Institutional Effectiveness
2024-2025

Program: Engineering Technology BSET
College and Department: College of Engineering, Manufacturing and Engineering Technology
Contact: Dr. Ismail Fidan
Mission:

To graduate innovative Applied Engineers who solve technological challenges to meet societal needs.

Attach Curriculum Map (Educational Programs Only):
Attached Files: See Appendices 1 and 2

SLO 1: FUNDAMENTALS: Apply knowledge, techniques, skills and modern tools of STEM

Define Outcome:
Student Learning Outcome 1: Apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly defined engineering problems appropriate to the discipline.

Assessment Methods:
Alumni Survey - Indirect Assessment Tool: The survey is conducted every three years to evaluate the professional growth of our graduates. The University Advancement conducts this survey, which is sent to program graduates from the past five years. The alumni survey employs a 5-point "Outstanding/Unacceptable" scale (1 to 5), which is later converted to a 0-4 *level-of-attainment* scale. To align with SLO 1, the survey asks the following question:

Based on your experiences while in our Engineering Technology program, please rate how effectively you feel you were prepared in the following areas.

> *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.*

Senior Exit Survey - Indirect Assessment Tool: An online survey is one part of the Graduating Senior Exit Interview process. It is handed by the College of Engineering. The Senior Exit Survey for the BSET program allows graduating seniors to provide feedback regarding the faculty, the department, the career services, and their perceived attainment of the ETAC of ABET Student Outcomes. The Graduating Senior Exit Survey uses a 1-5 "agree/disagree" scale, which is then converted to the 0-4 level-of-attainment scale. To align with SLO 1, the survey asks the following question:

Based on your experiences while in our Engineering Technology program, please rate how effectively you feel you were prepared in the following areas.

> *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.*

Course Term Project External Evaluation - Direct Assessment Tool: The departmental graduate students and/or adjuncts are used as external evaluators to assess some of the technical courses' term project presentations. An evaluation form was developed for this purpose. The

external evaluation of the term projects' assessment tool uses a "0-10" scale, which is then converted to the 0-4 level-of-attainment scale. To align with SLO 1, the survey asks the following question:

> *The student presents 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 through the term project presented today. YOUR ANSWER: 1-10 (1 is lowest, 10 is highest). Explain very briefly why you gave this grade.*

Course embedded Assessment - Direct Assessment Tool: Specific course-level assessments (HW, Test, Project, Report) are taken and evaluated to measure the success rate of the course students for a specific ABET Student Outcome in Outcomes 1-5. Then the final score of the course embedded assessment is converted to a 1-4 scale.

Senior Design Project – Direct Assessment Tool: Capstone projects, along with their mockups, posters, and presentations, are showcased to the METAB advisory board members and program faculty. The assessment tool employs a 1-5 level of attainment scale, which is then averaged and converted to a 0-4 scale. To align with SLO 1, the survey asks the following question to the METAB advisory board members and program faculty:

> *How well did the team use the foundational/applied knowledge and modern tools of STEM (Science, Technology, Engineering, and Math).*

Co-op Employer Survey - Direct Assessment Tool: Few program students participate in the co-op program during their time at Tennessee Tech. For co-op jobs sponsored by Tennessee Tech, employers are required to complete a formal evaluation of each student's performance at the end of each co-op semester. Additionally, employers of College of Engineering students are asked to respond to further assessment questions, some of which pertain to Student Outcomes. Co-op surveys provide valuable feedback directly from employers, offering insights into students' performance before graduation. The co-op employer survey uses a 5-point scale (1 to 5), which is then converted to a 0-4 level-of-attainment scale. To align with SLO 1, the survey asks the following question:

> *Applies knowledge, techniques, skills, and modern tools of math, science, engineering, and technology to solve broadly defined engineering problems.*

Criteria for Success (Thresholds for Assessment Methods):
Each individual assessment tool contributes to the overall level of attainment for the SLO (Alumni survey 10%, Senior Exit Survey 10%, Course Term Project External Evaluation 15%, Course-embedded Assessment 25%, Senior Design Project 20%, and Co-op Employer Survey 20%). There was no Co-op Employer Survey in Spring 2025. So, the departmental assessment committee slightly rescaled the regularly used SLO percentages to reflect this change for the period of 2024-2025.

The expected level of attainment of the SLO is considered using the same 4-point scale used for the individual assessment tools.

4 = Excellent

3 = Good (This is the threshold number)

2 = Satisfactory (Any attainment between 2 and 3 will be monitored continuously)

1 = Low

0 = Negligible

Referring to the above scale, a score of 3.0 or above is a desirable score for each Student Learning Outcome (1)-(5). A score between 2.0 and 3.0 is a cause for review by the MET faculty, with some possible actions/continued monitoring. A score lower than 2.0 would require major corrective actions to be taken by the MET Faculty.

Link to 'Tech Tomorrow' Strategic Plan:
1.A Experiential Learning,2.A Technology Infused Programs

Results and Analysis:
Overall level of attainment of SLO 1, based on the evaluation of the assessment data

FALL 2024

SLO 1	Assessment Data (Level of Attainment) 4 = Excellent; 3 = Good; 2 = Satisfactory; I = Low; 0 = Negligible	Level of Attainment	Weight (%)	Overall Level of Attainment
Fall 2024	Alumni Survey	3.27	10	

	Senior Exit Interview	3.47	10	3.45 (86.19%)
	COOP	3.2	20	
	Term Project	3.73	15	
	Course-embedded Assessment	3.60	25	
	Senior Design Project: MET4620	3.37	20	

Results and Analysis:

- The assessment of SLO 1 (FUNDAMENTALS – Apply knowledge, techniques, and skills of STEM) for Fall 2024 demonstrates that students achieve this outcome at a satisfactory level or higher across all evaluated components. Each assessment method yielded an attainment score above the 3.00 threshold, indicating consistent performance in the "Good" to "Excellent" range. The weighted average level of attainment for this outcome is 3.45, corresponding to 86.19%, which reflects strong proficiency among students in applying STEM fundamentals. The components contributing to this result include Alumni Survey (3.27), Senior Exit Interview (3.47), COOP (3.20), Term Project (3.73), Course-embedded Assessment (3.60), and the Senior Design Project (3.37).
- The findings of the assessment data show that curricular courses help the ET students gain the skill sets needed for SLO 1.
- Overall, the SLO 1 attainment scores are slightly lower for the Alumni and COOP participating students. Getting more feedback from them might be helpful.

SPRING 2025

SLO 1	Assessment Data (Level of Attainment) 4 = Excellent; 3 = Good; 2 = Satisfactory; I = Low; 0 = Negligible	Level of Attainment	Weight (%)	Overall Level of Attainment
Spring 2025	Alumni Survey	3.27	12.5	3.61 (90.19%)
	Senior Exit Interview	3.55	12.5	
	COOP	-	0	
	Term Project	3.69	20	
	Course-embedded Assessment	3.65	30	

	Senior Design Project: MET4620	3.67	25	

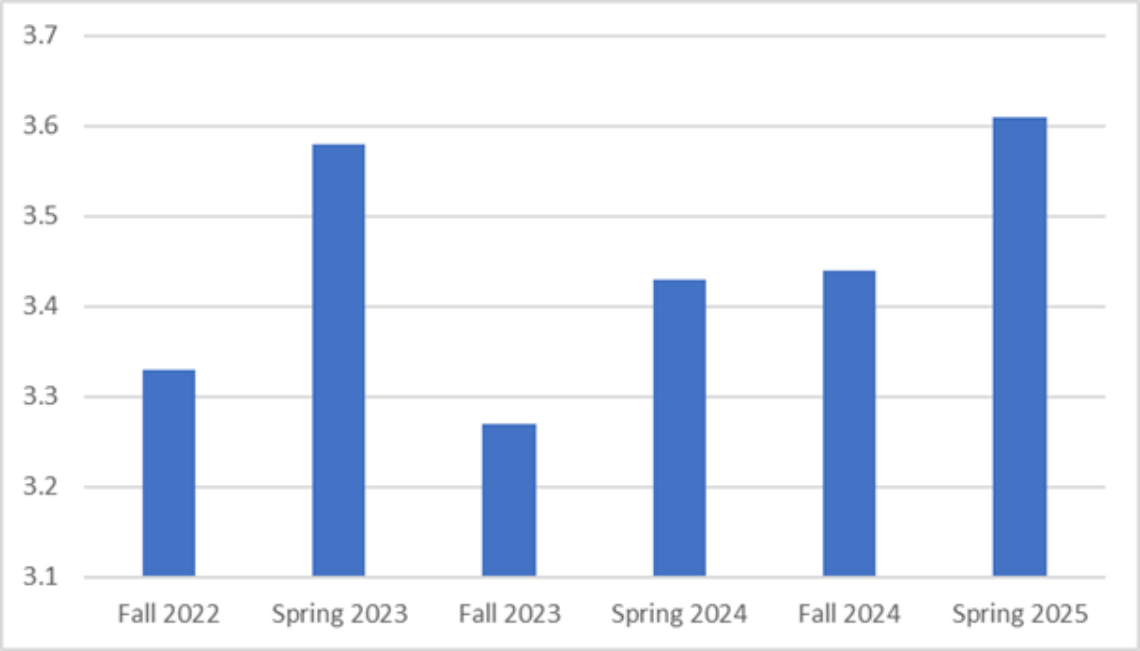
Results and Analysis:

- The attainment of SLO 1 in Spring 2025 is “3.61”, indicating that ET students show that they the assessment of SLO 1 (FUNDAMENTALS – Apply knowledge, techniques, and skills of STEM) for Spring 2025 shows continued strong performance by students in applying core STEM competencies. All assessment components used reported attainment levels above the 3.00 threshold, indicating performance within the "Good" to "Excellent" range. The weighted average level of attainment is 3.61, equivalent to 90.19%, reflecting improved achievement compared to the previous term. Data sources include the Alumni Survey (3.27), Senior Exit Interview (3.55), Term Project (3.69), Course-embedded Assessment (3.65), and the Senior Design Project (3.67). COOP data was not available for this cycle and carried no weight in the calculation.
- In Spring 2025, there was no COOP report submission. The assessment committee will monitor the COOP report submission plan. And the assessment committee will encourage more COOP opportunities for ET students.
- The department will hire two more faculty members. Thus, more course-embedded assessment data will be available.

Use of Results to Improve Outcomes:

- Strengthen engagement with alumni and COOP participants to better understand areas of improvement by enhancing survey design and increasing follow-up efforts to obtain more qualitative and quantitative feedback.
- Encourage increased COOP participation and timely report submissions by integrating COOP preparation and reporting guidelines more thoroughly into junior/senior-level courses and advising sessions.
- Expand course-embedded assessments by leveraging the expertise of the two newly hired faculty members to implement consistent, high-quality performance metrics across additional courses.
- Integrate additional real-world STEM application scenarios into the term and senior design projects to further reinforce the practical application of STEM knowledge and techniques.
- Provide targeted support or enrichment modules for students identified as needing reinforcement in fundamental STEM skills based on course-embedded or project-level assessment data.

Graphical Representation of the Attainment Levels of SLO 1



SLO 2: DESIGN: Design systems, components, or processes

Define Outcome:

Student Learning Outcome 2: Design systems, components, or processes meeting specified needs for broadly defined engineering problems appropriate to the discipline.

Assessment Methods:

Alumni Survey - Indirect Assessment Tool: The survey is conducted every three years to evaluate the professional growth of our graduates. The University Advancement conducts this survey, which is sent to program graduates from the past five years. The alumni survey employs a 5-point "Outstanding/Unacceptable" scale (1 to 5), which is later converted to a 0-4 *level-of-attainment* scale. To align with SLO 2, the survey asks the following question:

Based on your experiences while in our Engineering Technology program, please rate how effectively you feel you were prepared in the following areas.

> *Ability to design systems, components, or processes meeting specified needs for broadly defined engineering problems appropriate to the discipline.*

Senior Exit Survey - Indirect Assessment Tool: An online survey is one part of the Graduating Senior Exit Interview process. It is handed by the College of Engineering. The Senior Exit Survey for the BSET program allows graduating seniors to provide feedback regarding the faculty, the department, the career services, and their perceived attainment of the ETAC of ABET Student Outcomes. The Graduating Senior Exit Survey uses a 1-5 "agree/disagree" scale, which is then converted to the 0-4 level-of-attainment scale. To align with SLO 2, the survey asks the following question:

Based on your experiences while in our Engineering Technology program, please rate how effectively you feel you were prepared in the following areas.

> *Ability to design systems, components, or processes meeting specified needs for broadly defined engineering problems appropriate to the discipline.*

Course Term Project External Evaluation - Direct Assessment Tool: The departmental graduate students and/or adjuncts are used as external evaluators to assess some of the technical courses' term project presentations. An evaluation form was developed for this purpose. The external evaluation of the term projects' assessment tool uses a "0-10" scale, which is then converted to the 0-4 level-of-attainment scale. To align with SLO 2, the survey asks the following question:

The student presents an ability to design systems, components, or processes meeting specified needs for broadly defined engineering problems appropriate to the discipline throughout the term project presented today. YOUR ANSWER: 1-10 (1 is lowest, 10 is highest). Explain very briefly why you gave this grade.

Course-embedded Assessment - Direct Assessment Tool: Specific course-level assessments (HW, Test, Project, Report) are taken and evaluated to measure the success rate of the course students for a specific ABET Student Outcome in Outcomes 1-5. Then the final score of the course embedded assessment is converted to a 1-4 scale.

Senior Design Project – Direct Assessment Tool: Capstone projects, along with their mockups, posters, and presentations, are showcased to the METAB advisory board members and program faculty. The assessment tool employs a 1-5 level of attainment scale, which is then averaged and converted to a 0-4 scale. To align with SLO 2, the survey asks the following question to the METAB advisory board members and program faculty:

Did the design meet the defined specifications of the project's problem?

Co-op Employer Survey - Direct Assessment Tool: Few program students participate in the co-op program during their time at Tennessee Tech. For co-op jobs sponsored by Tennessee Tech, employers are required to complete a formal evaluation of each student's performance at the end of each co-op semester. Additionally, employers of College of Engineering students are asked to respond to further assessment questions, some of which pertain to Student Outcomes. Co-op surveys provide valuable feedback directly from employers, offering insights into students' performance before graduation. The co-op employer survey uses a 5-point scale (1 to 5), which is then converted to a 0-4 level-of-attainment scale. To align with SLO 2, the survey asks the following question:

Displays an ability to design systems, components, or processes meeting specified needs for broadly defined engineering problems.

Criteria for Success (Thresholds for Assessment Methods):
Each individual assessment tool contributes to the overall level of attainment for the SLO (Alumni survey 10%, Senior Exit Survey 10%, Course Term Project External Evaluation 15%, Course-embedded Assessment 25%, Senior Design Project 20%, and Co-op Employer Survey 20%). There was no Co-op Employer Survey in Spring 2025. So, the departmental assessment committee slightly rescaled the regularly used SLO percentages to reflect this change for the period of 2024-2025.

The expected level of attainment of the SLO is considered using the same 4-point scale used for the individual assessment tools.

4 = Excellent

3 = Good (This is the threshold number)

2 = Satisfactory (Any attainment between 2 and 3 will be monitored continuously)

1 = Low

0 = Negligible

Referring to the above scale, a score of 3.0 or above is a desirable score for each Student Learning Outcome (1)-(5). A score between 2.0 and 3.0 is a cause for review by the MET faculty with some possible actions/continued monitoring. A score lower than 2.0 would require major corrective actions to be taken by the MET Faculty.

Link to 'Tech Tomorrow' Strategic Plan:

1.A Experiential Learning,2.A Technology Infused Programs

Results and Analysis:

Overall level of attainment of SLO 2, based on the evaluation of the assessment data

FALL 2024

SLO 2	Assessment Data (Level of Attainment) 4 = Excellent; 3 = Good; 2 = Satisfactory; I = Low; 0 = Negligible	Level of Attainment	Weight (%)	Overall Level of Attainment
Fall 2024	Alumni Survey	3.18	10	3.49 (87.29%)
	Senior Exit Interview	3.43	10	
	COOP	3.2	20	
	Term Project	3.8	15	
	Course-embedded Assessment	3.68	25	
	Senior Design Project: MET4620	3.50	20	

Results and Analysis:

- For Fall 2024, assessment results for SLO 2 (DESIGN – Design systems, components, or processes) indicate that students are meeting this outcome at a high level. All assessment methods yielded scores above the 3.00 threshold, reflecting performance in the "Good" to "Excellent" range. The weighted average level of attainment is 3.49, which translates to 87.29%, demonstrating strong student competency in engineering design practices. Contributions to this result came from the Alumni Survey (3.18), Senior Exit Interview (3.43), COOP (3.20), Term Project (3.80), Course-embedded Assessment (3.68), and the Senior Design Project (3.50). These findings confirm that students are effectively acquiring and applying design skills aligned with program expectations.
- The CAD for Technology course has been offered by an industrial expert who has a PhD and industrial design skills.
- iMakerSpace offers a design team to support the students' design needs.
- The Plant Layout and Materials Handling course provides more facility design and improvement practices.

