Academic Cycle 2018-2019

Engineering Technology (BS, IET)

College of Business and Technology

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Northwestern Mission. Northwestern State University is a responsive, student-oriented institution that is committed to the creation, dissemination, and acquisition of knowledge through teaching, research, and service. The University maintains as its highest priority excellence in teaching in graduate and undergraduate programs. Northwestern State University prepares its students to become productive members of society and promotes economic development and improvements in the quality of life of the citizens in its region.

College of Business and Technology Mission. The College of Business and Technology is dedicated to providing a high quality – market responsive business and technology education, preparing our diverse student population for successful careers and enriched lives in the public, private and nonprofit sectors, and enhancing our students' academic experiences through our research and scholarly activities. (Adopted September 28, 2015, 04/13/2018)

Engineering Technology Department Mission: The Engineering Technology Department is dedicated to delivering high-quality education in the areas of engineering technology, electronics engineering technology, and industrial engineering technology, as well as pre-engineering preparation. The department prepares students for successful careers and enriched lives in the public, private and nonprofit sectors, and promotes economic development and enrichment of the communities we serve.

Industrial Engineering Technology Mission Statement: The mission of BS in Industrial Engineering Technology is to produce four-year graduates with the breadth and depth of knowledge in industrial engineering technology to become lifelong productive members of the regional workforce and the local society.

Purpose: The Bachelor of Science in Industrial Engineering Technology program will prepare students to 1) Analyze, test, build, operate and maintain industrial systems (equipment, warehouse operations, safety management, plant operations, etc.), and 2) Manage manufacturing facilities, systems, and operations to include installation, motion and time, safety and efficiency. It prepares students for entry positions in government and the private sector in which the ability to implement changes, upgrade operations, set- up equipment, analyze problems, and modify if necessary is increasingly critical. It will also prepare interested students for the pursuit of advanced degrees in Engineering and Technology at other institutions.

Methodology: The assessment process for the BS in Industrial Engineering Technology program is as follows:

(1) Data from assessment tools (both direct – indirect, quantitative and qualitative) are collected and returned to the department head and ET ABET committee

(2) The department head and ET ABET committee analyze the data to determine whether students have met measurable outcomes

(3) Results from the assessment are discussed with the program faculty
(4) The department head, in consultation with the Engineering Technology Advisory Board, will propose changes to measurable outcomes, assessment tools for the next assessment period and, where needed, curricula and program changes.

Student Learning Outcomes (SLOs):

Student learning outcome data was collected, analyzed, and reported for the Industrial Engineering Technology degree program. Measures used to collect data include reports, case studies, projects, exams, presentations, and written exercises. Assessment data for the academic year 2017-2018 show that targets were met or exceeded. Most of the students' performance indices for all SLOs were found to be satisfactory.

From these results, there were several key actions recommended and decisions made to enhance the student experience and student learning outcomes with the focus on assuring students meet and exceed target expectations.

SLO 1. Ability to apply the industrial engineering technology knowledge, skills, and tools to real-world problem solving (ETAC of ABET Outcome a).

Course Map: Tied to course syllabus objectives.

IET 2020: METALS MACHINING I
EET 4950 or IET 4960: PROJECT DESIGN II

Measure 1.1. (Direct – Knowledge)

Every spring semester, students' grades on the IET 2020 final exam are used to assess the attainment of SLO 1. The acceptable target is 80% of students scoring a C or better on the final examination.

Finding: The target was met.

Analysis: In both AY 17-18 and AY 18-19, the target was met. 32 out 37 (86%) students scored a C or better on the final exam in AY 18-19. In AY 17-18, 31 out 36 (86%) students scored a C or better on the final exam. The AY 18-19 result stayed at the same level as in AY 17-18.

Based on the success of AY 17-18 assessment results, the G-code programming is now a part of the curriculum. One dedicated lab exercise using CNC router is also now a part of the curriculum. Most of the students answered this question correctly except for a couple of students doing double major (also in music) had to travel a lot of missing classes. Further, one student in the Baseball program could have done better in the final had he not had to travel for his baseball games.

Action - Decision or Recommendation: Based on the AY 18-19 assessment results, in AY 19-20 the following changes will be made to drive improvement:

a) Introduce more G-code programming examples
b) Provide more practice problems to the students in AY 19-20, and
c) Restrict class size up to 25 students.

