Assessment results for Industrial Engineering, Engineering Management and Construction Management (BS and MS).

Figure 1 shows that the assessment plan for the industrial engineering program was outcome 6 as indicated in Figure 1.

Year 1: 2021-2022	Industrial Engineering
1. Which PLO(s) to assess	6. An ability to develop and conduct Appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (ILO 1 & 2)
2. Is it aligned with ILO	Yes ILO 1, 2
3. Sample (courses/# of students)	Several IE courses
4. SLO from the course	Outcome assessed via the student's Final Oral Presentation and Written Report
5. Assessment indicators	Final report and presentation
6. Assessment instrument	Program rubric, at least 70% of students achieve the outcome at a level of 70% or higher, the outcome is considered achieved.
7. Time (which semester(s))	Spring 2022, Fall 2021
8. Responsible person(s)	Dr. Bowen, Dr. Ganjeizadeh
9. Ways of reporting (how, to who)	The results (qualitative and quantitative) will be reported by faculty to the department chair via completion of the course Faculty Self-Assessment form.

Figure 1 Industrial Engineering Assessment for the Year 21-22

Assessment results:

<u>Outcome 6</u>

"An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions", was assessed in INDE 420, INDE 460, INDE 492, ENGR 340, and ENGR 210.

ENGR 200 - Introduction to Engineering and Design

Hands on Lab exercises were conducted. Students used various measuring devices, solved electrical engineering problems, wrote reports on the analysis and results, and wrote a conclusion. 89% achieved above threshold.

ENGR 230-Electrical Circuits

Hands on assignments on operational amplifiers were used to assess this outcome. Students constructed, simulated, and analyzed the performance of an amplifier using LT Spice. The average was 86.6%. The standard deviation was 2%. A planned improvement will be covering more theory before lab assignments. 87% of students were above the threshold.

ENGR 340-Design of Experiments

Each team selected a real-life project involving design of the experiments, analysis of the results and making decisions based on results. Students delivered a written report and presented their findings. Students were required to analyze the problem using at least 3 different experimental tools such as ANOV, RCBD and Latin Square, etc. 90% of students performed above the threshold.

ENGR 460 - Service and Manufacturing Systems Modeling

Team projects were used to assess this outcome. 87% performed above the threshold.

INDE 492 – Senior Design

This outcome was assessed via the student's Final Oral Presentation and Written Report.
THRESHOLD: 70% of students performed at or above a score of 5.6/8 (equivalent to 70/100%) on our common rubric, which is at the level of, "Can design and conduct intermediate level experiments with few or no errors and analyze data." 90% of students performed above the threshold.

Closing the Loop: We are making substantial changes to the senior design course (INDE 492) to assure that students have the knowledge and incorporate realistic engineering constraints and standards.

▪ Year 2: 2021-2022	▪ Engineering Management
1. Which PLO(s) to assess	PLO d - Have the ability to effectively and persuasively communicate (ILO 2)
2. Is it aligned to an ILO?	Yes, ILO 2
3. Assessment activity	Team project
4. Assessment instrument	Department rubric
5. Sample (courses name)	ENGR 650 Project Management
6. SLO from the course	Understand the importance of work breakdown structures and networks to planning, scheduling, and controlling projects. Ability to identify and rectify potential conflicts and problems that can occur on projects. An ability to use computer-based information systems for managing projects. Ability to communicate convincingly in writing and orally regarding the efficacy of a particular managerial decision criteria with various constraints e.g., time, budget and resources, etc. supported by description and application of relevant theories.
7. Time (which semester(s))	Fall 2021
8. Responsible person(s)	Prof. Ganjeizadeh
9. Strategies on reporting (how, to who)	Oral presentation score results (qualitative) will be reported by faculty to the department chair via completion of the course Faculty Self-Assessment form.
10. Strategies on closing the loop	Interaction between chair, faculty and industrial advisory board

Figure 2 Assessment for Engineering Management in 21-22

C. Summary of Assessment Results

Summary: This course involves hands on lab activities related to application of theory in solving engineering problems. Alumni have evaluated the course material as valuable in their professional career. The performance indicators for assessment of this outcome and the rubric used are as follows. The rubric used for assessing communications skills is as follows:

Project topic originality 5%

Methodology	8%
Application	5%
Written report	20%
Team Presentation	20%
Team member evaluation	5%
Peer evaluation	2%
Clarity of Presentation	10%
Presentation material	10%
Team transactions	5%
Individual presentation ability	10%

According to this rubric 70% of the grade is based on students' communication skills. For the 13 students participating in this evaluation, the average grade was 80% with the lowest grade of 70% and the highest of 95%. Majority of students achieved the communications skills outcome.

