BS Industrial Engineering

Annual Program Report Template

Year:	2024 (Submitted 7/1/24)
Program:	**Master of Engineering Management (MEM)**
Contact Person (include email & phone#)	James Curry james.curry@lamar.edu 2488025891

Summary of Continuous Improvement Efforts since Last Report

Provide a brief description of how assessment results have been used for program improvement. Point to a specific example of how an assessment provided the program with data it could use for improvement and what that improvement was, if possible, also show evidence of the improvement. You may look at data from the two previous academic years to support this case.

The MEM program uses the IE departments assessment procedure. The assessment committee reviews student work using the comprehensive test. This test is a closed book closed note written test. The assessment committee grades sample of student work on this exam. A total of 20 reviews were performed. A 4-point scale rubric is used. The standard is 75% of students in the top 2 categories.

The IE department is committed to improvement driven by assessments. The department also uses graded materials in class, student performance, faculty suggestions, student suggestions, advisory council suggestions, course survey, SWOT analysis, and industry trends to develop improvements. The following are the recent improvement plans for the MEM program with improvement 5 to 8 being assessment driven based on this 2024 assessment. After the improvement, the assessment data is presented in the standard format.

1. INEN 5380 Project Management (Required Course)

Identification: INEN 5380 "Project Management" is a mandatory course for MEM program and elective course for other graduate students. Instructor realized that students need more interaction even though the course listed as an online course.

Improvement: Instructor created more live sessions to increase interactions for the class during nighttime since many of the students had full time jobs. The focus was more on use of theory behind MS Project and use of MS project. Attendance was not mandatory for these sessions, but the sessions were recorded via collaborate ultra. In this case, students can watch the live sessions.

Result of Improvement: Feedback from the students were great, they liked the live sessions and even they stated that they would like to have more live sessions in their course evaluations.

2. INEN 5380 Project Management (Required Course)

Identification: INEN 5380 "Project Management" is a mandatory course for MEM program and elective course for other graduate students. The instructor realized that students had struggle on the solution of

the problems in homework assignments. Instructor realized that explanation of issues with recorded videos and live session would be good.

Improvement: Instructor developed some videos explaining more examples for the preparation of HW and Project. Instructor created some live sessions to explain MS Project software as well. Attendance was not mandatory for this session, but the sessions were recorded via collaborate ultra. In this case, students can watch the live session videos and do not miss the opportunity to learn from the live sessions.

Result of Improvement: Homework and project quality were significantly improved.

3. Contest in Technology Entrepreneurship

Identification: The instructor developed the Technology Entrepreneurship course to provide engineering students with knowledge about how technology-based startup companies are founded and grow. The course was originally developed in collaboration with the Center for Innovation Commercialization and Entrepreneurship (CICE), and was intended to be a starting point for students to become engaged in CICE events and activities. Unfortunately, due primarily to COVID, most activities never came about and CICE was recently restructured and brought under the new Entrepreneurship Institute at LU. There was a need to work with the new executive director and other stakeholders to connect the course into the Entrepreneurship Institute ecosystem.

Improvement: Through a series of meetings over Summer of 2022 the instructor, along with collaborators at the Entrepreneurship Institute and community stakeholders, developed a plan to coordinate course activities with events such as the Entrepreneurship Institute speaker series and, most importantly, the new Cardinal Ideas Pitch Deck Competition.

Result: Students taking the course worked in small teams to develop an initial idea into a product design, and then into a business model. The pitch deck competition was timed to correspond with the point in the course when students were making their pitch decks, in this way all the teams could apply to enter the competition. Teams who were not accepted were still allowed to give practice talks, while those who were accepted competed for $10,000 in prizes! Students not only learned abut entrepreneurship, but also learned about the resources and connections available to them through the Entrepreneurship Institute, and they will be invited to future events such as an entrepreneurship bootcamp and an entrepreneurship field trip planned for spring 2023. In 2024, this contest continued with several winner from the class.

