Institutional Effectiveness
2024-2025

Program: Master of Engineering Management MSEM
College and Department: College of Engineering, Engineering Management
Contact: John Tester
Mission:

To provide distance learning in the engineering management knowledge area to working technology employees with four-year engineering degrees and equivalent science degrees.

Curriculum Map (Educational Programs Only):

See Appendices 1 and 2

PO1: Student Graduation

Define Outcome:

All students who complete two courses per semester for six consecutive semesters will be awarded the MSEM degree.

Assessment Methods:

Evaluation of data from the IARE report. The report contains data:

- ·List of MSEM accepted students for each semester since MSEM program inception (Spring 2020)
- ·List of students who were awarded degrees for each semester starting Fall 2022, which was the first semester that MSEM students had degrees conferred. For each student:

    a. Calendar time from first enrolled class to graduation date.
    b. Number of semesters enrolled.
    c. Number of semesters from first enrolled class semester to graduation semester

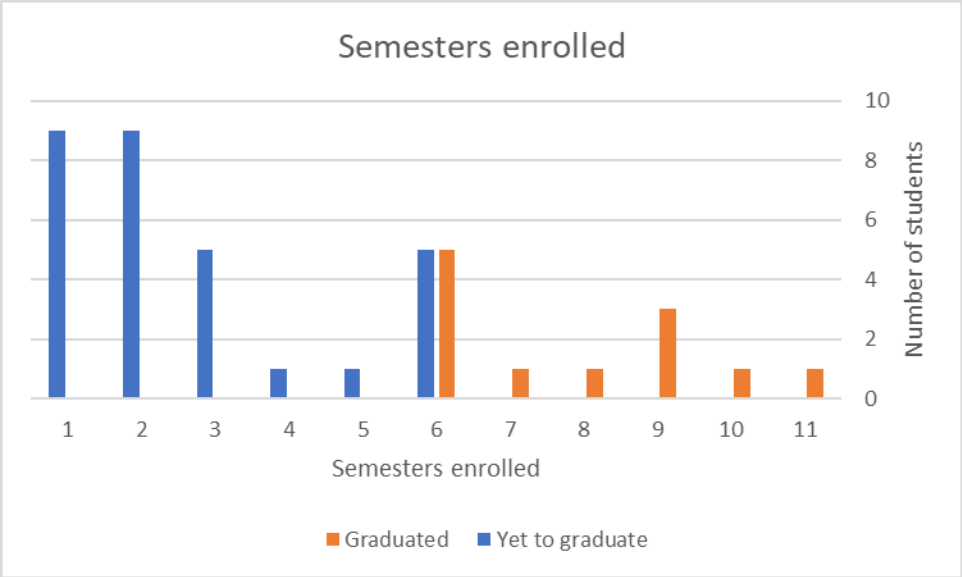
Criteria for Success (Thresholds for Assessment Methods):

a. A majority of accepted and enrolled students earn degrees within 6 years
b. All students who complete two courses per semester for six consecutive semesters will be awarded the MSEM degree.

Results and Analysis:

PO1: MSEM students graduate within 6-year time limit. Analysis shows ongoing success for this PO. PO 1 addresses the need for students to graduate upon completing the courses successfully and in a timely manner. The PLO is thus cumulative, reported for the latest data from 2024. There are several measurements, but they illustrate essentially the same information. For simplicity, Figure 1 illustrates the cumulative number of semesters enrolled for MSEM students. Seven of the twelve graduates required longer than six semesters of enrollment for graduation. However, most students, including these graduates, enroll in less than the two per semester allowed for full-time online graduate enrollment. Their reduced course load per semester results in more semesters required to graduate. TTU requires all graduate students to complete their degrees within six years. So far, all students enrolled in MSEM and remaining in “Good Standing” academically have completed within six years, or are ongoing and under that time limit.

Figure 1. Number of semesters enrolled with respect to MSEM graduates and currently enrolled MSEM students (latest compiled data to 05/2024).



Use of Results to Improve Outcomes:

No improvements anticipated at this time, as the MSEM program is not yet 6 years in existence.

PO2: Program Online Equivalence

Define Outcome:

The MSEM programs will provide an equivalent learning experience to that of on campus Engineering master's degree programs. (Pursuant to TTU Policy 223 on Distance Education)

Assessment Methods:

List of Engineering master's degree programs that have accepted and enrolled students.

a. On-campus students currently enrolled for the previous academic year
b. Online students currently enrolled for the previous academic year
    i. Number of students with thesis option selected
    ii. Number of students with non-thesis option selected
c. Numbers of students who completed master's degrees in these programs.
d. Calendar time from first enrolled class to graduation date.
e. Number of semesters enrolled.
f. Number of semesters from first enrolled class semester to graduation semester.

[1] (or up to 12 months previous to report generation in October of current year)

Criteria for Success (Thresholds for Assessment Methods):

a. MSEM students complete graduate degrees in equivalent timeframe as those of other online engineering master's degrees.
b. All students who complete two courses per semester for six consecutive semesters will be awarded the MSEM degree.