SPRING 2025

SLO 2	Assessment Data (Level of Attainment) 4 = Excellent; 3 = Good; 2 = Satisfactory; I = Low; 0 = Negligible	Level of Attainment	Weight (%)	Overall Level of Attainment
Spring 2025	Alumni Survey	3.18	12.5	3.55 (88.85%)
	Senior Exit Interview	3.55	12.5	
	COOP	-	0	
	Term Project	3.56	20	
	Course-embedded Assessment	3.57	30	
	Senior Design Project: MET4620	3.77	25	

Results and Analysis:

- The Spring 2025 assessment of SLO 2 (DESIGN – Design systems, components, or processes) shows that students continue to perform at a high level in this critical competency area. All available assessment measures reported attainment levels above the 3.00 benchmark, indicating performance within the "Good" to "Excellent" range. The overall weighted level of attainment is 3.55,

corresponding to 88.85%, reflecting a slight improvement over the previous term. Assessment sources include the Alumni Survey (3.18), Senior Exit Interview (3.55), Term Project (3.56), Course-embedded Assessment (3.57), and the Senior Design Project (3.77). COOP data was not available during this cycle and was therefore not factored into the calculation. These results confirm that students are demonstrating solid proficiency in engineering design, consistent with program expectations and industry standards.

- In MET4250, students can understand the mechatronics system and its components and relate them to real applications. Students designed and developed the mechatronics-based systems via the term projects.
- iMakerSpace offers a design team to support the students' design needs.
- The Plant Layout and Materials Handling course provides more facility design and improvement practices.

Use of Results to Improve Outcomes:

Continue and expand collaboration with industrial experts like the CAD for Technology instructor, by inviting additional guest lecturers or adjunct faculty with real-world design experience to enhance practical exposure.

Leverage iMakerSpace resources more strategically by integrating its design support team into senior design reviews, early project planning stages, and interdisciplinary design activities to broaden student access and impact.

Enhance the MET4250 mechatronics curriculum by adding more structured design milestones and peer-review checkpoints throughout the term project timeline, ensuring deeper engagement in system integration and design thinking.

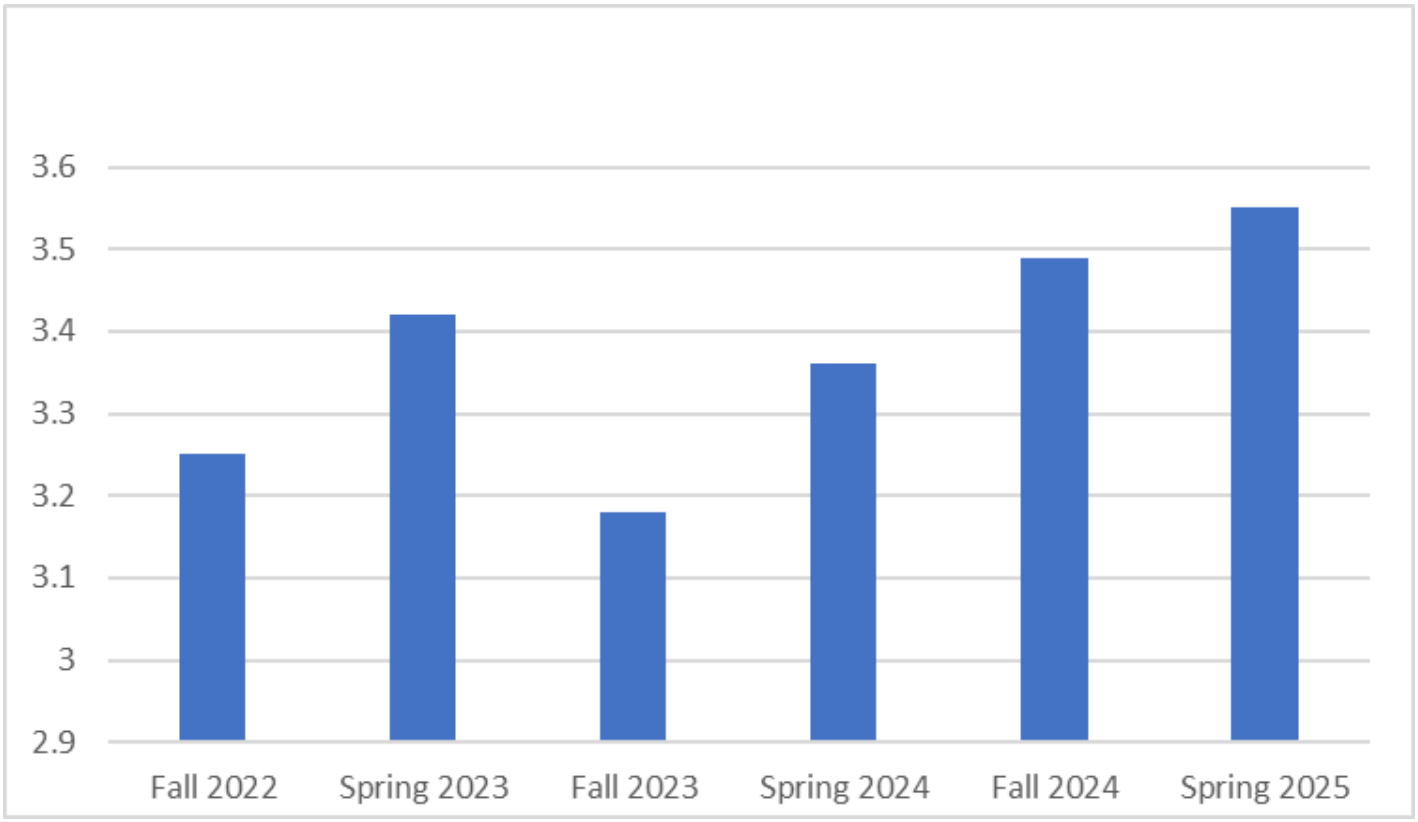
Incorporate more open-ended and industry-relevant projects in courses such as Plant Layout and Materials Handling, encouraging students to tackle facility optimization and layout problems using real or simulated data.

Address COOP assessment gaps by implementing a structured follow-up protocol to ensure timely data collection and better integration of workplace design experiences into student portfolios.

Promote interdisciplinary design teams across course projects and capstones to mirror real-world engineering design environments and build teamwork alongside technical design skills.

Periodically review course-embedded assessment instruments to ensure that rubrics and metrics accurately capture the breadth and depth of students' design capabilities, especially in evolving technology domains.

Graphical Representation of the Attainment Levels of SLO 2



SLO 3: COMMUNICATION: Apply written, oral, and graphical communication

Define Outcome:

Student Learning Outcome 3: Apply written, oral, and graphical communication in broadly defined technical and non-technical environments; and an ability to identify and use appropriate technical literature.

Assessment Methods:

Alumni Survey - Indirect Assessment Tool: The survey is conducted every three years to evaluate the professional growth of our graduates. The University Advancement conducts this survey, which is sent to program graduates from the past five years. The alumni survey employs a 5-point "Outstanding/Unacceptable" scale (1 to 5), which is later converted to a 0-4 *level-of-attainment* scale. To align with SLO 3, the survey asks the following question:

Based on your experiences while in our Engineering Technology program, please rate how effectively you feel you were prepared in the following areas.

> *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.*

Senior Exit Survey - Indirect Assessment Tool: An online survey is one part of the Graduating Senior Exit Interview process. It is handed by the College of Engineering. The Senior Exit Survey for the BSET program allows graduating seniors to provide feedback regarding the faculty, the department, the career services, and their perceived attainment of the ETAC of ABET Student Outcomes. The Graduating Senior Exit Survey uses a 1-5 "agree/disagree" scale, which is then converted to the 0-4 level-of-attainment scale. To align with SLO 3, the survey asks the following question:

Based on your experiences while in our Engineering Technology program, please rate how effectively you feel you were prepared in the following areas.