Overall, the target was met with a performance index of 86.5% for the second year in a row.

Measure 1.2. (Indirect – Knowledge/Ability/Skill)

Every semester, upon presentation of capstone projects, ET faculty evaluate student performance with respect to the ability to apply industrial engineering technology knowledge, skills, and tools to real-world problem-solving. The acceptable target is 80% of IET students score at least C on capstone projects.

Finding: The target was met.

Analysis: In both AY 17-18 and AY 18-19, the target was met. In AY 18-19, the overall results were that 26 out of 29 (90%) students scored a C or better on capstone projects with respect to the ability to apply industrial engineering technology knowledge, skills, and tools to real-world problem-solving.

In AY 17-18, the overall results were that 28 out of 28 (100%) students scored a C or better on the capstone projects in IET 4960. As compared to AY 17-18, student performance decreased to 90% in AY 18-19. Therefore, year-to-year results trended lower.

Based on the results of the AY 17-18 assessment, the AY 18-19 results were anticipated because the industry projects (as a part of QEP) were more comprehensive and technically challenging. In addition, the grading format was converted to a rubric based allowing faculty to more rigorously grade specific IET based knowledge and skill sets.

On a semester-to semester-basis in AY 18-19, in IET 4960, students scored a C on the capstone projects in IET 4960 as follows:

- Fall 2018, 6/6 (100%)

- Spring 2019, 20/23 (87%).

On a semester-to semester-basis in AY 17-18, in IET 4960, students scored a C or better on the capstone projects in IET 4960 as follows:

- Fall 2017, 11/11 (100%)
- Spring 2018, 19/19 (100%).

Action - Decision or Recommendation: Based on the AY 18-19 assessment results, mock presentations proved to be very beneficial, hence, in AY 19-20 it will be required for students to participate in at least two mock presentations before the actual presentation; one with the course instructor and additional one with different faculty member.

SLO 2. Ability to perform tests, measurements and experiments (ETAC of ABET Outcome b).

Course Map: Tied to course syllabus objectives.

IET 3570: ENGINEERING ECONOMICS
IET 4700: MANUFACTURING FACILITIES

Measure 2.1. (Direct – Knowledge/Skills)

Every spring semester, students' grades on the IET 3570 (Engineering Economics) final exam are used to assess the attainment of SLO 2. The acceptable target is 80% of students scoring a C or better on the final examination.

Finding: The target was met.

Analysis: The target was met in both AY 17-18 and AY 18-19. In AY 18-19, the acceptable target was met and exceeded. 17 out of 18 (94.5%) students scored a C or better on the final examination in AY 18-19. In AY 17-18, 37 out of 41 (90%) students scored a C or better on the final examination. The slight increase in positive results could be a random phenomenon.

Based on the AY 17-18 assessment results, in AY 18-19 the instructor of the course demonstrated how to approach each type of engineering economics problems by solving many different problems in class, using board as well as MS Excel software. Students were also given assignments that needed MS Excel to solve. The instructor continued to hold a comprehensive exam review session before the final, but began emphasizing material that the students were particularly weak in. Overall, in AY 18-19 the target was met with a performance index of 94.5%.

Action - Decision or Recommendation: Based on the results of the AY 18-19 assessment, it was decided that in AY 19-20 Microsoft Excel would become a required

component of the course going forward. Based on discussion with the faculty teaching this course and the faculty teaching IET 4700 which uses this course as a pre-requisite, it was agreed that using Microsoft Excel for financial problem solving would be a good tool to be incorporated as much as possible in this course, IET 3570 Engineering Economics. As Excel is becoming a part of the course, the faculty will attempt to get students involved with the software earlier in the semester.

Measure 2.2. (Direct – Knowledge/ Skill)

Every spring semester, students' grades on the IET 4700 final exam are used to assess the attainment of SLO 2. The acceptable target is 80% of students scoring a C or better on embedded questions.

Finding: The target was met.

Analysis: In AY 17-18 and in AY 18-19, the target was met. In AY 18-19, 29 out of 31 (94%) of students scored a C or better on embedded questions and assignments. However, in AY 17-18, 28 out of 28 (100%) of students scored a C or better on the embedded questions and assignments. The performance index for AY 18-19 decreased slightly. Again, the target was met in both years.