Year 1: 2021-2022	Construction Management BS
1. Which PLO(s) to assess	PLO 1 - An ability to identify, formulate, and solve broadly defined technical problems by applying knowledge of mathematics and science and/or engineering to areas. PLO 3 - An ability to develop and conduct experiments or test hypotheses, analyze and interpret data and use construction science and professional judgment to draw conclusions.
2. Is it aligned to an ILO?	Yes, (see above)
3. Sample (courses/# of students)	CMGT 310 Statics and Strength of Materials CMGT 340 Construction Cost Estimating
4. SLO from course	1- Develop knowledge of vector mathematics and application to engineering mechanics. 2- Perform force analysis for external reactions computation.
	3- Draw free-body diagrams and apply the concepts of particle and rigid-body equilibrium. 4- Analyze and design structural members subjected to tension, compression, torsion, bending and combined stresses.
5. Assessment indicators	Midterm exam question
6. Assessment Instrument	Program rubric
7. Time (which semester(s))	Spring 2021;
8. Responsible person(s)	Professor Motavalli,
9. Ways of reporting (how, to who)	The results (quantitative) will be reported by faculty to the department chair via completion of the course Faculty Self-Assessment form.
10. Ways of closing the loop	Interaction between chair, faculty and industry advisory board

Assessment Results:

Outcome 1

CMGT 310 – Statics and Strength of Materials, Spring 2019, Spring 2020, and Spring 2021. The assessment tool was Quiz 1. This quiz focuses mainly on force vectors and their separation into x and y components. It also includes a resultant force problem. Quiz 1 was chosen as the tool to assess the outcome as it blends mechanics and vectorial algebra. We considered that this outcome is met when at least 70% of students achieve at least of 70% on this quiz.

In Spring 2019, the outcome was not achieved, as only 68% of students had a score of 70% or above on Quiz 1. The proposed improvement was to add an additional in-class activity that emphasizes how the components of different types of vectors are obtained. The analysis also showed that the students' challenges partially stemmed from their inadequate background in math and physics. In addition, the extra support at the beginning of the class was critical to ensure successful performance of the students in CMGT 310.

In 2020 76% of students had a score of 70% or above on Quiz 1. This improvement was possible by investing more time at the beginning of the class to reinforce the students' understanding of vectors. The outcome was also achieved in Spring 2021 when 91.7% of the students achieved the outcome. The instructor continued to emphasize how the components of different types of vectors are obtained. Also, students took Quiz 1 online in a take home format, with more time to complete it.

Outcome 3:

CMGT 340 – Construction Cost Estimating, Spring 2019, Spring 202, and Spring 2021. This outcome was evaluated through a final group project where students were asked to use a set of blueprints to perform quantity take offs and estimate the cost of material and labor required to complete the project. Students were encouraged to reach out to contractors for labor and materials pricing for a more realistic experience. The goal was to provide an opportunity for students to apply what they have learned through the semester to create a comprehensive construction estimate. As shown in Figure 4.4, 72%, 100%, and 94% achieved a score above 70% in this activity, in Spring 2019, Spring 2020, and Spring 2021, respectively. Therefore, this outcome was achieved. The instructor suggested additional in-class activities to reinforce students' understanding of quantity take off. Also, the instructor recommended starting the project earlier in the semester and allow the students to spend more time on each trade.

Construction Management MS

1.Which PLO(s) to assess	PLO c - plan and deliver a project meeting the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, constructability, and sustainability. (ILO 2,5)
2. Is it aligned to an ILO?	Yes, ILO 2,5
3.Sample (courses/# of students)	CMGT 680, Construction Safety and Health
4.SLO from the course	SLO 1 - Develop strong technical knowledge and understanding of the basic principles of hazard sources related to environment, humans and equipment; SLO 3 - Identify occupational health and safety regulations, and understand their ethical and legal implications;
4.Assessment activity	b-Midterm exam question;
5.Assessment Instrument	Program rubric
6.Time (which semester(s))	Fall 2021;
7.Responsible person(s)	b-Lecturer
8.Ways of reporting (how, to who)	The results (quantitative and qualitative) will be reported by faculty to the department chair via completion of the course Faculty Self-Assessment form.
9.Ways of closing the loop	Interaction between chair, faculty and industry advisory board

Summary of Assessment Results: Outcome c was assessed in CMGT 680 – Construction Safety and Health, using the course midterm exam. The exam was designed to assess students' understanding of the key safety and health measures, plans, and improvement tools. The exam focuses on Occupational Safety and Health Administration (OSHA) regulations and standards as well as the National Institute of Occupational Safety and Health (NIOSH) research findings.