Results and Analysis:

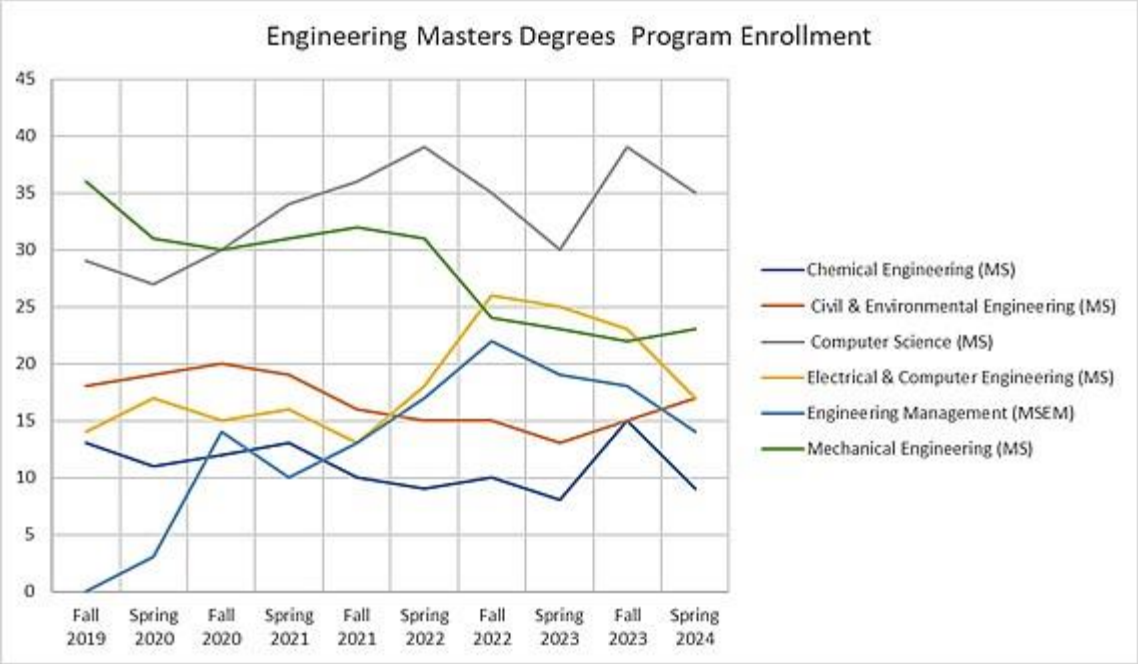
Intent was to compare to other online engineering programs at Tennessee Tech. However, this comparison proved impossible, as there were no other totally online master's programs offered from university at the time.

Program online equivalence (to other graduate programs) is addressed by PLO 2. Using similar measures, this PLO originally was to compare to online engineering graduate degrees at TTU. However, there are few full-time, similar engineering online programs available for comparison. Thus, the comparisons are with on-campus graduate degree programs. The comparisons are program-level, rather than for each student's individual histories (such as for PLO 1). Of most interest is Figure 1, which shows all of the College of Engineering Master's degree enrolled students. As noted earlier, all these master's degrees are traditional on-campus programs, other than MSEM.

The data shows MSEM ongoing enrollment to be in the same magnitude as some historically

on-campus programs, such as Civil Engineering and Chemical Engineering. Nevertheless, the enrollment per semester has a considerable deviation from the average. Much of this variation is associated with a start-up program, some is also due to students enrolling in only one course per semester at times, as implied by the Figure 2 data. On-campus students are typically enrolled full-time, and thus the latter issue has minimal impact on their enrollment variations.

Figure 2. Engineering Master's Degree programs enrollments (ending 05/2025).



This equivalence also begins to show some impact in PO 3, Program Sustainability. Though MSEM is in the range of at least one other Engineering Master's program, Civil & Environmental Engineering, its enrollment is unsteady and falling for the past 4 semesters. This lower-than-desired enrollment level is more of a sustainability issue than an equivalency issue and is addressed in PO 3 analysis.

Use of Results to Improve Outcomes:

Improvement: Comparison of MSEM enrollments will be made with on-campus engineering masters programs, until more online engineering masters programs are formed.

PO3: Program Sustainability

Define Outcome:

Current enrollment of students in program at sustainable levels

Assessment Methods:

Use the institutional enrollment report for the past year of study in MSEM Program

Criteria for Success (Thresholds for Assessment Methods):

Enrollment is progressing to achieve levels of peak enrollment noted in the 2018 MSEM proposal, the basis for the MSEM Proposal approval by THEC.

Results and Analysis:

Results show a leveling of degrees conferred, but lower enrollment trends within the MSEM major over the last recorded four semesters (Fall 2022 through Spring 2024).

PLO 3 addresses some aspects of program sustainability from enrolment and graduation rates. Thus, these measures are cumulative, though for graduation numbers, as noted earlier, the data starts with the first graduation in 2022.

Figure 3 illustrates overall MSEM student enrollment per semester. These are students who matriculated in MSEM for any given semester. Additional information is provided in Figure 3 and Figure 4 comparing MSEM graduates to on-campus Engineering master's program graduates, in terms of thesis and non-thesis students.