4. INEN 5358 Intro to Robotics

Identification: Applications of robotic automation have become increasingly important in manufacturing, warehouse, and other industrial and service sectors. INEN 5358 Intro to Robotics was in the course inventory but was not offered for at least 10 years.

Improvement: The instructor decided to develop the course with modern approach. It was first developed in Summer 2021, then offered again in 2022. We used the textbook “Modern robotics: Mechanics, Planning, and Control” by Kevin M. Lynch and Frank C. Park, Cambridge University Press, 2017. The CoppeliaSim robot simulation environment (formerly known as V-REP) was used to experiment with the kinematics of different robots and to animate solutions to inverse kinematics,

dynamics simulations, and controllers. It is free for educational use and cross platform. Two simulation workshops, one on forward kinematics, one on inverse kinematics were developed to allow student to better understand the algorithms.

Results of improvement: The course received very good student evaluation. The course went from online to face to face in 2024 to improve lab experiences.

5. Reduce class size (2024)

Identification: Several IE graduate courses were over 100 students (INEN 5345 CIM, INEN 5396 Automation, INEN 5392 Database, INEN 5301 ST: Applied Programming) in 2023-2024. The IE faculty were concerned about quality with large numbers of students in course.

Improvement: Hiring additional resources to teach courses.

Result: The department with support of university leadership is in the process of hiring 1 tenured track faculty member, 1 adjunct with doctoral degree, and increasing the teaching load of one adjunct from 1 to 2 courses per semester for fall 2025. The department is increasing the number of TA from 4 to ~10 who have Blackboard access for fall 2025. The department will report next year if we have achieved reasonable class sizes.

6. Teach More AI and Robotics Courses (2024)

Identification: Due to Industry trends and recommendation of the advisory council, the department determined that AI has the potential to become a bigger part of Industrial Engineering and Operations Research.

Improvement:
The department offered 2 new AI courses in 2024 (INEN 6301 ST: User Interface, INEN 5301 ST: AI For IE).

Result: The courses were well received by students with outstanding course evaluations. Both courses had over 15 students. Both courses will be taught again. The department added one new robotics course.

7. Expand Course offering (2024)

Identification: MEM has 7 unique pathways plus the ability to make a custom pathway in the program. This flexibility requires a large number of courses be offered for students.

Improvement: Add courses and use courses from other departments.

Result: A total of 45 courses in Fall 2024 are on our recommended list. Fifteen are IE courses with the rest from Computer Science, MISY, Construction Management, and Math.

8. Math Based Formulation to General Questions

Identification: The results of this year's assessment were less than our standard for math-based reasoning when asked general questions. While the responses were reasonable, the lack of math formulation in the responses is concerning.

Improvement: The program will focus more on quantitative responses to questions. The qualifier will be updated with questions more focused on quantitative reasoning. INEN 5375 Simulation and INEN 5350 PIC will add additional modules about problem formulation to business questions. These exercises will help students develop model-based responses to open ended questions.

Results: Improvement in progress.

Program Highlights Since Last Report

Identify and briefly discuss any programmatic curriculum changes made since the last report (e.g. new courses, course changes, SLO changes, course deletions).

1. Continued strong graduate enrollment.
2. Expanded course offering (2 new AI courses, Simulation taught for the first time in several years, one new robotics course for fall 2024).
3. New faculty in robotics.
4. New robotics equipment on order.

Performance Indicators and Rubrics for Outcome #1:

An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. The following rubric is used in assessment.

