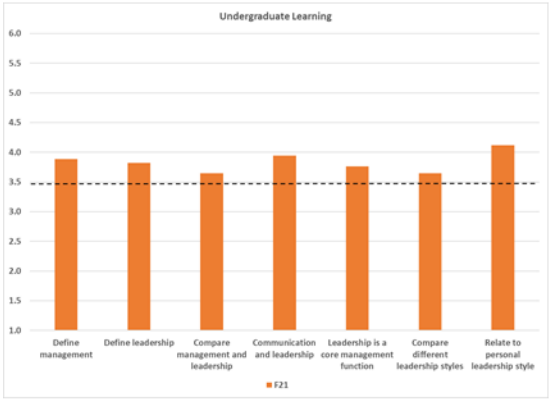
Figure 2. BSBA Assessment Results 2016-2021

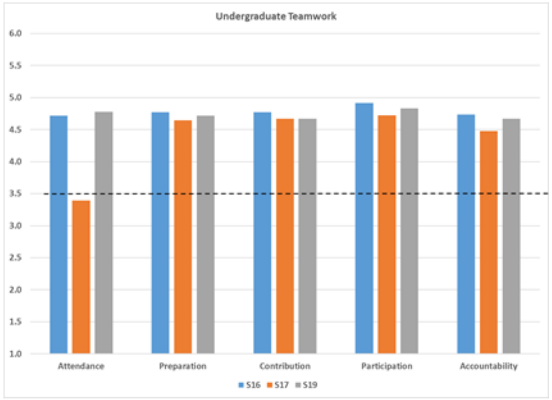


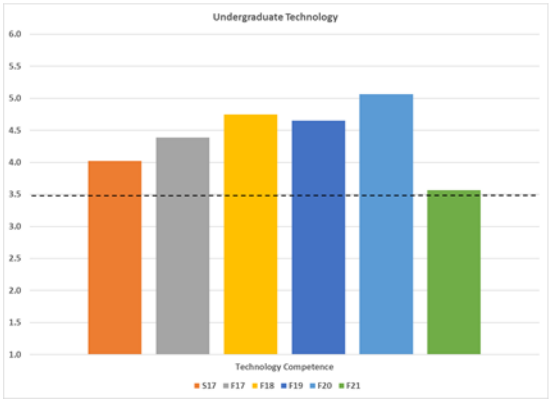












3. Assessment Plan for 2022-2025 Academic Years

1) Technology: Develop and deploy rubric to assess outcome (b) in BSBA respective courses.
2) Ethics: Provide more case studies to assess ethical dilemmas.
3) Leadership: Develop and deploy rubric to assess outcome (a) in BSBA respective courses.
4) Teamwork: Continue to assess teamwork.
5) Visual Communication: Develop and deploy rubric in BSBA respective courses.
6) Written and Oral Communication: Use review of drafts to help increase written communication performance. Use dress rehearsals to maintain oral communication performance.
7) Knowledge in Discipline: Provide review session to students in MGT4213 to help increase consistency of student performance.

BS in Information Technology

1. Assessment Plan and Summary

The assessment plan for the BSIT program is designed according to the new University undergraduate program level learning outcomes. The assessment plan for the BSIT program is provided in Table 1, the curriculum map is shown in Table 2. The assessment plan addresses the set of five LTU undergraduate program level learning outcomes, along with BSIT learning outcome, Knowledge in the Discipline. Learning outcomes except for Knowledge are directly assessed using course embedded rubrics; Knowledge is directly assessed using commercially produced comprehensive standardized or faculty-generated comprehensive final exam. Each learning outcome is assessed each semester in randomly selected respective courses. Loop-closing occurs annually.