One should realize that the individual courses of EMGT 6100 (Introduction to Engineering Management), EMGT 6210 (Project Management I), EMGT 6220 (Project Management II), and ENGR 6200 (Statistics) also serve some on-campus students as electives; as such, their class enrollments will include non- MSEM students as well. No hard data was collected on this trend of non-MSEM graduate students on campus enrolling in the MSEM-designed online classes. Thus, the MSEM matriculated student population enrolled each semester is less than the actual

EMGT/ENGR courses enrollments. This observation is notable for the early classes noted above. Thus, the EMGT courses later in the curriculum (EMGT 6230, EMGT 6300, and EMGT 6900) will show markedly lesser enrollment levels in comparison.

Figure 3. MSEM student enrollment by semester, since launch.

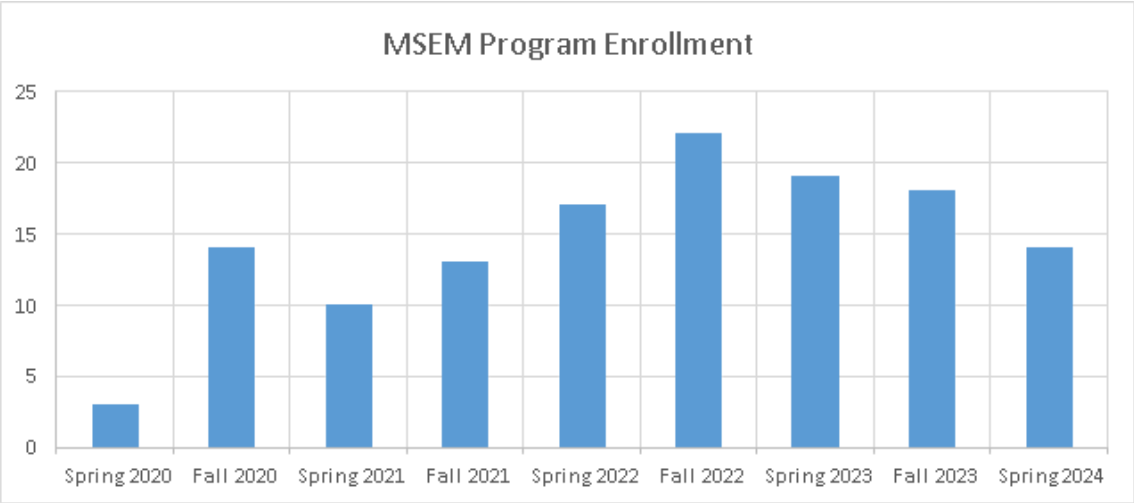
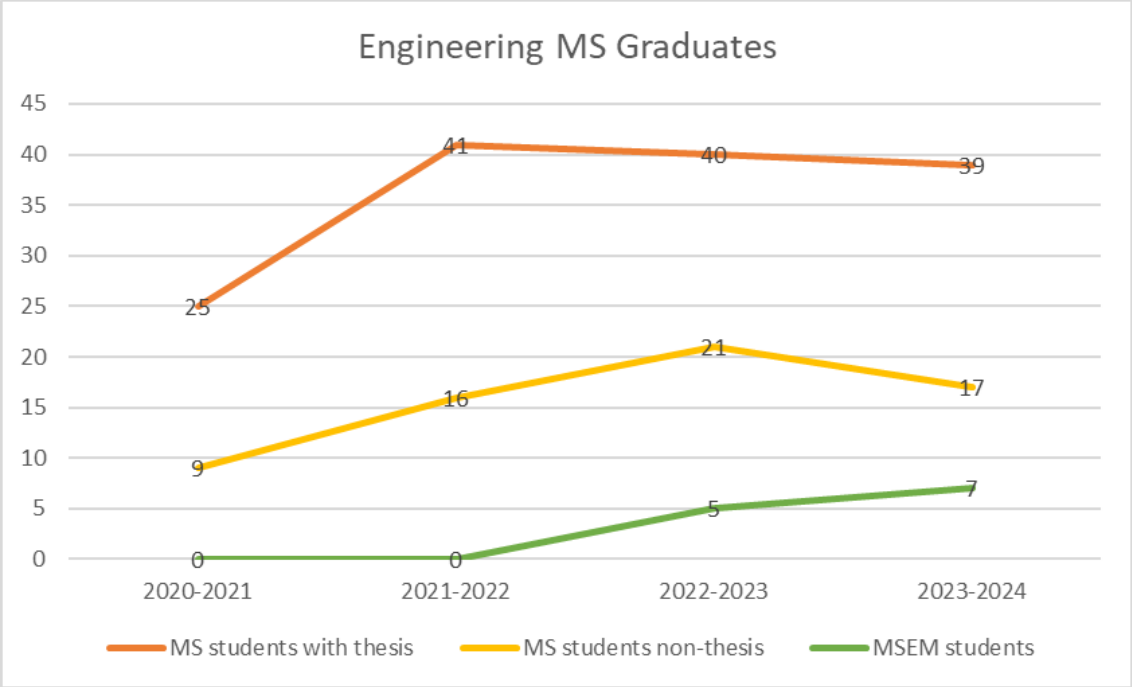


Figure 4. Engineering master's graduates in terms of thesis and non-thesis students (data to 05/2024); 4 additional students have graduated in 12/2024.