Based on the results of the AY 17-18 assessment process, in AY 18-19 the faculty held review sessions for the exam, but the faculty also implemented more rigorous test questions in AY 18-19. It was evident that more rigorous test questions resulted in a slight decrease in the performance index, which was expected. The comprehensive review before the test was likely to have had an impact on the PI even though the rigor of the test was increased. Overall, the AY 18-19 target was met with a performance index of 94%.

Action - Decision or Recommendation: Based on the AY 18-19 assessment results, a comprehensive review before the final exam demonstrated that struggling students that took advantage of this review had improved grades. As AY 18-19 exam contained more rigorous exam questions, this may have affected exam results. Therefore, in AY 19-20 more assessment data is needed to determine a results trend and whether additional revisions or content changes to the measure, the exam material, or the review session are necessary. Lastly, while the exam was more difficult, this was the second year that the review session was instituted, and it will be instituted going forward as well.

Measure 2.3. (Direct – Knowledge/ Skill)

Every spring semester, students' grades on the IET 4700 Design Project are used to assess the attainment of SLO 2. The acceptable target is 85% of students scoring a B or better on the Team Timed Lighting design project.

Finding: The target was met.

Analysis: The target was met in AY 17-18 and AY 18-19. In AY 18-19, 27 out of 31 (87%) students scored a B or better on the Team Timed Lighting design project. However, in AY 17-18, 25 out of 28 (89%) of students scored a B or better on the Team Timed Lighting design project. While the target was met in both years, student achievement decreased by only two percentage point.

The slight decrease in student performance was due to one group of two students who came extremely late causing the group to score only 68%.

Based on the AY 17-18 assessment process, other than one group which brought the score down, an increased emphasis on punctuality led to increased student performance. Faculty noticed that making all students come on time helped in reduction of group dissention based on some students always being late

Overall, the performance index is acceptable and satisfactory, and the faculty took appropriate measures to encourage student timeliness.

Action - Decision or Recommendation: Based on the AY 18-19 assessment results, in AY 19-20 the faculty will place even greater emphasis on punctuality and expand this emphasis to include all classes. In addition, the faculty will consider placing points on punctuality or will research methods to encourage punctually.

SLO 3. Ability to conduct continuous improvement projects (ETAC of ABET Outcome c).

Course Map: Tied to course syllabus objectives.

IET 3150: FLUID POWER
IET 3510: MOTION AND TIME STUDY

Measure 3.1. (Direct – Knowledge/Skills)

Every fall semester, students' grades on the IET 3150 Fluid Power circuit experiment are used to assess the attainment of SLO 3. The acceptable target is 80% of students scoring a C or better on the fluid-power circuit experiment.

Finding: The target was met.

Analysis: In AY 17-18 the target was not met, but in AY 18-19, the target was met. In AY 18-19, 27 out of 30 (90 %) students scored a C or better on the fluid-power circuit experiment. In AY 17-18, 21 out of 28 (75%) students scored a C or better on the fluid-power circuit experiment.

Based on the assessment data from AY 17-18, in AY 18-19, the instructor of the course assigned team members to the teams rather than allowing students to form their own

groups. This strategy was decided at the end of the last assessment cycle. The implementation of this strategy was found to be very successful. Additionally, no latecomers were put together in the last group. Further, all students successfully completed their experiments and unlike in prior assessment cycle where a few students missed the assignment. In AY 18-19, the target was met, and the results improved over AY 17-18.

Action - Decision or Recommendation: Based on the review of the AY 18-19 assessment results, the faculty will supervise student group-formation, assign group leaders, and ensure diversity in team members. As AY 18-19 was the first year for this process, the faculty will develop best practices and other criteria for assigning group members and ensuring smooth group operations in AY 19-20. More non-graded practice quizzes will be made available for students to practice on different kinds of fluid power problems.

Measure 3.2. (Direct – Knowledge/Skills)

Every fall semester, students' grades on the IET 3510 Final Project are used to assess the attainment of SLO 3. The acceptable target is a final class project rated at 70% or better by the client and faculty.

Finding: The target was met.

Analysis: The target was met in AY 17-18 and in AY 18-19. Year-to-year, the results decreased somewhat. In AY 18-19, 25 out of 25 (100%) were rated at 70% or better by the client and faculty. The target was met. In AY 17-18, 28 out of 33 (85%) were rated at 70% or better by the client and faculty.