Performance Indicator	**Excellent** **4**	**Good** **3**	**Satisfactory** **2**	**Unsatisfactory** **1**
(a) Identify complex engineering problems by applying proper engineering, science, and mathematical principles.	Identify and fully describe complex engineering problems using correct specifications, design variables, and proper constraints.	Identify and describe complex engineering problems but may have missing specifications, design variables, and proper constraints	Partially identify and describe complex engineering problems missing some specifications/design variables/proper constraints	Cannot Identify and describe complex engineering problems using specifications, design variables, and proper constraints
(b) Formulate the complex engineering problem by applying proper engineering, science, and mathematical principles.	Formulate the complex problem *mathematically by application of* engineering and science theories and principles without mistakes.	Formulate the problems *mathematically by application of* engineering and science theories and principles with minor mistakes.	Model the problems *mathematically by application of* engineering and science theories and principles with mistakes and errors.	Cannot formulate the problem *mathematically by application of* engineering and science theories and principles
(c) Solve the problem by applying proper engineering, science, and mathematical principles.	Effectively apply the engineering problem solving procedure: mathematical modeling, solution method, interpretation of results	Essentially apply the engineering problem solving procedure: mathematical modeling, solution method, interpretation of results	Reasonably apply the engineering problem solving procedure: mathematical modeling, solution method, interpretation of results	Cannot follow correctly the engineering problem solving procedures at all.

Degree: Master of Engineering Management (MEM) 2023-2024 Assessment Plan		
	Student Learning Outcome #2	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
PLAN	**Assessment Method(s)**	Comprehensive Exam
	Proficiency	Minimum acceptable standard 75% (3 out of 4)
DO	**Benchmark**	75% of students to the proficiency of 75% (3 out of 4)
	Results of Assessment	(a) Identify complex engineering problems by applying proper engineering, science, and mathematical principles. 75% (b) Formulate the complex engineering problem by applying proper engineering, science, and mathematical principles. 70% (c) Solve the problem by applying proper engineering, science, and mathematical principles. 75%
STUDY	**Analysis of Results**	The results are close to our standard. The improvement plans of wider courses (improvement plans 6 and 7) and smaller class sizes should help (improvement plan 5). The result is partially due to the style of question asked on the comprehensive exam (improvement 8).
ACT	**Improvement Plan for 2024-2025**	**5. Reduce class size (2024)** **Identification:** Several IE graduate courses were over 100 students (INEN 5345 CIM, INEN 5396 Automation, INEN 5392 Database, INEN 5301 ST: Applied Programming) in 2023-2024. The IE faculty were concerned about quality with large numbers of students in course.

		Improvement: Hiring additional resources to teach courses. **Result:** The department with support of university leadership is in the process of hiring 1 tenured track faculty member, 1 adjunct with doctoral degree, and increasing the teaching load of one adjunct from 1 to 2 courses per semester for fall 2025. The department is increasing the number of TA from 4 to ~10 who have Blackboard access for fall 2025. The department will report next year if we have achieved reasonable class sizes. **6. Teach More AI and Robotics Courses (2024)** **Identification:** Due to Industry trends and recommendation of the advisory council, the department determined that AI has the potential to become a bigger part of Industrial Engineering and Operations Research. **Improvement:** The department offered 2 new AI courses in 2024 (INEN 6301 ST: User Interface, INEN 5301 ST: AI For IE). **Result:** The courses were well received by students with outstanding course evaluations. Both courses had over 15 students. Both courses will be taught again. The department added one new robotics course. **7. Expand Course offering (2024)** **Identification:** MEM has 7 unique pathways plus the ability to make a custom pathway in the program. This flexibility requires a large number of courses be offered for students. **Improvement:** Add courses and use courses from other departments. **Result:** A total of 45 courses in Fall 2024 are on our recommended list. Fifteen are IE courses with the rest from Computer Science, MISY, Construction Management, and Math. **8. Math Based Formulation to General Questions** **Identification:** The results of this year's assessment were less than our standard for math-based reasoning when

		asked general questions. While the responses were reasonable, the lack of math formulation in the responses is concerning. **Improvement:** The program will focus more on quantitative responses to questions. The qualifier will be updated with questions more focused on quantitative reasoning. INEN 5375 Simulation and INEN 5350 PIC will add additional modules about problem formulation to business questions. These exercises will help students develop model-based responses to open ended questions. **Results:** Improvement in progress.

Performance Indicators and Rubrics for Outcome #2:

An ability to apply engineering design to produce solutions appropriately. The following rubric is used in assessment.