The MSEM headcount peaked at 22 students in Fall 2022; given that the first EMGT 6900 course was in Fall 2022, the matriculated students were retained without graduation up to the end of that semester. Afterwards, the enrollment drifted downward. Figure 2 shows the beginning of

graduations occurring, rising to 7 by 05/2024. One should note that, at the time of this report, an additional 4 students have graduated in 12/2025, with another 2 applying for graduation by 8/2025. Thus, the graduation rate is apparently flat, instead of increasing, over the past two academic years. If the average number of graduates were to stay at 7 per year, one would expect the average number of MSEM-matriculated students to stay at around 9-10 students per semester.

An external review of the assessment processes was conducted in February 2025. As part of the report, the reviewer suggested some actions to improve future MSEM enrollment. One suggested action that directly involves the MSEM program is increasing the flexibility of the MSEM curriculum offerings. That improvement in the short term would be possible by creating certificate options for MSEM.

Another suggested action that indirectly addresses MSEM enrollment is the creation of an on-campus MS in Industrial & Systems Engineering (MSISE) degree program, which enables international student recruiting and allows for on-campus course electives to off-campus students. The MSISE program approval is underway, and further actions in that program will be reported in the MSEM assessments when the two programs intersect.

Use of Results to Improve Outcomes:
Outcome is not ideal. Improvements recommended include certificate creation and integration with a new MS in Industrial & Systems Engineering on-campus degree program.

SLO 1: Communication

Define Outcome:

Students will demonstrate an ability to communicate graduate-level Engineering Management topics in a professional format.

Assessment Methods:

EMGT 6900 (Final Professional Project class) Professional Project Report. Data contains:

- Student creation of written project report.
- Student oral presentation (online or in person) before instructor and advisory committee members.

Criteria for Success (Thresholds for Assessment Methods):

Metrics for success

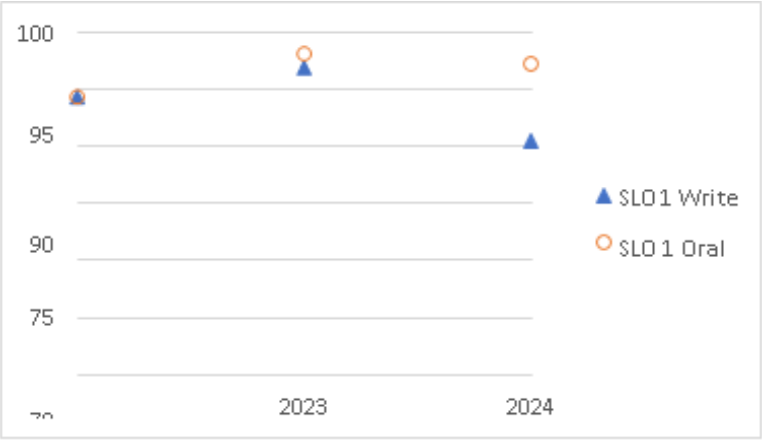
- Written Report: Exceeding 75%: Student proportion of above average grading outcomes for written project report
- Oral Report: Exceeding 75%: Student proportion of above average grading outcomes for oral presentation report

Results and Analysis:

All students by 2024 achieved or exceeded performance criteria.

SLO 1 Communication uses two measurements, both from EMGT 6900 (capstone project course): The written report and the oral presentation. This course is one of the last courses in the curriculum, and thus it was offered first in 2022. Students' outcomes are illustrated in Figure 5, for years 2022, 2023 and 2024 (one section offered each year).

Figure 5. EMGT 6900 Project Report average grades, written report and oral presentation.



The students are guided through their projects via a set of progressing deliverables (drafts) of the reports, with ongoing feedback. The fourth deliverable is the oral presentation. The final deliverable is the graded written report. The method of requiring a set of connected deliverables throughout the semester for the report results in a very clear set of outcomes for the communication SLO—mainly, by the end of the semester, students clearly understand what is required for the written document and they demonstrate good to excellent writing and oral presentation skills. The criterion for success is 75% of students doing above average (75% scoring); however, all students performed above 90% by 2024, in both communication areas. Thus, no adjustments to the data collection nor the teaching approach is needed for the next assessment cycle.

Use of Results to Improve Outcomes:
No changes in methods necessary for next review cycle.

SLO 2: Engineering Analysis and Evaluation

Define Outcome:

Students will be able to analyze and evaluate data from multiple sources as part of making informed engineering management decisions.

Assessment Methods:

SLO2 A1: EMGT 6220 Assignment 2 results. Data contains: Student creation and evaluation of Engineering Management proposal.

SLO2 A2: EMGT6900 (Final Professional Project class) Exit Survey. Report contains data:

- Student self-efficacy of engineering management analysis tools learned as part of MSEM educational experience.
- Student self-efficacy of business management tools learned as part of MSEM courses enrolled from the Business College.

SLO2 A3: EMGT 6300 Project assignment. Data contains: Student creation and evaluation of Decision Analysis report, based upon several selected Engineering Management publications.

Criteria for Success (Thresholds for Assessment Methods):

SLO2 A1: Metrics for success

a. Exceeding 75%: Student proportion of above average grading outcomes.

SLO2 A2: Metrics for success

a. Greater than 50% of students report good confidence (or higher) in at least 75% of the listed analytical tools.
b. Greater than 50% of students report good confidence (or higher) in at least 75% of the listed management tools.