Based on the AY 17-18 assessment process, in AY 18-19 changes were implemented to help group formation and communication. The increase in performance is potentially due to changes that resulted in better group formation and more feedback and meeting time with the instructor as the projects were assignment very early in the semester. Students also had more time to visit clients' facility. Each group in the last assessment cycle went at least three times to the clients' facility.

Action - Decision or Recommendation: Based on the AY 18-19 assessment results, to better clarify about the group project and involved processes, in AY 19-20 the instructor will place increased emphasis on project expectations as well as students' responsibilities early in the semester. The instructor will make group assignments to ensure that groups can manage their project responsibilities and to make sure that their other potential conflicts ("Christmas Gala", sports, etc.) are addressed properly.

SLO 4. Ability to function effectively on a team (ETAC of ABET Outcome d).
Course Map: Tied to course syllabus objectives.

EET 4940: PROJECT DESIGN I

EET 4950 or IET 4960: PROJECT DESIGN II

Measure 4.1. (Indirect – Knowledge/Ability/Skill)

Every semester, upon presentation of capstone projects (both Project Design I EET 4940 and II IET 4960), ET faculty evaluate student performance with respect to the ability to function effectively on a team. The acceptable target is 80% of IET students rating at least a 4 out of 7.

Finding: The target was met.

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Analysis: The target was met in AY 17-18 and AY 18-19. In AY 18-19, the fall semester result was that 23 out of 23 (100%) students rated at least a 4 out of 7 for the ability to function effectively on a team in EET 4940. In AY 17-18, the overall results were that 27 out of 27 (100%) students rated at least a 4 out of 7 for the ability to function effectively on a team in EET 4940.

On a semester-to semester-basis in AY 17-18, in EET 4940, students were rated at least a 4 out of 7 for the ability to function effectively on a team as follows:

- Fall 2018, 23/23 (100%)

On a semester-to semester-basis in AY 17-18, in EET 4940, students were rated at least a 4 out of 7 for the ability to function effectively on a team as follows:

- Fall 2017, 19/19 (100%)
- Spring 2018, 8/8 (100%).

Similarly, in AY 18-19, the spring semester results were that 8 out of 8 (100%) students rated at least a 4 out of 7 for the ability to function effectively on a team in IET 4960. Meanwhile, in AY 17-18, the overall results were that 27 out of 27 (100%) students rated at least a 4 out of 7 for the ability to function effectively on a team in IET 4960.

On a semester-to semester-basis in AY 17-18, in IET 4960, students were rated at least a 4 out of 7 for the ability to function effectively on a team as follows:

- Fall 2018, 8/8 (100%)

On a semester-to semester-basis in AY 17-18, in IET 4960, students were rated at least a 4 out of 7 for the ability to function effectively on a team as follows:

- Fall 2017, 11/11 (100%)
- Spring 2018, 19/19 (100%).

For both courses, EET 4940 and IET 4960, the acceptable target was exceeded. The previous performance level (100%) was maintained in the AY 18-19 assessment cycle.

Based on the AY 17-18 assessment cycle, the consistent AY 18-19 results were attributed to proper guidance and support from the course faculty as well as better coordination and teamwork by the presenting students during their final presentation. Also, based on the AY 17-18 assessment, instructors assigned a team leader for the first time for every group in these courses.

A team leader's responsibility (in addition to performing as a group member) was to oversee each task assigned to each member of a group and ensure progress as per the project guideline. Further, it was the leader's responsibility to call meetings, review progress, and prepare a revised action plan until the final report and presentation was delivered to the client.

Also, in AY 18-19 mock presentations were introduced to give students extra presentation practice. This additional practice helped students to identify their weaknesses, plan, and organize better as a team when they presented their reports to faculty and the clients. In review, the faculty felt that the mock presentations were very beneficial to student learning and helped maintain the 100% result for this measure.

Additionally, the faculty members value the contributions made by other courses that have helped students throughout the program to be prepared for this course. Students must take four different English courses, including technical writing and a communications course. It was our assessment that the students' performance in this SLO reflects the combined results of preparation across various courses, and diligent work and support from all faculty involved, the including instructor of the course.

Action - Decision or Recommendation:
Based on the AY 18-19 assessment results, the following items were discussed among the Faculty and it was decided to be implemented starting AY 19-20.

1. Student group must communicate with the instructor with their weekly meeting agenda/minutes.

2. Any conflicts within the group will be brought forward to the instructor only after formal resolution is attempted within the group meetings and either minutes or communication (email).