Performance Indicator	Excellent 4	Good 3	Satisfactory 2	Unsatisfactory 1
(a) Identify the requirement and constraints in the design of the system	Include a complete analysis on the needs of customer and end-users. Engineering specifications and realistic constraints are completely listed.	The needs of customer and end-users are included. The engineering and realistic constraints are listed without missing the critical ones.	The essential needs of customer and end-users are included. The engineering and realistic constraints are listed but not completely.	The needs of customer and end-users are not considered. The engineering and realistic constraints are not specified.
(b) Application of the detailed processes and skills in design	Apply effectively the engineering design process, explore the alternative design options, evaluate the design alternatives, identify and choose the final design.	Reasonably address all the following items: engineering design process, alternative designs, evaluation of design alternatives, and identification of final design.	May not address one of the following items: engineering design process, alternative designs, evaluation of design alternatives, and identification of final design.	Many of the following items are not included: engineering design process, alternative designs, evaluation of design alternatives, and identification of final design.
(c) Finalize designs based on the need, constraints and economic analyses	Demonstrate effective use of engineering and economic analyses, standards and codes to satisfy design objectives and real-world constraints.	Include all the following items: engineering analysis, economic analysis, standards and codes.	May not include one of the following items: engineering analysis, economic analysis, standards and codes.	Do not include many of the followings: engineering analysis, economic analysis, standards and codes.

Degree: Master of Engineering Management (MEM) 2023-2024 Assessment Plan		
	Student Learning Outcome #3	An ability to apply engineering design to produce solutions appropriately.
PLAN	**Assessment Method(s)**	Comprehensive Exam
	Proficiency	Minimum acceptable standard 75% (3 out of 4)
DO	**Benchmark**	75% of students to the proficiency of 75% (3 out of 4)
	Results of Assessment	(a) Identify the requirement and constraints in the design of the system 80% (b) Application of the detailed processes and skills in design 80% (c) Finalize designs based on the need, constraints and economic analyses 75%
S T U D Y	**Analysis of Results**	The results met our standard. The improvement plans of wider courses (improvement plans 6 and 7) and smaller class sizes should help (improvement plan 5) in future years. The result being close to our standard is partially due to the style of question asked on the comprehensive exam (improvement 8).
ACT	**Improvement Plan for 2024-2025**	See first section for active improvement plans 5 to 8.

Performance Indicators and Rubrics for Outcome #3:

An ability to use modern engineering tools to produce engineering analysis in a systematic manner. The following rubric is used in assessment.

Performance Indicator	**Excellent** **4**	**Good** **3**	**Satisfactory** **2**	**Unsatisfactory** **1**
(a) Ability of using modern engineering tools	Clearly demonstrated ability to use modern engineering tools	Demonstrated some ability to use modern engineering tools	Demonstrated minimal ability to use modern engineering tools	Does not demonstrate ability to use modern engineering tools
(b) Quality of analysis	Clearly demonstrates ability to show results of engineering analysis in a high-quality fashion	Demonstrates ability to show results of engineering analysis in generally good quality	Demonstrates minimal ability to show results of engineering analysis, quality compromised	Does not demonstrate ability to show results of engineering analysis in an acceptable quality

Degree: Master of Engineering Management (MEM) 2023-2024 Assessment Plan		
	Student Learning Outcome #3	An ability to use modern engineering tools to produce engineering analysis in a systematic manner.
PLAN	**Assessment Method(s)**	Comprehensive Exam
	Proficiency	Minimum acceptable standard 75% (3 out of 4)
DO	**Benchmark**	75% of students to the proficiency of 75% (3 out of 4)
	Results of Assessment	(a) Ability of using modern engineering tools 90% (b) Quality of analysis 80%
STUDY	**Analysis of Results**	The results met our standard. The improvement plans of wider courses (improvement plans 6 and 7) and smaller class sizes should help (improvement plan 5) in future years. The result being close to our standard is partially due to the style of question asked on the comprehensive exam (improvement 8).
ACT	**Improvement Plan for 2024-2025**	See first section for active improvement plans 5 to 8.