SLO2 A3: Metrics for success

a. Exceeding 75%: Student proportion of above average grading outcomes.

Results and Analysis:

Students in all instruments achieved criteria for success. A minor terminology adjustment in a survey tool will be made in future years, but this change will not impact outcomes.
SLO 2 Engineering Analysis and Evaluation uses information from EMGT 6220 (Project Management 2), EMGT 6900, and EMGT 6300 (Decision Analysis).

a. In this example, a single year is examined, from the last report of 2023-2024. The EMGT 6220 Project management 2 assignment requires the student develop a proposal with finances and pricing estimates. The criteria for success in this year was to view at least 75% of the students earning at least a “B” (80/100) on the overall proposal. The figure shows that the scores (evaluated on a 10 point scale) were averaged to 8.2, with a proportion of 4 out of 5 being above 80%, or 83% of all students. The criterion for success is above 75%.
b. The EMGT 6900 exit survey was adapted to ask questions associated with a student’s confidence in their engineering management and business management skills. The specific questions are listed in Figure 6 and Figure 7.

Figure 6. Summer 2024 EMGT 6900 Exit Survey question regarding Engineering Management tools.

Figure 7. Summer 2024 EMGT 6900 Exit Survey question regarding Business Management tools.

Use of Results to Improve Outcomes:

The change in the survey wording is strictly a terminology alignment; it will neither improve nor degrade future outcomes.

SLO 3: Engineering Project Management Knowledge

Define Outcome:

Students will be able to demonstrate engineering project management knowledge.

Assessment Methods:

SLO A1: EMGT 6210 Assignment results (HW10 or HW11). Data contains:

1. Student written, short essay addressing project management use in a specific scenario.

SLO A2: EMGT6900 (Final Professional Project class) Exit Survey. Report contains data:

1. Student self-efficacy of engineering project management knowledge learned as part MSEM Engineering courses.
2. Student self-efficacy of project management applications to apply in the business environment, based upon MSEM program Business College courses.

Criteria for Success (Thresholds for Assessment Methods):

SLO A1: EMGT 6210 Assignment results (HW10 or HW11).

a. Exceeding 75%:Student proportion of above average grading outcomes.

SLO A1: EMGT6900 (Final Professional Project class) Exit Survey.

a. Greater than 50% of students report good confidence (or higher) in at least 75% of the listed analytical tools.
b. Greater than 50% of students report good confidence (or higher) in at least 75% of the listed management tools.

Results and Analysis:

Most students in all measurements achieved the criteria thresholds desired.

SLO 3, Project Management knowledge, is presented as an example from 2024 information. This SLO is new for 2024, added at the request of the IARE in 2023. Eight students were enrolled in EMGT 6210 and thus assigned the essay addressing project management. For that assignment, all students earned at least 95 out of 100 points, meaning the 75% earning an 'average score' (80%) was met.

A second measurement was from two questions in the EMGT 6900 exit survey; the results from Summer 2024 are shown in Figure 8 and Figure 9. The first question had a typo (reference Figure 8), where the phrase "solid foundation of knowledge" should have stated "solid

foundation of *engineering* knowledge." However, an email was sent to the students during the survey publication, noting that distinction.

Figure 8. Summer 2024 EMGT 6900 exit survey, engineering knowledge & project management

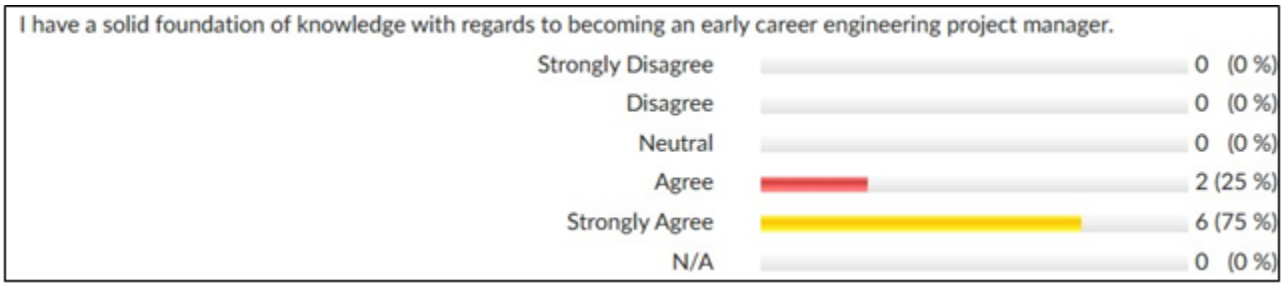
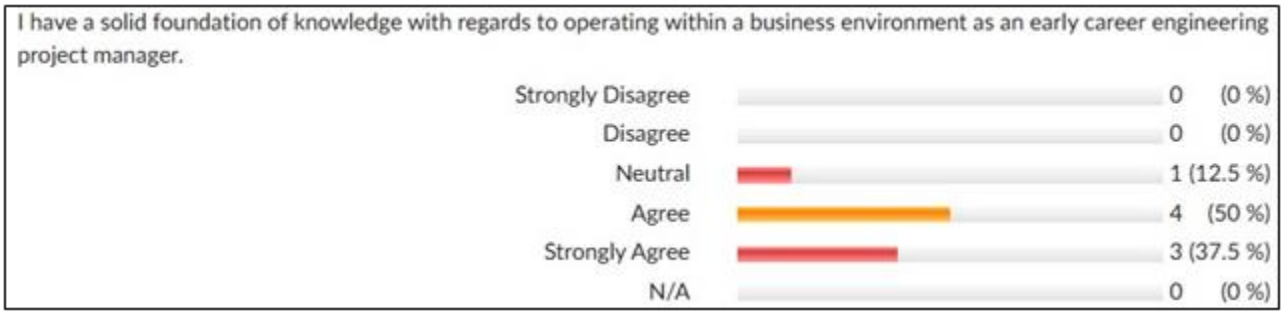