Table 1: Assessment Plan for the BSIT Program

Undergraduate Program Level Learning Outcomes	Student Outcomes	Assessment Strategy	Metrics/ Indicators
TECHNOLOGY	(a) Apply technology via media and quality of slides in presentations. (Bloom's 3) (b) Analyze and interpret data using appropriate tools (Bloom's 3)	Direct assessment of assignment using course embedded rubric in INT2103, INT2123, INT2134, MGT2203, INT3203, INT3703, INT3803,MGT3103. MGT3113, INT4203	Mean score ≥ 3.5 on 6-point scale course embedded rubric: 1, 2 = deficient; 3, 4 = competent 5, 6 = exemplary
ETHICS	(a) Identify the ethical issues implicit in a business situation. (Bloom's 2) (b) Describe and use ethical frameworks application to business situations. (Bloom's 3) (c) Develop a variety of ethical alternatives for resolving or at least addressing a problem in business. (Bloom's 3-4)	Direct assessment of assignment using course embedded rubric in INT2103, MGT3103	Mean score ≥ 3.5 on 6-point scale course embedded rubric: 1, 2 = deficient; 3, 4 = competent 5, 6 = exemplary
LEADERSHIP	(a) Explain the difference between leadership and management. (Bloom's 2) (b) Demonstrate effective leadership skills in a team project in terms of motivation, delegation, and conflict resolution. (Bloom's 3)	Direct assessment of assignment using course embedded rubric in INT2103, MGT 2203, INT3803, INT4203	Mean score ≥ 3.5 on 6-point scale course embedded rubric: 1, 2 = deficient; 3, 4 = competent 5, 6 = exemplary
TEAMWORK	Demonstrate appropriate group techniques to participate in a team task that results in effective performance in terms of attendance, preparation, contribution, participation, and accountability. (Bloom's 3)	Direct assessment of assignment using course embedded rubric in MGT 2203, MKT 2013, HRM 3023, MGT4213	Mean score ≥ 3.5 on 6-point scale course embedded rubric: 1, 2 = deficient; 3, 4 = competent 5, 6 = exemplary
VISUAL COMMUNICATION	Demonstrate professional standards in graphical communication (including figures, plots, tables, and posters) by integrating evidence and analysis within a coherent structure. (Bloom's 3 and 4)	Direct assessment of assignment using course embedded rubric in MKT 2013, FIN3103, MGT3103, HRM 3023, MGT3113, MGT4213	Mean score ≥ 3.5 on 6-point scale course embedded rubric: 1, 2 = deficient; 3, 4 = competent 5, 6 = exemplary
WRITTEN AND ORAL COMMUICATION	Demonstrate professional-standards in written and oral communication (oral presentations, written essays) by integrating evidence and analysis within a coherent structure. (Bloom's 3 and 4)	Direct assessment of assignment using course embedded rubric in MGT2203, MKT 2013, HRM 3023, MGT3113, MGT4213	Mean score ≥ 3.5 on 6-point scale course embedded rubric: 1, 2 = deficient; 3, 4 = competent 5, 6 = exemplary
KNOWLEDGE IN DISCIPLINE	Demonstrate knowledge and ability to apply facts, concepts, theories and analytical methods in core business administration concepts in accounting, economics, management, quantitative business analysis, finance, marketing, legal and social environment, information systems, and international issues.	A comprehensive faculty generated examination organized into multiple content areas of information technology knowledge administered to all seniors in INT4303.	Faculty generated final exam deployed to seniors in INT4203. Criterion performance is 75% of students scoring ≥ 70% on final exam.

Table 2: Curriculum Map for the BSIT Program

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**	Principles of Mgmt MGT2203	Info Tech Mgmt INT2103	Web Design INT2123	Intro to Java INT2134	Project Mgmt MGT3103	Comp Network 1 INT 3203	Enter. Resource Plan Systems INT 3703	Database Systems 2 INT 3803	Systems Analysis & Design INT 4203	Capstone INT4303
TECHNOLOGY	**I (F)**	**I (F)**	**R (F)**	**R (F)**	**R (F)**	**R (F)**	**R (F)**	**R (F)**	**E (F)**	
ETHICS		**I (F)**			**I (F)**					
LEADERSHIP	**I (F)**	**R (F)**						**R (F)**	**R (F)**	
TEAMWORK	**I (F)**	**R (F)**						**R (F)**	**R (F)**	
VISUAL COMMUNICATION				**R (F)**	**R (F)**					
WRITTEN/ORAL COMMUNICATION	**I (F)**	**R (F)**						**R (F)**	**R (F)**	
KNOWLEDGE IN DISCIPLINE										**E (F)**