> *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.*

Course Term Project External Evaluation - Direct Assessment Tool: The departmental graduate students and/or adjuncts are used as external evaluators to assess some of the technical courses' term project presentations. An evaluation form was developed for this purpose. The

external evaluation of the term projects' assessment tool uses a "0-10" scale, which is then converted to the 0-4 level-of-attainment scale. To align with SLO 3, the survey asks the following question:

> *The student presents 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 throughout the term project presented today. YOUR ANSWER: 1-10 (1 is lowest, 10 is highest). Explain very briefly why you gave this grade.*

Course-embedded Assessment - Direct Assessment Tool: Specific course-level assessments (HW, Test, Project, Report) are taken and evaluated to measure the success rate of the course students for a specific ABET Student Outcome in Outcomes 1-5. Then the final score of the course embedded assessment is converted to a 1-4 scale.

Senior Design Project – Direct Assessment Tool: Capstone projects, along with their mockups, posters, and presentations, are showcased to the METAB advisory board members and program faculty. The assessment tool employs a 1-5 level of attainment scale, which is then averaged and converted to a 0-4 scale. To align with SLO 3, the survey asks the following question to the METAB advisory board members and program faculty:

> *Did the team effectively present the project with technical literature?*

Co-op Employer Survey - Direct Assessment Tool: Few program students participate in the co-op program during their time at Tennessee Tech. For co-op jobs sponsored by Tennessee Tech, employers are required to complete a formal evaluation of each student's performance at the end of each co-op semester. Additionally, employers of College of Engineering students are asked to respond to further assessment questions, some of which pertain to Student Outcomes. Co-op surveys provide valuable feedback directly from employers, offering insights into students' performance before graduation. The co-op employer survey uses a 5-point scale (1 to 5), which is then converted to a 0-4 level-of-attainment scale. To align with SLO 3, the survey asks the following question:

> *Produces effective written communications to targeted audiences.*
>
> *Produces effective oral presentations to targeted audiences.*
>
> *Demonstrates effective graphical communication for targeted audiences.*

Criteria for Success (Thresholds for Assessment Methods):

Each individual assessment tool contributes to the overall level of attainment for the SLO (Alumni survey 10%, Senior Exit Survey 10%, Course Term Project External Evaluation 15%, Course-embedded Assessment 25%, Senior Design Project 20%, and Co-op Employer Survey 20%). There was no Co-op Employer Survey in Spring 2025. So, the departmental assessment committee slightly rescaled the regularly used SLO percentages to reflect this change for the period of 2024-2025.

The expected level of attainment of the SLO is considered using the same 4-point scale used for the individual assessment tools.

4 = Excellent

3 = Good (This is the threshold number)

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1 = Low

0 = Negligible

Referring to the above scale, a score of 3.0 or above is a desirable score for each Student Learning Outcome (1)-(5). A score between 2.0 and 3.0 is a cause for review by the MET faculty with some possible actions/continued monitoring. A score lower than 2.0 would require major corrective actions to be taken by the MET Faculty.

Link to 'Tech Tomorrow' Strategic Plan:

1.A Experiential Learning,2.A Technology Infused Programs

Results and Analysis:

Overall level of attainment of SLO 3, based on the evaluation of the assessment data

FALL 2024

SLO 3	Assessment Data (Level of Attainment) 4 = Excellent; 3 = Good; 2 = Satisfactory; I = Low; 0 = Negligible	Level of Attainment	Weight (%)	Overall Level of Attainment
Fall 2024	Alumni Survey	3.25	10	

	Senior Exit Interview	3.31	10	3.38 (84.60%)
	COOP	3.2	20	
	Term Project	3.73	15	
	Course-embedded Assessment	3.5	25	
	Senior Design Project: MET4620	3.27	20	

Results and Analysis:

- Assessment results for SLO 3 (COMMUNICATION – Apply written, oral, and graphical communication) in Fall 2024 indicate that students are effectively demonstrating communication skills at or above the expected threshold. All measured components yielded scores greater than 3.00, placing performance in the "Good" to "Excellent" range. The overall weighted level of attainment is 3.38, equivalent to 84.60%, confirming that students are meeting program expectations in communication. Contributing data sources include the Alumni Survey (3.25), Senior Exit Interview (3.31), COOP (3.20), Term Project (3.73), Course-embedded Assessment (3.50), and Senior Design Project (3.27). These findings reflect a well-rounded ability among students to communicate effectively in various professional and technical formats.
- Support received from the Student Success Center and Career Development Center is a great plus for the students to improve their communication skills.
- Several courses from the Freshman to Senior level help students engage and practice communication skills.
- The faculty members provide support to students' writing and speech development.

SPRING 2025

SLO 3	Assessment Data (Level of Attainment) 4 = Excellent; 3 = Good; 2 = Satisfactory; I = Low; 0 = Negligible	Level of Attainment	Weight (%)	Overall Level of Attainment
Spring 2025	Alumni Survey	3.25	12.5	3.55 (88.69%)
	Senior Exit Interview	3.39	12.5	
	COOP	-	0	
	Term Project	3.63	20	

	Course-embedded Assessment	3.69	30	
	Senior Design Project: MET4620	3.54	25	

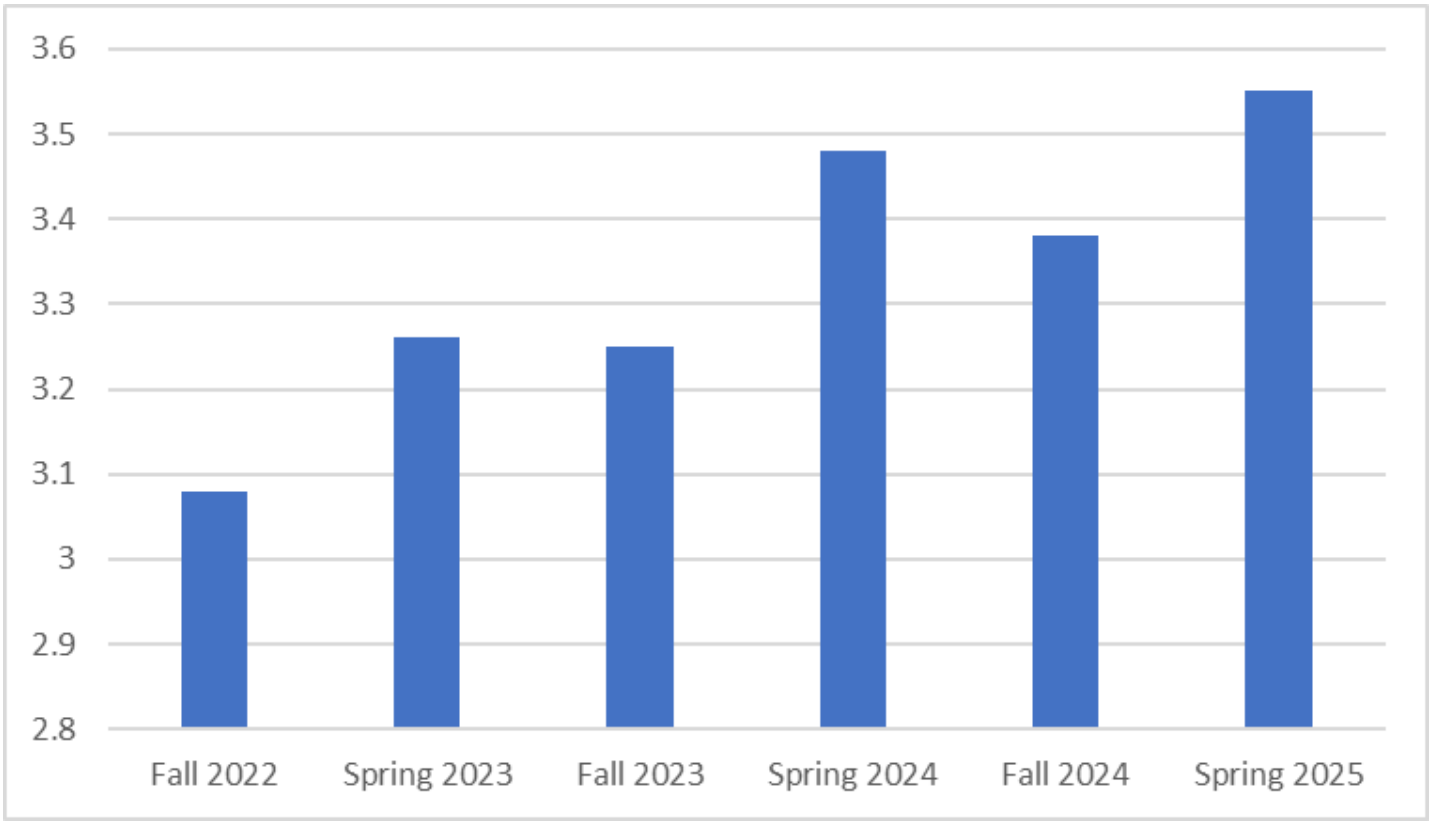
Results and Analysis:

- The Spring 2025 assessment for SLO 3 (COMMUNICATION – Apply written, oral, and graphical communication) shows that students continue to perform at a high level in this essential skill area. All assessment components achieved scores above the 3.00 threshold, reflecting performance within the "Good" to "Excellent" range. The weighted average level of attainment is 3.55, corresponding to 88.69%, indicating marked improvement from the previous semester. Assessment sources include the Alumni Survey (3.25), Senior Exit Interview (3.39), Term Project (3.63), Course-embedded Assessment (3.69), and Senior Design Project (3.54). COOP data was unavailable for this term and carried no weight. Overall, these results affirm that students are effectively demonstrating strong communication skills in written, oral, and graphical formats across multiple assessment points.
- The use of term projects and their professional oral and written presentation is encouraged in some ET courses.
- Participation of ET students in the Research and Inquiry Day is encouraged.

Use of Results to Improve Outcomes:

- Strengthen integration of communication skills across the curriculum by requiring structured oral and written components in more technical courses, particularly in junior-level courses where students transition into advanced engineering tasks.
- Enhance collaboration with the Student Success Center and Career Development Center by formalizing workshops or modules focused on technical writing, resume building, and professional presentations tailored for ET students.
- Expand student participation in public forums, such as Research and Inquiry Day, senior showcase events, and professional society meetings, to offer broader platforms for students to present their work.
- Promote peer-to-peer review processes in writing and presentation assignments to foster collaborative learning and critical feedback skills, especially in upper-level courses.
- Introduce a capstone communication workshop near graduation to help students synthesize and polish their technical communication skills across written reports, oral presentations, and graphical documentation.

Graphical Representation of the Attainment Levels of SLO 3



SLO 4: ANALYSIS: Conduct standard tests, measurements, and experiments and analyze the results

Define Outcome:
Student Learning Outcome 4: Conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes.

Assessment Methods:
Alumni Survey - Indirect Assessment Tool: The survey is conducted every three years to evaluate the professional growth of our graduates. The University Advancement conducts this survey, which is sent to program graduates from the past five years The alumni survey employs a 5-point "Outstanding/Unacceptable" scale (1 to 5), which is later converted to a 0-4 *level-of-attainment* scale. To align with SLO 4, the survey asks the following question:

Based on your experiences while in our Engineering Technology program, please rate how effectively you feel you were prepared in the following areas.

> *Ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes.*

Senior Exit Survey - Indirect Assessment Tool: An online survey is one part of the Graduating Senior Exit Interview process. It is handed by the College of Engineering. The Senior Exit Survey for the BSET program allows graduating seniors to provide feedback regarding the faculty, the department, the career services, and their perceived attainment of the ETAC of ABET Student Outcomes. The Graduating Senior Exit Survey uses a 1-5 "agree/disagree" scale, which is then converted to the 0-4 level-of-attainment scale. To align with SLO 4, the survey asks the following question:

Based on your experiences while in our Engineering Technology program, please rate how effectively you feel you were prepared in the following areas.

> *Ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes.*

Course-embedded Assessment - Direct Assessment Tool: Specific course level assessments (HW, Test, Project, Report) are taken and evaluated to measure the success rate of the course students for a specific ABET Student Outcome in Outcomes 1-5. Then the final score of the course embedded assessment is converted to 1-4 scale.

Senior Design Project – Direct Assessment Tool: Capstone projects, along with their mockups, posters, and presentations, are showcased to the METAB advisory board members and program faculty. The assessment tool employs a 1-5 level of attainment scale, which is then averaged and converted to a 0-4 scale. To align with SLO 4, the survey asks the following question to the METAB advisory board members and program faculty:

> *Did the team conduct standard experiments and analysis to improve processes?*

Co-op Employer Survey - Direct Assessment Tool: Few program students participate in the co-op program during their time at Tennessee Tech. For co-op jobs sponsored by Tennessee Tech, employers are required to complete a formal evaluation of each student's performance at the end of each co-op semester. Additionally, employers of College of Engineering students are asked to respond to further assessment questions, some of which pertain to Student Outcomes. Co-op surveys provide valuable feedback directly from employers, offering insights into students' performance before graduation. The co-op employer survey uses a 5-point scale (1 to 5), which is then converted to a 0-4 level-of-attainment scale. To align with SLO 4, the survey asks the following question:

> *Displays the ability to conduct standard tests, measurements, and experiments and to analyze the results to improve processes.*

Criteria for Success (Thresholds for Assessment Methods):
Each individual assessment tool contributes to the overall level of attainment for the SLO (Alumni survey 10%, Senior Exit Survey 10%, Course Term Project External Evaluation 15%, Course-embedded Assessment 25%, Senior Design Project 20%, and Co-op Employer Survey 20%). There was no Co-op Employer Survey in Spring 2025. So, the departmental assessment committee slightly rescaled the regularly used SLO percentages to reflect this change for the period of 2024-2025.

The expected level of attainment of the SLO is considered using the same 4-point scale used for the individual assessment tools.

4 = Excellent

3 = Good (This is the threshold number)

2 = Satisfactory (Any attainment between 2 and 3 will be monitored continuously)

1 = Low

0 = Negligible

Referring to the above scale, a score of 3.0 or above is a desirable score for each Student Learning Outcome (1)-(5). A score between 2.0 and 3.0 is a cause for review by the MET faculty, with some possible actions/continued monitoring. A score lower than 2.0 would require major corrective actions to be taken by the MET Faculty.

Link to 'Tech Tomorrow' Strategic Plan:

1.A Experiential Learning,2.A Technology Infused Programs

Results and Analysis:

Overall level of attainment of SLO 4, based on the evaluation of the assessment data.

FALL 2024

SLO 4	Assessment Data (Level of Attainment) 4 = Excellent; 3 = Good; 2 = Satisfactory; I = Low; 0 = Negligible	Level of Attainment	Weight (%)	Overall Level of Attainment
Fall 2024	Alumni Survey	3.09	13	3.16 (78.91%)
	Senior Exit Interview	3.39	13	
	COOP Report	3.2	23	
	Evaluation of Term Projects	-	0	
	Course-embedded Assessment	2.9	28	
	Senior Design Project: MET4620	3.33	23	

Results and Analysis:

- Assessment of SLO 4 (ANALYSIS – Conduct standard tests, measurements, and experiments) in Fall 2024 indicates that students are attaining this outcome at a satisfactory level. All evaluated components scored at or above the 2.90 level, with an overall weighted level of attainment of 3.16, equivalent to 78.91%. While this score remains above the minimum threshold of 3.00, it is the lowest among the five outcomes assessed this term, suggesting an area for potential instructional improvement. Data sources contributing to this outcome include the Alumni Survey (3.09), Senior Exit Interview (3.39), COOP Report (3.20), Course-embedded Assessment (2.90), and the Senior Design Project (3.33). The Term Project evaluation data provided by the graduate students and adjuncts

was not available and thus not included in the calculation. Despite this, the overall results indicate that students are generally competent in conducting standard testing and measurement activities, though continued attention to strengthening experimental analysis skills may be warranted.

- The number of course-embedded studies is low. The assessment committee suggested having more courses to assess and evaluate SLO 4.
- Electricity-based testing is good for now. For the future, the Principles of Metal Casting is a good course for our students to do some sand testing and analysis studies.