Figure 9. Summer 2024 EMGT 6900 exit survey, business knowledge for project management



For the EMGT 6210 assignment, all students earned at least 95% out of 100 points. For the engineering knowledge survey question, 8 out of 8 (100%) stated they had at least good (agree or strongly agree) confidence in the Engineering arena of project management. 7 out of 8 stated they had at least good (agree or strongly agree) confidence in the Engineering arena of project management. These results were incorrectly entered into the 2023-2024 IARE report, as 4 out of 4 and 3 out of 4, respectively

The SLO 3 EMGT 6210 assignment addressed the engineering project management topic. However, other factors should be considered when using data from this course. EMGT6210 is becoming a course that enrolls non-MSEM, on-campus graduate students, to take as an elective. Thus, within that sampled population of this Spring 2024 class, only 2 out of the 6 respondents enrolled were MSEM-matriculated students. The learning of the topic is assessed for a larger group of students, but the course is being accessed by more non-MSEM students. This situation may be a program-level consideration for the next assessment cycle since we now are assessing non-MSEM students in the classes as well.

The instructor has corrected the survey's typo for the engineering project management knowledge question.

This change in the assessment question is strictly a terminology alignment; it will neither improve nor degrade future outcomes.

Use of Results to Improve Outcomes:
Wording was changed in one survey question, an error. This change will not change any outcomes.

Summative Evaluation:
Students are enrolling and graduating after nearly five years since the MSEM program began. Students are recorded as learning knowledge appropriately and reflecting satisfaction in that learning process.

However, the assessment tools note that there is lower enrollment than the planners desired, possibly impacting sustainability of the program. Another lesser issue was a need for comparative data with this solely online engineering graduate program.

A point of reference: The MSEM program was reviewed by an external reviewer in February 2025 as part of a Tennessee Higher Education Council (THEC) scheduled event. The review yielded 'excellent' (highest) score in 23 out of 32 categories, with three as 'good' and 6 as N/A. Two of the three 'good' categories also independently identified lagging enrollment as a potential weakness, thus validating both assessment processes.

Assessment Plan Changes:
PO3 (Program Sustainability) addresses enrollment measurements. Though not changing the measurements, program changes are underway as a result of this outcome's measurements. These program improvements include:

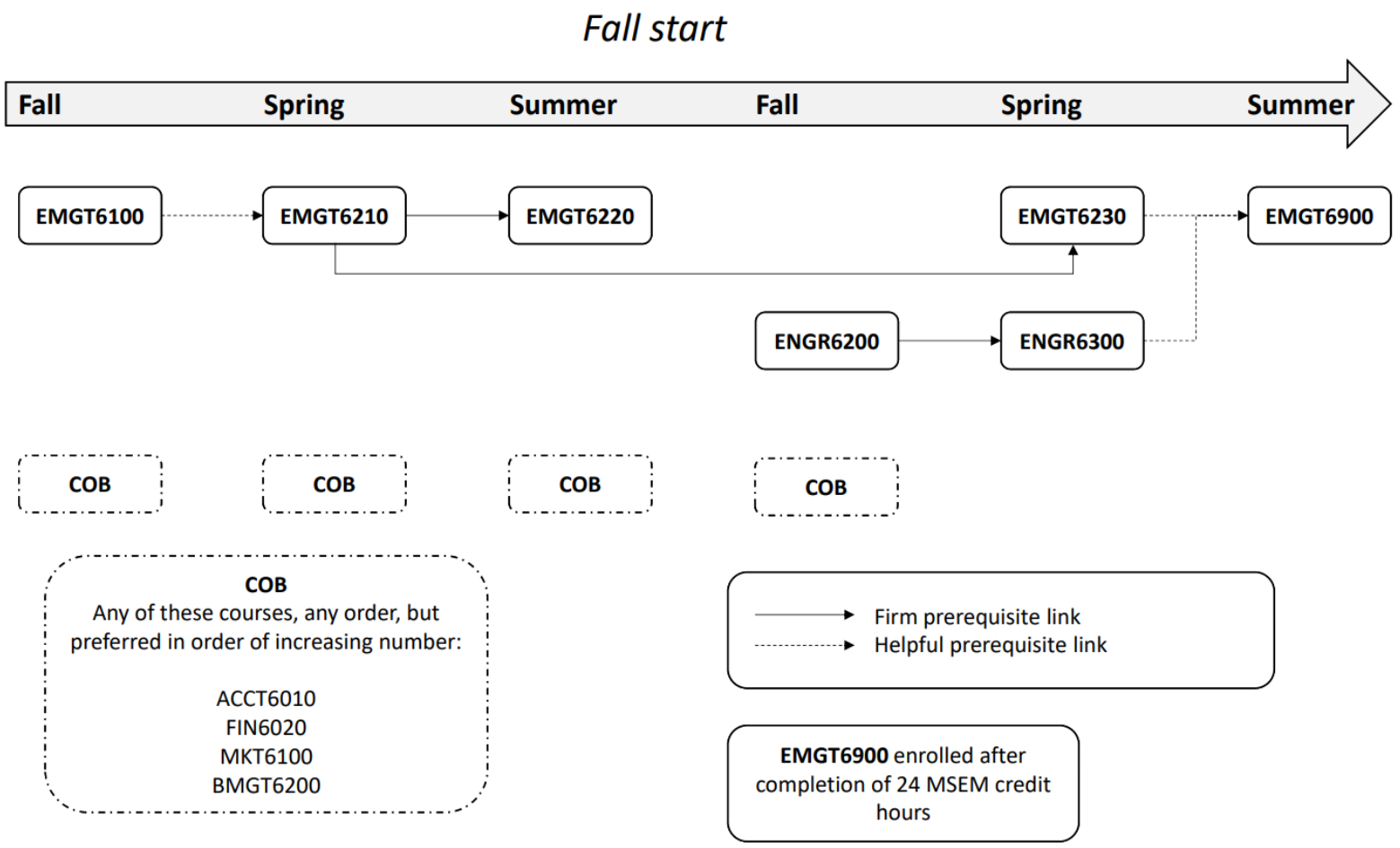
- A certificate option in Engineering Project Management, to enable program flexibility
- Planning for future integration with a recently approved, on-campus, MS in Industrial & Systems Engineering (MSISE).