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

During the 2019–2021 academic years, several student learning outcomes for the BSIT program were identified for assessment, although most were not yet formally evaluated. For the **Technology** outcome, which includes applying technology via media and slide quality and analyzing data using appropriate tools, no assessment was conducted. Future actions include implementing assessments in relevant BSIT courses and developing a rubric to evaluate data analysis. All faculty are responsible for implementation, with support from university resources such as the Academic Achievement Center and the College's Assessment and Curriculum Committees.

For **Ethics**, which involves identifying ethical issues, describing relevant frameworks, and developing resolutions, no data was collected. The College's Curriculum and Standards Committee has been consulted to support integration into teaching, and all faculty are expected to implement the assessments in their courses.

The **Leadership** outcome—covering distinctions between leadership and management and demonstrating effective leadership in team settings—was also not assessed. A rubric will be developed, and outcome (a) will be assessed via a leadership essay in MGT2203, while outcome (b) will be assessed through team projects. Faculty will be supported by the College Assessment Committee in developing this rubric.

The **Teamwork** outcome, focused on appropriate group techniques and effective team performance, also lacked assessment. Plans include assessing this outcome in BSIT courses, with team-building activities supported by the College at the beginning of each semester.

Visual Communication, requiring professional standards in graphical communication, was not assessed either. The College Assessment Committee will work with faculty to develop and deploy a suitable rubric for evaluating graphical outputs like plots, tables, and posters.

For **Written and Oral Communication**, which evaluates integration of evidence and analysis into coherent written and oral formats, no assessment data was collected. Future plans include implementation in relevant BSIT courses. Students can be supported by the Academic Achievement Center, and the College offers Toastmasters programming to support oral communication development.

Lastly, for **Knowledge of Information Technology**, the program uses a standardized exam developed by Peregrine Associates. In Spring 2019, five seniors in INT4303 took the exam, but only 60% met the benchmark of scoring 70% or higher—falling short of the 75% target. As a result, review sessions will be provided in future courses, and the College will evaluate whether this commercial exam is the most suitable tool for assessing IT core concepts.

Across all outcomes, there is a strong emphasis on developing appropriate rubrics, embedding assessments in coursework, and utilizing both university-level and college-level support resources to improve and close the assessment loop.

3. Assessment Plan for 2022-2025 Academic Years

Follow assessment plan in Table 1 and express results for longitudinal evaluation.

Master of Business Administration

1. Assessment Plan and Summary

The assessment plan for the MBA program is designed according to the new University undergraduate program level learning outcomes. The assessment plan for the MBA program is provided in Table 1, the curriculum map is shown in Table 2. The assessment plan addresses the set of four LTU graduate program level learning outcomes. Learning outcomes except for Knowledge are directly assessed using course embedded rubrics; Knowledge is directly assessed using ETS commercially produced comprehensive standardized Major Field Test in MBA. Each learning outcome is assessed each semester in randomly selected respective courses. Loop-closing occurs annually.