SPRING 2025

SLO 4	Assessment Data (Level of Attainment) 4 = Excellent; 3 = Good; 2 = Satisfactory; I = Low; 0 = Negligible	Level of Attainment	Weight (%)	Overall Level of Attainment
Spring 2025	Alumni Survey	3.09	15	3.51 (86.10%)
	Senior Exit Interview	3.42	15	
	COOP Report	-	0	
	Evaluation of Term Projects	-	0	
	Course-embedded Assessment	3.53	40	
	Senior Design Project: MET4620	3.52	30	

Results and Analysis:

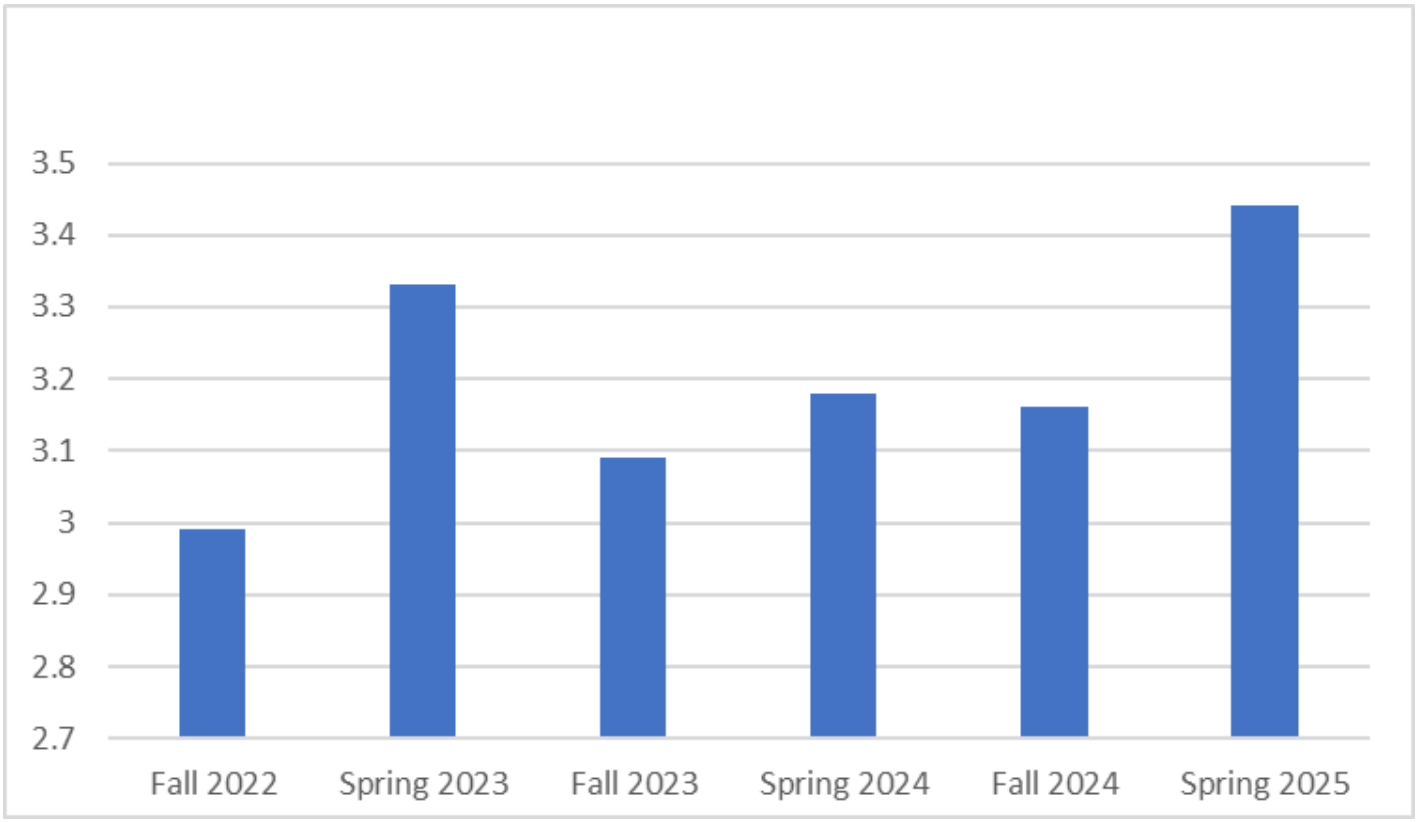
- The Spring 2025 assessment of SLO 4 (ANALYSIS – Conduct standard tests, measurements, and experiments) shows a notable improvement compared to the previous semester. All evaluated components exceeded the 3.00 threshold, with an overall weighted level of attainment of 3.51, corresponding to 86.10%, indicating strong student performance in experimental and analytical skills. Contributing assessments included the Alumni Survey (3.09), Senior Exit Interview (3.42), Course-embedded Assessment (3.53), and the Senior Design Project (3.52). Data from COOP reports and Term Projects were unavailable and assigned no weight. These results suggest that students are consistently demonstrating competence in conducting standard tests and experiments, with strengthened performance in key instructional areas since Fall 2024.

- In Spring 2025, there is no COOP report submission. The assessment committee will monitor the COOP report submission plan. And the committee will encourage more COOP opportunities for students.
- The department will hire two more faculty members. Thus, more course-embedded assessment data will be available.

Use of Results to Improve Outcomes:

- Increase the number of course-embedded assessments related to experimental analysis by incorporating SLO 4 evaluation in additional laboratory-based courses (e.g., MET3700 and MET4420). Make orientation meetings and prepare new faculty members to produce more data from their courses for measuring the students' attainment for Student Outcome 4.
- Leverage the Principles of Metal Casting course to include structured sand testing and metallurgical analysis as a new embedded assessment component aligned with Outcome 4.
- Encourage faculty collaboration and calibration for Outcome 4 assessment through regular workshops and rubric standardization to ensure uniform grading and evaluation practices across multiple sections.
- Invest in lab equipment modernization to support hands-on testing in areas beyond electricity-based analysis—such as materials testing, thermofluids, and manufacturing process validation.
- Use the viscosimeter testing device, which is newly donated by the AFS senior chapter.
- Integrate software-based data acquisition and analysis tools (e.g., LabVIEW, MATLAB, Excel analytics) more deeply into lab-based courses to reflect industry-relevant data handling and reporting practices.
- Again, monitor, mentor, and support the onboarding of new faculty to ensure their courses contribute to SLO 4 assessments through well-structured experiments and reporting assignments.

Graphical Representation of the Attainment Levels of SLO 4



SLO 5: TEAMWORK: Function as a technical team member and leader

Define Outcome:
Student Learning Outcome 5: Function effectively as a member as well as a leader on technical teams.

Assessment Methods:
Alumni Survey - Indirect Assessment Tool: The survey is conducted every three years to evaluate the professional growth of our graduates. The University Advancement conducts this survey, which is sent to program graduates from the past five years. The alumni survey employs a 5-point "Outstanding/Unacceptable" scale (1 to 5), which is later converted to a 0-4 *level-of-attainment* scale. To align with SLO 5, the survey asks the following question:

Based on your experiences while in our Engineering Technology program, please rate how effectively you feel you were prepared in the following areas.

Ability to function effectively as a member as well as a leader on technical teams.

Senior Exit Survey - Indirect Assessment Tool: An online survey is one part of the Graduating Senior Exit Interview process. It is handed by the College of Engineering. The Senior Exit Survey for the BSET program allows graduating seniors to provide feedback regarding the faculty, the department, the career services, and their perceived attainment of the ETAC of ABET Student Outcomes. The Graduating Senior Exit Survey uses a 1-5 "agree/disagree" scale, which is then converted to the 0-4 level-of-attainment scale. To align with SLO 5, the survey asks the following question:

Based on your experiences while in our Engineering Technology program, please rate how effectively you feel you were prepared in the following areas.

Ability to function effectively as a member as well as a leader on technical teams.

Course Term Project External Evaluation - Direct Assessment Tool: The departmental graduate students and/or adjuncts are used as external evaluators to assess some of the technical courses' term project presentations. An evaluation form was developed for this purpose. The external evaluation of the term projects' assessment tool uses a "0-10" scale, which is then converted to the 0-4 level-of-attainment scale. To align with SLO 5, the survey asks the following question:

The student presents an ability to function effectively as a member as well as a leader on technical teams throughout the term project presented today. YOUR ANSWER: 1-10 (1 is lowest, 10 is highest). Explain very briefly why you gave this grade

Course-embedded Assessment - Direct Assessment Tool: Specific course-level assessments (HW, Test, Project, Report) are taken and evaluated to measure the success rate of the course students for a specific ABET Student Outcome in Outcomes 1-5. Then the final score of the course embedded assessment is converted to a 1-4 scale.