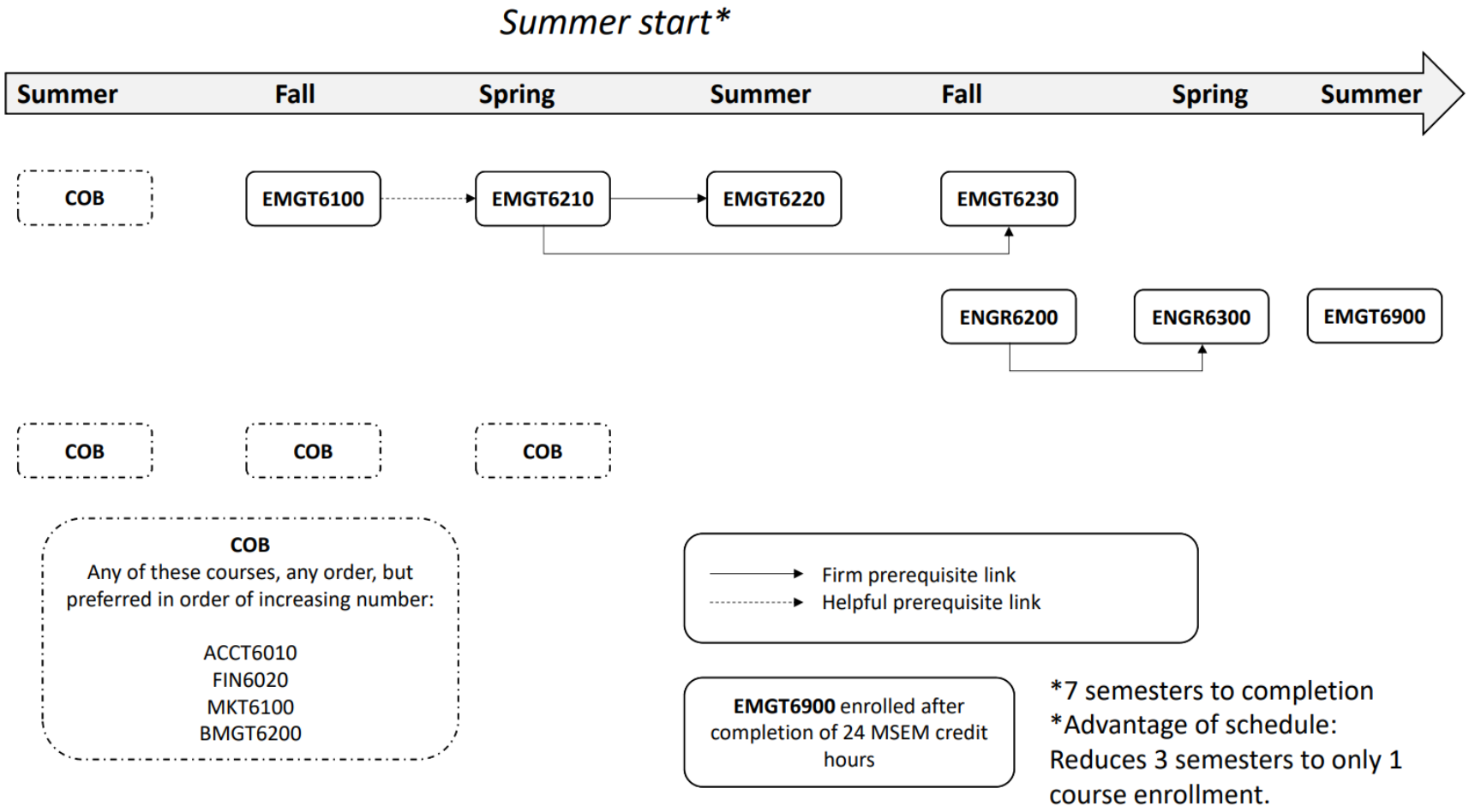
PO2 (Online Equivalence) addresses a comparison of MSEM online program enrollments and graduation rates with other Online Engineering graduate programs' enrollments and rates. However, there *are no other totally online Engineering graduate programs* with steady enrollments for that comparison.