Table 1: Assessment Plan for MBA

University Graduate Learning Outcomes	Supporting Program Learning Objectives	Assessment Tools	Metrics/ Indicators
ADVANCED KNOWLEDGE	Demonstrate knowledge of core MBA concepts in marketing, management, finance, accounting, and strategic integration.	A comprehensive standardized examination organized into multiple content areas of business knowledge administered to all students in MBA6073.	ETS Major Field Test in MBA. Target scaled score ≥ 1 standard deviation (SD) below the standardized scale mean of the annual comparative data.
ETHICS	(a) Identify the ethical issues implicit in a business situation. (Bloom's 2) (b) Describe and use ethical frameworks application to business situations. (Bloom's 3) (c) Develop a variety of ethical alternatives for resolving or at least addressing a problem in business. (Bloom's 3-4)	Course embedded ethics rubric of assignment in MBA6003, Financial Management; MBA6033, Corporate Finance	Course embedded rubric scored on a 6-point scale, with target mean score = 3.5: 1, 2 = deficient 3, 4 = competent 5, 6 = exemplary
COMMUNICATION	Demonstrate professional-standards in written and oral communication (oral presentations, written essays) by integrating evidence and analysis within a coherent structure. (Bloom's 4)	Course embedded rubric of oral and written presentations in ECN6023, Global Business Economics; MBA6043, Global Leadership	Course embedded rubric scored on a 6-point scale, with target mean score = 3.5: 1, 2 = deficient 3, 4 = competent 5, 6 = exemplary
TECHNOLOGY	(a) Apply technology via media and quality of slides in presentations. (Bloom's 3) (b) Analyze and interpret data using appropriate tools (Bloom's 3)	Course embedded rubric of required oral presentation or online discussion board, and technology rubric in ACC6003, Financial Management; INT6043, Enterprise Information Technology; MBA6043, Global Leadership; MBA6053, Strategic Marketing Management; MBA6063, Operations and Supply Chain Management	Course embedded rubric scored on a 6-point scale, with target mean score = 3.5: 1, 2 = deficient 3, 4 = competent 5, 6 = exemplary

Table 2: Curriculum Map for the MBA Program

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**	Man. Acct. ACC6003	Global Bus Econ ECN6023	Enter Info Tech INT6043	Fin Mgmt MBA6003	Corp Fin (OL) MBA6033	Global Leader (OL) MBA6043	Strat Mkt Mgmt MBA6053	Oper. & Supply Chain Mgmt MBA6063	Global Strat Mgmt Capstone MBA6073
ADVANCED KNOWLEDGE									**E (S)**
ETHICS				**R (F)**	**E (F)**				
WRITTEN/ORAL COMMUNICATION		**R (F)**				**R (F)**			
TECHNOLOGY	**R (F)**		**R (F)**	**R (F)**		**R (F)**	**R (F)**	**R (F)**	

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

(1) Knowledge in Discipline, based on Major Field Test MBA

a. ETS MFT MBA Total Score results are shown in Figure 1 (top half). Results of two sample t-test found the Lawrence Tech students (Mean = 245, SEM = 1.46) scored similar to the comparative sample (Mean = 247, SEM = 0.52). After parsing the LTU students into national and international students, the LTU national students scored significantly higher than the comparison sample (251 vs. 247), whereas the international students scored significantly lower than the comparison sample (237 vs. 247).

b. Assessment Indicator (Domain) results are shown in Figure 1 (bottom half). Results of two sample t tests found Lawrence Tech students were similar to the comparative sample in all domains except Finance, where the LTU students scored significantly higher than the comparison students. After parsing the LTU students into national and international students, the LTU national students scored significantly higher than the comparison students on all domains, whereas the LTU international students scored significantly lower than the comparison sample on the domains of Marketing, Management, and Strategic Integration.

c. Improvements-Process: Proctor students to use all available test time. Improve English comprehension in international students via Speechcraft and Toastmasters International (annually).

d. Improvements-Curriculum: Graduate faculty to encourage all students to ask questions for information clarity. Faculty to prompt international students regularly to check information comprehension.

(2) Communication: Oral
   a. Results: Competent (see Figure 2).

(3) Communication: Written
   a. Results: Competent (see Figure 2).

(4) Ethics
   a. Results: Competent (see Figure 2).

(5) Global Awareness
   a. Results: Competent (see Figure 2).