Senior Design Project – Direct Assessment Tool: Capstone projects, along with their mockups, posters, and presentations, are showcased to the METAB advisory board members and program faculty. The assessment tool employs a 1-5 level of attainment scale, which is then averaged and converted to a 0-4 scale. To align with SLO 5, the survey asks the following question to the METAB advisory board members and program faculty:

Did the team leader and members function well together?

Co-op Employer Survey - Direct Assessment Tool: Few program students participate in the co-op program during their time at Tennessee Tech. For co-op jobs sponsored by Tennessee Tech, employers are required to complete a formal evaluation of each student's performance at the end of each co-op semester. Additionally, employers of College of Engineering students are asked to respond to further assessment questions, some of which pertain to Student Outcomes. Co-op surveys provide valuable feedback directly from employers, offering insights into students' performance before graduation. The co-op employer survey uses a 5-point scale (1 to 5), which is then converted to a 0-4 level-of-attainment scale. To align with SLO 5, the survey asks the following question:

Functions effectively as a member as well as a leader on technical teams.

Criteria for Success (Thresholds for Assessment Methods):
Each individual assessment tool contributes to the overall level of attainment for the SLO (Alumni survey 10%, Senior Exit Survey 10%, Course Term Project External Evaluation 15%, Course-embedded Assessment 25%, Senior Design Project 20%, and Co-op Employer Survey 20%). There was no Co-op Employer Survey in Spring 2025. So, the departmental assessment committee slightly rescaled the regularly used SLO percentages to reflect this change for the period of 2024-2025.

The expected level of attainment of the SLO is considered using the same 4-point scale used for the individual assessment tools.

4 = Excellent

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Referring to the above scale, a score of 3.0 or above is a desirable score for each Student Learning Outcome (1)-(5). A score between 2.0 and 3.0 is a cause for review by the MET faculty, with some possible actions/continued monitoring. A score lower than 2.0 would require major corrective actions to be taken by the MET Faculty.

Link to 'Tech Tomorrow' Strategic Plan:
1.A Experiential Learning,2.A Technology Infused Programs

Results and Analysis:
Overall level of attainment of SLO 5, based on the evaluation of the assessment data

FALL 2024

SLO 5	Assessment Data (Level of Attainment) 4 = Excellent; 3 = Good; 2 = Satisfactory; I = Low; 0 = Negligible	Level of Attainment	Weight (%)	Overall Level of Attainment
Fall 2024	Alumni Survey	3.50	10	3.62 (90.50%)
	Senior Exit Interview	3.73	10	
	COOP	3.2	20	
	Term Project	3.87	15	
	Course-embedded Assessment	3.8	25	
	Senior Design Project: MET4620	3.63	20	

Results and Analysis:

- Assessment results for SLO 5 (TEAMWORK – Function as a technical team member and leader) in Fall 2024 demonstrate that students are achieving this outcome at

a high level. All components scored well above the 3.00 threshold, indicating consistent performance in the "Good" to "Excellent" range. The overall weighted level of attainment is 3.62, corresponding to 90.50%, which reflects strong student capability in both contributing to and leading technical teams. Assessment sources included the Alumni Survey (3.50), Senior Exit Interview (3.73), COOP (3.20), Term Project (3.87), Course-embedded Assessment (3.80), and the Senior Design Project (3.63). These results affirm that students are developing the collaborative and leadership skills necessary for success in professional engineering environments.

- Several departmental courses provide in-depth support to enhance students' teamwork skills.
- Departmental extracurricular activities of SME, AFS, and NASA Rover also support the attainment of teamwork skills of the ET students.

SPRING 2025

SLO 5	Assessment Data (Level of Attainment) 4 = Excellent; 3 = Good; 2 = Satisfactory; I = Low; 0 = Negligible	Level of Attainment	Weight (%)	Overall Level of Attainment
Spring 2025	Alumni Survey	3.50	12.5	3.70 (92.54%)
	Senior Exit Interview	3.68	12.5	
	COOP	-	0	
	Term Project	3.66	20	
	Course-embedded Assessment	3.83	30	
	Senior Design Project: MET4620	3.70	25	

Results and Analysis:

- The Spring 2025 assessment for SLO 5 (TEAMWORK – Function as a technical team member and leader) indicates that students continue to perform at an excellent level in collaborative and leadership roles. All assessed components exceeded the 3.00 benchmark, contributing to an overall weighted level of attainment of 3.70, which corresponds to 92.54%. This result reflects a slight improvement over the previous semester and affirms the program's effectiveness in developing students' teamwork and leadership competencies. Assessment data were drawn from the Alumni Survey (3.50), Senior Exit Interview (3.68), Term Project (3.66), Course-embedded Assessment (3.83), and Senior Design Project

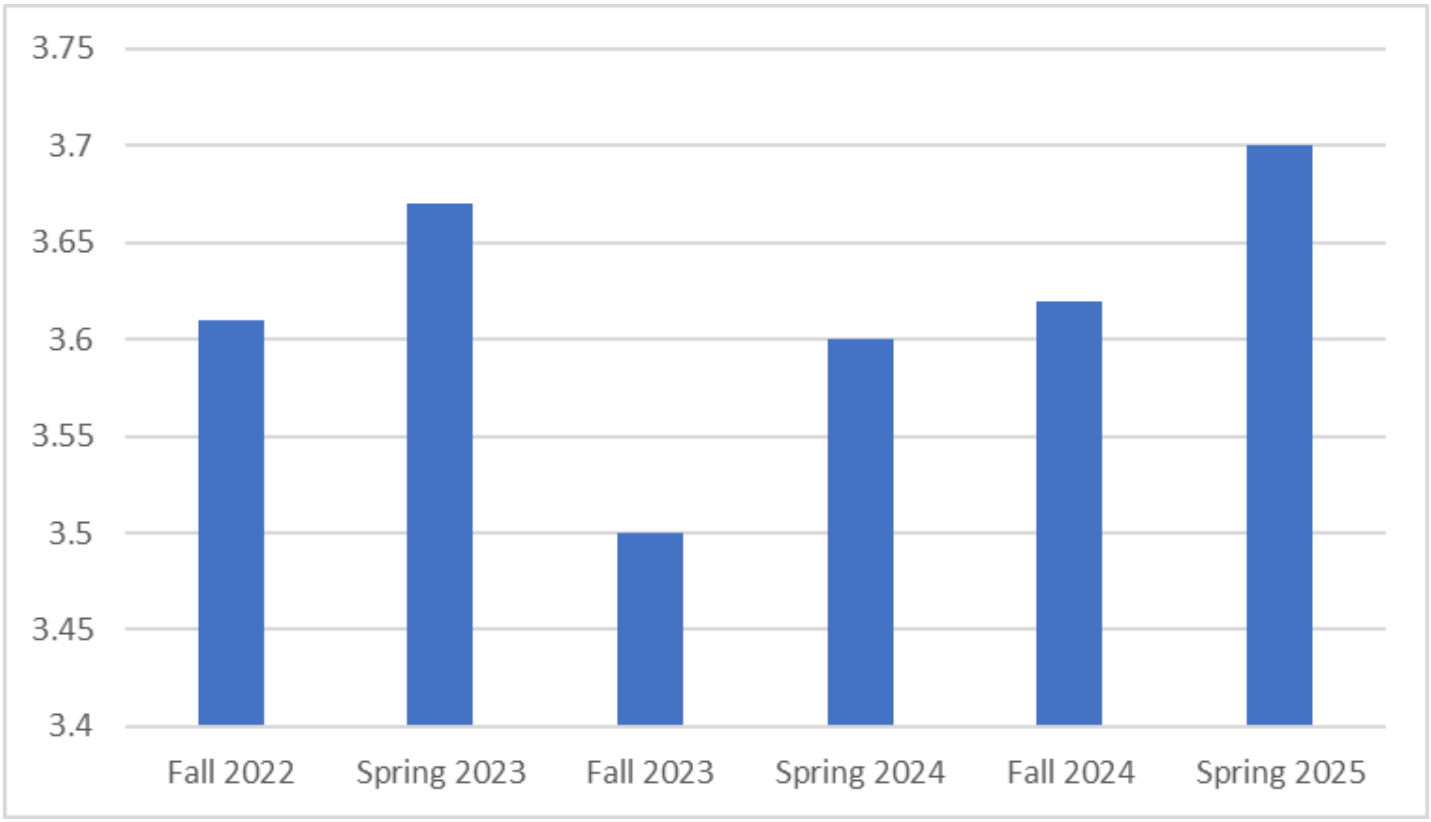
(3.70). COOP data were not available and were not factored into the outcome. Overall, these findings confirm that students are well-prepared to function effectively as both members and leaders of technical teams in professional settings.