As part of the exam students are expected to:

1. Identify differences between safety and health.

2. Determine roles and responsibilities of different parties in construction with regards to safety.

3. Identify components of OSHA inspection procedure.

4. Indicate importance of accident investigation.

5. Evaluate company safety culture.

6. Determine the direct and indirect cost of accidents.

7. Determine incidence rate (IR) and days of restricted work activity or job transfer (DART) according to the procedures established by OSHA.

Outcome c was achieved since 88% of students' scores were above 70% in Fall 2021.

Close the Loop

The instructor recommended improvement, is to train students on the use of proper personal protective equipment (PPE) at different work environments and on how to conduct respirator fit test as performed by an OSHA trained professional. These changes has been implemented in Fall 2022 and the results will be reported next time.

Computer Engineering B.S.

Year 3: 2021-2022	
1. *Which PLO(s) to assess*	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. (ILO 1 & 5)
2. *Assessment activity*	e-Final exam
3. *Assessment instrument*	Program rubric
4. *Sample (courses/# of students)*	ENGR 330 Electric Circuits
5. *SLO from the course*	1) Analyze and compute voltage, current, and power in circuits with passive and active components. 2) Understand the design and operation of transistor amplifiers. 3) Understand small- and large-signal models and DC operating points for circuit components. 4) Understand the design and operation of digital circuit components. 5) Utilize circuit analysis software and hardware to compute electrical quantities in transistor-based circuits. 6) Develop greater general knowledge of household electronic devices
6. *Time (which semester(s))*	e-Spring 2022;
7. *Responsible person(s)*	e-Prof. Doering
8. *Ways of reporting (how, to who)*	The results (quantitative and qualitative) will be reported by faculty to the department chair via completion of the course Faculty Self-Assessment form.
9. *Ways of closing the loop*	Interaction between chair, faculty and industrial advisory board

Summary of Assessment Results

The course CMPE 330 involves solving time-domain signal problems using frequency domain analysis. The problem taken for assessment was a series of related subproblems asked as part of a final exam. The course teaches problem solving with relation to optimization of power consumption and optimization of cost. By teaching optimization of power consumption students learn detailed problem solving skills applicable to minimizing power consumption of devices and also minimizing environmental and economic costs as well. The details of the assessment metric are as follows:

Performance Indicator 3: Analyze time-domain signals using a frequency-domain representations.
Performance level: Developmental

Rubric:
(1) Unable to formulate steps involved to analyze time-domain signal in frequency domain
(2) Partially able to formulate steps involved
(3) Able to formulate steps involved, but incorrect/missing final plot of the frequency-domain representation
(4) Able to formulate steps involved with correct final plot of the frequency-domain representation

Course: CMPE 330

Assessment 1:
Semester: Fall, 2019
Item: Homework 9

Score	# of Students
1	7
2	4
3	5
4	7
Total Students	*23*
Average Score	*2.52*
Score of 3 or Higher	*52%*

As shown here, students who receive a normalized score of 3 or higher on the assessment were considered to have passed this assessment and meet the requirements of the Computer Engineering program. As shown here, only slightly more than half of the students who took the assessment managed to score at an acceptable level. The target for the Computer Engineering program is for 65% of students or better to achieve a score of 3 or higher. In this regard, the Computer Engineering program needs some improvement with relation to this metric.

Closing the Loop

Many students had significant trouble with this assessment which indicates one of two possibilities:

1) This assessment was particularly difficult for the students and perhaps it was not taught effectively in this iteration of the class. It is suspected that this is the case.
2) This is a more pervasive problem that spans multiple assessment metrics and the Computer Engineering program needs to develop a comprehensive teaching plan that spans multiple

classes to ensure that students are learning the proper problem solving techniques for power optimization or cost optimization.

First, a more comprehensive review will be conducted in ENGR 230 and CMPE 492 in order to confirm that this is an isolated incident as suspected. If it is not isolated, professors in the Computer Engineering program will confer separately to discuss these findings and develop a plan to improve the program overall.