(6) Integration
   a. Results: Competent (see Figure 2).

(7) Teamwork
   a. Results: Competent (see Figure 2).

(8) Technology
   a. Results: Competent (see Figure 2).

Figure 1. ETS Major Field Test for MBA (2022 Comparative Data from 227 Institutions)

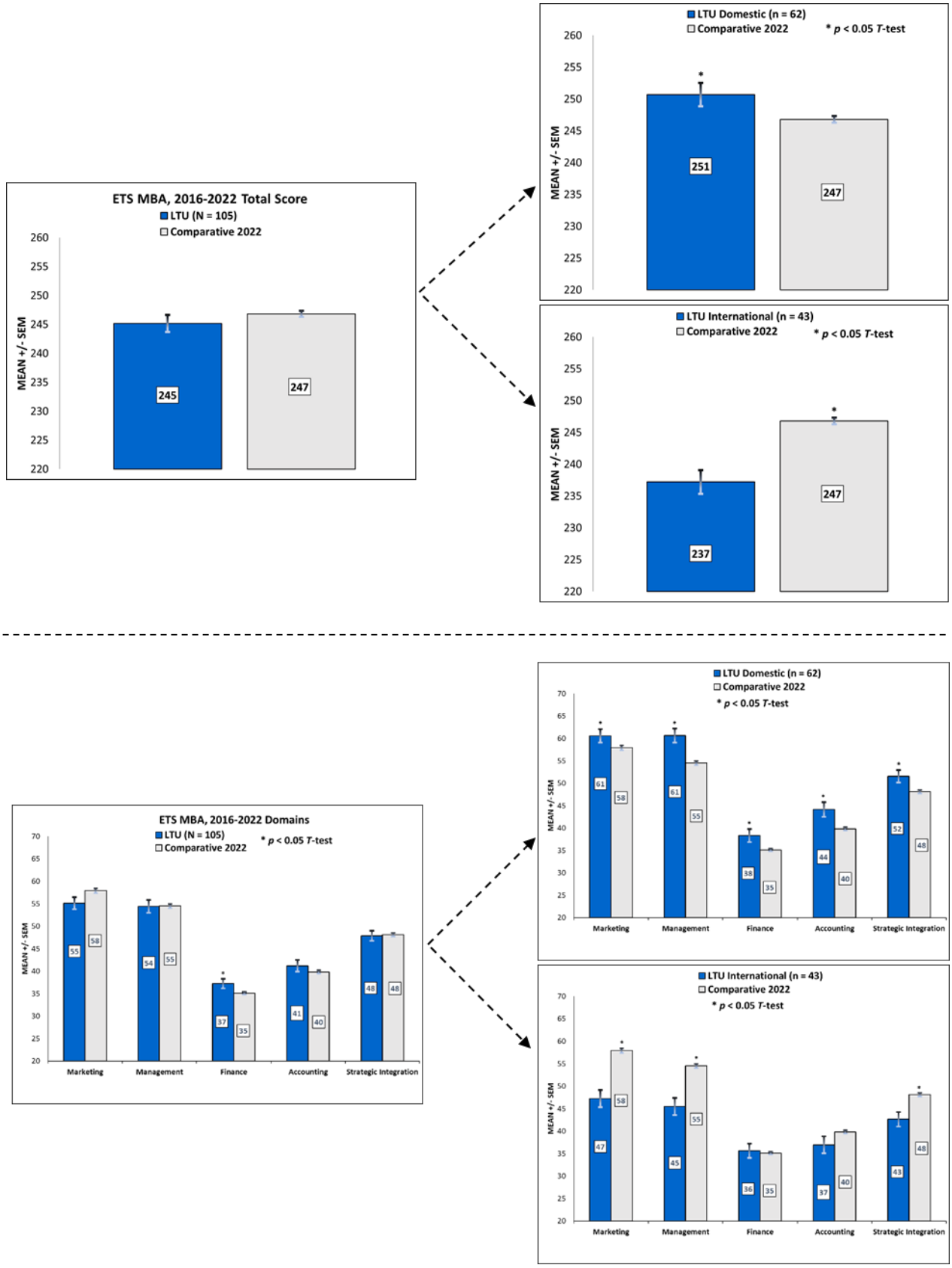
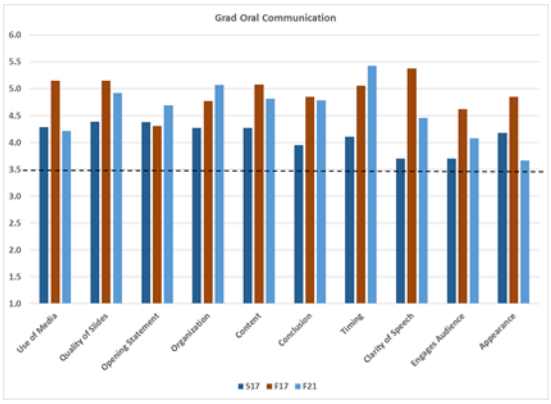
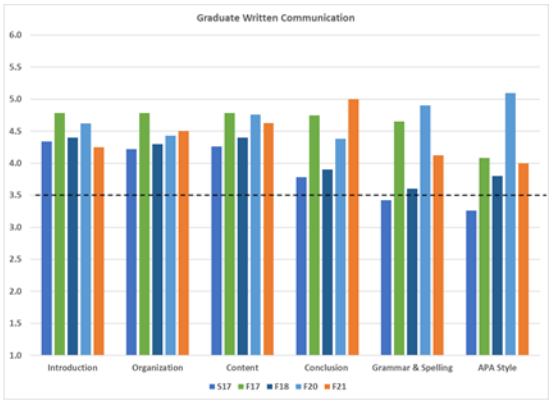
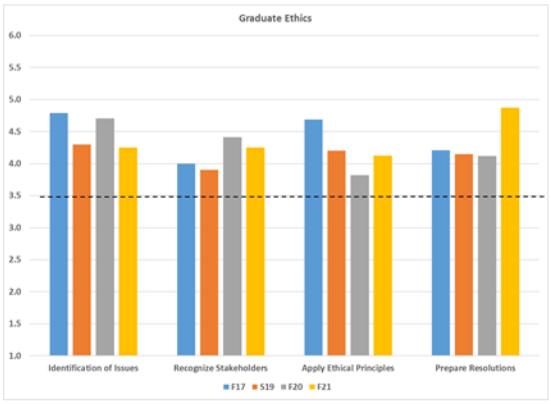
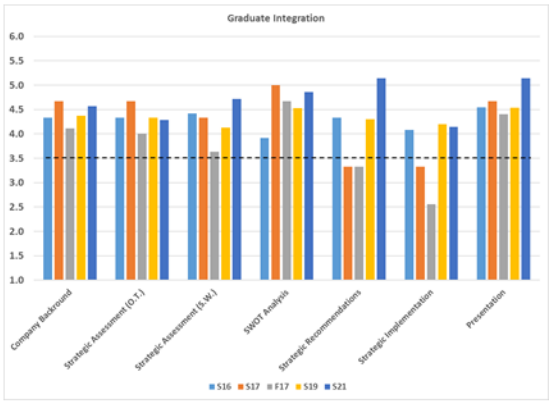