- Thus, PO2 is modified to compare the online MSEM program characteristics with the on-campus Engineering graduate programs.

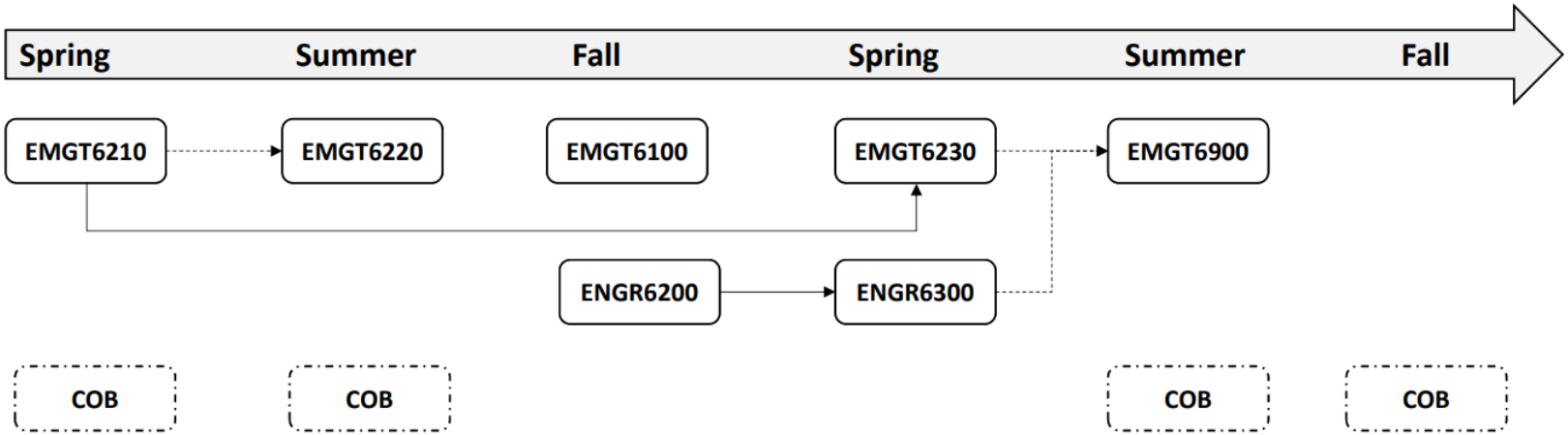
List of Appendices:
Appendix 1: Curriculum Flowchart
Appendix 2: Curriculum Map to Outcomes

Appendix 1: Curriculum Flowchart




Summer start*
Summer
Fall
Spring
Summer
Fall
Spring
Summer
COB
EMGT6100
EMGT6210
EMGT6220
EMGT6230
ENGR6200
ENGR6300
EMGT6900
COB
COB
COB
COB
Any of these courses, any order, but preferred in order of increasing number:
ACCT6010
FIN6020
MKT6100
BMGT6200
Firm prerequisite link
Helpful prerequisite link
EMGT6900 enrolled after completion of 24 MSEM credit hours
*7 semesters to completion
*Advantage of schedule:
Reduces 3 semesters to only 1 course enrollment.

Spring start



COB
Any of these courses, any order, but preferred in order of increasing number:

ACCT6010
FIN6020
MKT6100
BMGT6200

Firm prerequisite link
Helpful prerequisite link

EMGT6900 enrolled after completion of 24 MSEM credit hours

Appendix 2: Curriculum Map to Outcome

Table 1. Source Data mapped to Program Learning Outcomes

Source	PLO 1: Student Graduation	PLO 2: Program Online Equivalence	PLO 3: Program Sustainability
EMGT6900 Capstone Survey	X	X	
TTU Graduate Studies Office Admissions data	X		
TTU Institutional Research enrollment data		X	X
TTU Graduate Studies Office Degrees awarded data	X		

Table 2. Courses mapped to Student Learning Outcomes.

Course	Students will demonstrate an ability to communicate graduate-level Engineering Management topics in a professional format.	Students will be able to analyze and evaluate data from multiple sources as part of making informed engineering management decisions.	Students will be able to demonstrate engineering project management knowledge.
EMGT6100 Intro to Engineering Management	X	X	X
ACCT6010 Accounting Information for Management Decisions		X	X
EMGT6210 Project Management I	X	X	X
BMGT6200 Organizational Leadership	X		X
EMGT6230 Project Management II	X	X	X
FIN6020 Financial Management		X	
ENGR2600 Statistical Inference for Engineers	X	X	
MKT6100 Strategic Marketing	X	X	
EMGT6230 Project Management III		X	X
EMGT6300 Decision Analysis		X	X
EMGT6900 Capstone	X	X	X