- Departmental capstone projects have been doing a great job in enhancing the teamwork skills of the ET students for the 21st century.
- Dr. Baswell continuously revises and restructures his operations for capstone teams.
- The AFS student chapter had two teams to compete in CASTEXPO2024. However, they were not able to win any awards.

Use of Results to Improve Outcomes:

- Continue supporting and expanding participation in extracurricular technical teams (e.g., SME, AFS, NASA Rover) by providing faculty mentorship and structured timelines for deliverables and reflection.
- Encourage team competition participation (such as AFS CASTEXPO) while offering coaching sessions and feedback workshops to help teams better prepare for award-winning performance.
- Leverage capstone project structures to simulate real-world team dynamics and improve leadership training by encouraging the adoption of project management tools (e.g., Gantt charts, Agile sprints, MS Project, Trello).
- Formalize team performance assessment rubrics across all group-based courses to include dimensions of communication, collaboration, conflict resolution, and leadership initiative.
- Use reflective assignments and self-assessments post-projects to help students evaluate their contributions and identify areas for team-based skill improvement.
- Offer teamwork and leadership workshops in collaboration with the Student Success Center or Career Development Center, tailored specifically for engineering technology students.
- Document and disseminate best practices from instructors like Dr. Baswell to guide other faculty in effectively structuring and managing team-based learning environments.

Graphical Representation of the Attainment Levels of SLO 5



Summative Evaluation:

The Engineering Technology program has been continuously monitoring the attainment of all SLOs. All five SLOs met or exceeded the program's benchmark threshold of 3.00 on a 4.00 scale across both semesters, indicating strong overall student performance.

- SLO 1 (Fundamentals – Apply STEM knowledge):

  Consistently high attainment across terms (3.45 → 3.61).

  Students showed increasing proficiency in applying STEM techniques and concepts.

- SLO 2 (Design – Design systems/components):

  Maintained strong performance with slight improvement (3.49 → 3.55).

  Design-based courses, iMakerSpace support, and real-world term projects contributed positively.

- SLO 3 (Communication – Written, oral, graphical):

  Demonstrated improvement from 3.38 to 3.55.

  Strengthened by term projects, Senior Design, and institutional support (e.g., Career Center).

- SLO 4 (Analysis – Conduct standard tests and experiments):

  Notable progress from 3.16 in Fall to 3.51 in Spring.

  More use of course-embedded assessments and improved instructional practices could contribute to gains.

- SLO 5 (Teamwork – Function in and lead teams):

  Consistently high performance with strong outcomes in both semesters (3.62 → 3.70).

  Reinforced by capstone projects, student organizations (SME, AFS, NASA), and leadership opportunities.

- COOP report data was missing in Spring 2025 for SLOs 1, 2, 3, 4, and 5, slightly reducing the diversity of assessment inputs but not impacting attainment scores significantly due to strong other measures.
- Senior Exit Interviews and Course-embedded Assessments were critical and reliable tools across all SLOs, often reflecting the highest levels of student attainment.
- More course-embedded assessment tools are needed to measure the attainment of SLO 4.

Assessment Plan Changes:

- Expand the use of course-embedded assessments to include more courses across all SLOs, especially for SLO 4 (Analysis), where coverage was previously limited.
- Establish a more structured COOP report collection plan by:
    - Assigning a faculty/staff coordinator.
    - Creating deadlines and reminders for student submissions.
    - Exploring integration with academic credit or reflection assignments.
- Develop workshops and training modules (in collaboration with Student Success and Career Development Centers) focused on:
    - Communication and writing skills (SLO 3).
    - Leadership and teamwork dynamics (SLO 5).
- Incorporate experimental/lab-based enhancements into new or existing courses (e.g., Principles of Metal Casting) to strengthen SLO 4's real-world testing and measurement component.
- Continue faculty development by sharing internal best practices and onboarding new faculty with expectations for assessment contributions.

List of Appendices:

Appendix 1: Curriculum Map

Appendix 2: Graphical Representation of the Attainment Levels of All Student Learning Outcomes in 2024-2025

Appendix 1: Curriculum Map

Course	Title	Pre-reqs	Co-reqs	FALL	SPR	SUM	SO1	SO2	SO3	SO4	SO5
MET 1115	Intro to MET & Engr Ethics			X	X						
MET 2000	Occupational Safety				X						
MET 2065	Metal Manufacturing Technology	ENGR 1110, MET 1115, MATH 1710 & 1720 or MATH 1730 or MATH 1910 or MATH 1920		X	X						
MET 2400	Statics/Strengths of Materials	MATH 1710 & 1720 or MATH 1730 or MATH 1910, PHYS 2010 or PHYS 2110		X	X						
MET 3003	Principals of Metal Casting	ENGR 1110, MET 1115, MET 3100 or ME 3010	MET 3100 or ME 3010	X	X						
MET 3060	Comp Num Cont Mchng Prct	ENGR 1120, MET 2065		X	X		cbf	cb	cbf		cbf
MET 3100	Applied Physical Metallurgy	MET 1115, CHEM 1010 or CHEM 1110		X	X						
MET 3150	Maintenance Technology	Junior Standing		X	X		cf		cf		cf
MET 3200	App Electricity & Electronics	MATH 1845 or MATH 1910, PHYS 2020 or PHYS 2120	PHYS 2020 or PHYS 21	X	X	X	c	c		cf	
MET 3270	Industrial Electronics & PLCs	MET 3200		X	X		c	c		c	c
MET 3303	CAD for Technology	ENGR 1110		X	X						
MET 3403	Applied Machine Elements	MET 2400, MET 3303		X	X	X	cf	c	cf	c	f
MET 3703	Manufacturing Cost Estimating	MET 2065		X							
MET 3713	Methods Dsgn/Work Measurement	MET 2000, MET 2065		X							
MET 4000	Advanced Foundry Technology	MET 3003		X							
MET 4220	Industrial Automation/Robotics	MET 3270		X	X		cf	cf	c		
MET 4250	Applied Mechatronics	MET 3270		X	X		c	cf	c		f
MET 4310	Plant Layout/Mtrl Handling	MET 3303, MET3713		X	X	X		cbf	cbf		cbf
MET 4550	Mntnce, Rplcmnt, Rlblty Engr	Senior standing in engineering, engineering technology, or business			X						
MET 4600	Product Design & Development	Senior standing in engineering, engineering technology, or business		X							
MET 4620	Senior Projects	MET 3403		X	X		cl	cl	cl	cl	cl
MET 4650	Lean Six Sigma Mfg	Senior standing in engineering, engineering technology, or business		X	X						
MET 4990	Special Problems	Senior standing in engineering, engineering technology, or business		X							
MET 4120	Process and Control Apps, Z	MET 3270									
MET 3620	Intro to Industrial IoT Syst. Z	ENGR 1120, MET 3200									
MET 4320	Mixed Reality in Manufacturing, Z	MET 3620									
MET 4420	Introduction to Additive Manufacturing, Z	MET 3620									
MET 4520	Autonomous Robots in Manufacturing, Z	MET 4320									
MET 4720	Senior Projects/Smart Manufacturing, Z	MET 3403, MET 3260									

Legend:
Courses address the ABET Student Outcomes, c
Term Project External Evaluation, b
Course-embedded Assessment, f
METAB Evaluation, l
Course NOT OFFERED YET, Z

Updated on May 20, 2025

Appendix 2: Graphical Representation of the Attainment Levels of All Student Learning Outcomes in 2024-2025

Graphical Representation of The Attainment Levels of All Student Learning Outcomes

(2024-2025)