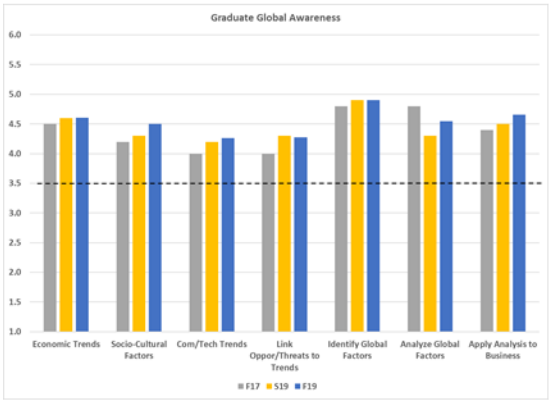
Figure 2. MBA Assessment Results 2016-2021

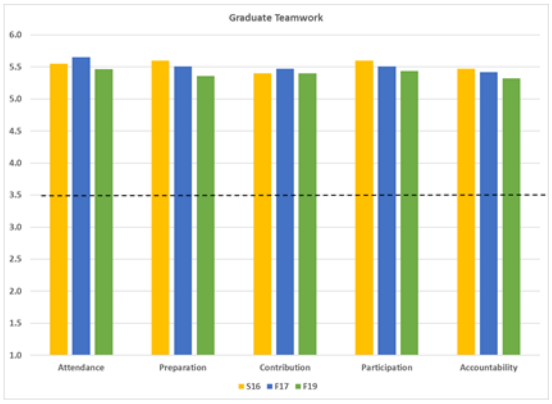


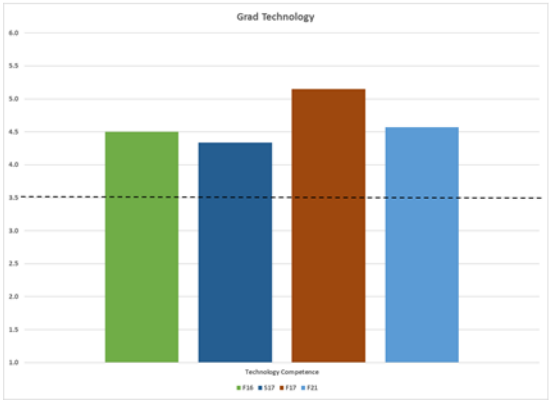












3. Assessment Plan for 2022-2025 Academic Years

1) Assess Knowledge and review the MFT in MBA practice test and content areas with MBA faculty and students.
2) Assess Technology in MBA respective courses.
3) Assess Critical Thinking in MBA respective courses.
4) Assess Written and Oral Communication in MBA respective courses.
5) Assess Ethics in MBA respective courses.

Master of Science in Information Technology

1. Assessment Plan and Summary

The assessment plan for the MSIT program is designed according to the new University undergraduate program level learning outcomes. The assessment plan for the MSIT program is provided in Table 1, the curriculum map is shown in Table 2. The assessment plan addresses the set of four LTU graduate program level learning outcomes. Learning outcomes except for Knowledge are directly assessed using course embedded rubrics; Knowledge is directly assessed using commercially produced comprehensive standardized or faculty-generated comprehensive final exam. Each learning outcome is assessed each semester in randomly selected respective courses. Loop-closing occurs annually.

Table 1: Assessment Plan for MSIT

University Graduate Learning Outcomes	Supporting Program Learning Objectives	Assessment Tools	Metrics/ Indicators
ADVANCED KNOWLEDGE	Students will demonstrate knowledge of core concepts in information technology.	A comprehensive examination organized into multiple content areas of information technology to all students in INT7593, IT Capstone.	75% of students scoring ≥ 70% on final exam.
ETHICS	(a) Identify the ethical issues implicit in a business situation. (Bloom's 2) (b) Describe and use ethical frameworks application to business situations. (Bloom's 3) (c) Develop a variety of ethical alternatives for resolving or at least addressing a problem in business. (Bloom's 3-4)	Course embedded rubric of required written presentation in INT7223, Enterprise Systems Security	Course embedded rubric scored on a 6-point scale, with target mean score = 3.5: 1, 2 = deficient 3, 4 = competent 5, 6 = exemplary
COMMUNICATION	Demonstrate professional-standards in written and oral communication (oral presentations, written essays) by integrating evidence and analysis within a coherent structure. (Bloom's 3 and 4)	Course embedded rubric of required oral and written presentations in MBA7063, Project Management; INT6113, Database Models an Administration; INT6123, Systems Analysis and Design	Course embedded rubric scored on a 6-point scale, with target mean score = 3.5: 1, 2 = deficient 3, 4 = competent 5, 6 = exemplary
TECHNOLOGY	(a) Apply technology via media and quality of slides in presentations. (Bloom's 3) (b) Analyze and interpret data using appropriate tools (Bloom's 3)	Course embedded rubric of required oral presentation or online discussion board, and technology rubric in MBA7063, Project Management; INT6113, Database Models an Administration; INT6123, Systems Analysis and Design; INT6143, Enterprise IT Infrastructure.	Course embedded rubric scored on a 6-point scale, with target mean score = 3.5: 1, 2 = deficient 3, 4 = competent 5, 6 = exemplary

Table 2: Curriculum Map for the MSIT Program

LEARNING OUTCOME **I = Introduce** **R = Reinforce** **E = Emphasize** **F = Formative** **S = Summative**	Project Mgmt (OL)	Database Model & Admin (OL)	Systems Anal & Design (OL)	Enter IT Infra-structure	Emerging Tech	Enterprise Systems Security (OL)	Info Tech Integ Capstone
	MBA7063	INT6113	INT6123	INT6143	INT7213	INT7223	INT7593
ADVANCED KNOWLEDGE							**E (S)**
ETHICS						**R (F)**	
WRITTEN/ORAL COMMUNICATION	**R (F)**	**E (F)**	**R (F)**				
TECHNOLOGY	**R (F)**	**R (F)**	**R (F)**	**R (F)**			

2. Report on 2019-2021 Academic Years and Action Plan (Loop Closing)

During the 2019–2021 academic years, the Master of Science in Information Technology (MSIT) program evaluated several key student learning outcomes aligned with university objectives.

For **Advanced Knowledge of Information Technology**, students were assessed using a comprehensive standardized exam developed by Peregrine Associates and administered in INT7593. Of the eight students tested, only 50% scored at or above the 70% benchmark, falling short of the 75% target. In response, faculty will implement preparatory review sessions and re-evaluate the utility and alignment of the commercial exam with program objectives. Oversight and curricular recommendations will be provided by the College Curriculum and Standards Committee.

The **Ethics** outcome—focused on identifying ethical issues, applying ethical frameworks, and developing ethical alternatives—was not assessed during this cycle. However, it remains a program priority. Plans are in place to implement the ethics rubric in relevant MSIT courses. The College Curriculum and Standards Committee continues to guide curriculum integration of ethical reasoning.

The **Communication** outcome, which includes demonstrating professional standards in both oral presentations and written essays, was also not assessed during the academic year. Future actions include embedding appropriate rubrics for written and oral communication into MSIT courses. The university's Academic Achievement Center will continue to support students in developing communication skills.

For the **Technology** outcome, students were assessed in INT6123 through oral presentations, focusing on the use of media and the quality of presentation slides. Results showed strong performance, with a mean rubric score of 4.7 (on a 6-point scale) in both categories, exceeding the 3.5 benchmark and indicating competency in outcome (a)—applying technology in presentations. Outcome (b)—analyzing and interpreting data using appropriate tools—was not assessed. Faculty are advised to continue supporting student use of technology in communication and expand assessment efforts to cover data analysis competencies in future terms.

Across all outcomes, the MSIT program emphasizes continuous improvement, appropriate use of rubrics, and alignment with university support services, while maintaining faculty responsibility for implementation and assessment integration.

3. Assessment Plan for 2022-2025 Academic Years

1. Evaluate efficacy of standardized exam for assessing Advanced Knowledge. Review content material with students prior to exam. Assess Technology in MSIT respective courses.
2. Assess Ethics in MSIT respective courses.
3. Assess Written and Oral Communication in MSIT respective courses.
4. Assess Technology in MSIT respective courses using technology in the classroom rubric