Measure 4.2. (Direct – Knowledge/Ability)
Every semester, upon presentation of capstone projects (both Project Design I and II), students evaluate each other (i.e., peer evaluation) with respect to the ability to function effectively on a team. The acceptable target is 80% of IET students rating at least a 4 out of 7.

Finding: The target was met.

Analysis: The target was met in AY 17-18 and AY 18-19. In AY 18-19, the overall results were that 23 out of 23 (100%) students were rated at least a 4 out of 7 by their peers in EET 4940. Meanwhile, in AY 17-18, the overall results were that 27 out of 27 (100%) students were rated at least a 4 out of 7 by their peers in EET 4940. In a year-to-year comparison, students maintained the 100% performance level and the target was met in both academic cycles.

On a semester-to semester-basis in AY 18-19, in EET 4940, students were rated at least a 4 out of 7 by their peers as follows:

- Fall 2018, 8/8 (100%)
- Spring 2019, 6/6 (100%)

On a semester-to semester-basis in AY 17-18, in EET 4940, students were rated at least a 4 out of 7 by their peers as follows:

- Fall 2017, 11/11 (100%)
- Spring 2018, 19/19 (100%).

Similarly, in AY 18-19, the mid-year results were that 8 out of 8 (100%) students rated at least a 4 out of 7 by their peers in IET 4960. Meanwhile, in AY 17-18, the overall results were that 27 out of 27 (100%) students rated at least a 4 out of 7 by their peers in IET 4960. In a year-to-year comparison, students maintained the 100% performance level and the target was met in both academic cycles.

On a semester-to semester-basis in AY 18-19, in IET 4960, students were rated at least a 4 out of 7 by their peers as follows:

- Fall 2018, 8/8 (100%)

On a semester-to semester-basis in AY 17-18, in IET 4960, students were rated at least a 4 out of 7 by their peers as follows:

- Fall 2017, 11/11 (100%)
- Spring 2018, 19/19 (100%).

Based on the AY 17-18 assessment, the instructor assigned a team leader for the first time for every group in these courses. The team leader's responsibility (in addition to functioning as a group member) was to oversee each task assigned to each member in a group and ensure that the project was progressing as per the project guideline. Further, the team leader's responsibilities included calling meetings, reviewing progress and preparing revised action plans until the final report and presentation were delivered to the client. This change helped the student groups function more smoothly and lead to continued evidence of student learning in the assessment results.

Overall, the AY 18-19 assessment results met with a performance index of 100%.

Action - Decision or Recommendation: Based on the AY 18-19 assessment results, in AY 19-20 team leaders will be assigned in all project groups. Team leaders will be informed that they must share in work breakdown structure to ensure that students performing team leader duties are not overloaded with work as compared to their peers. A written document outlining group leader responsibilities will be created. While the addition of team leaders has been successful, another year of data and experience with this practice will help find ways that the team leader role may be improved for the enhancement of the student learning process for all students.

SLO 5. Ability to communicate effectively (ETAC of ABET Outcome e).

Course Map: Tied to course syllabus objectives
EET 4940: PROJECT DESIGN I
EET 4950 or IET 4960: PROJECT DESIGN II

Measure 5.1. (Indirect – Knowledge/Ability/Skill)

Every semester, upon presentation of capstone projects, ET faculty evaluate student performance with respect to the ability to communicate effectively. The acceptable target is 80% of IET students rating at least a 4 out of 7.

Finding: The target was met.

Analysis: The target was met in AY 17-18 and AY 18-19. In AY 18-19, the overall results were that 23 out of 23 (100%) students rated at least a 4 out of 7 with respect to the ability to communicate effectively in EET 4940. Meanwhile, in AY 17-18, the overall results were that 27 out of 27 (100%) students rated at least a 4 out of 7 with respect to the ability to communicate effectively in EET 4940. In a year-to-year comparison, students maintained the 100% performance level, and the target was met in both academic cycles.

On a semester-to semester-basis in AY 18-19, in EET 4940, students were rated at least a 4 out of 7 with respect to the ability to communicate effectively as follows:

- Fall 2018, 23/23 (100%)
- Spring 2019, 6/6 (100%)

On a semester-to semester-basis in AY 17-18, in EET 4940, students were rated at least a 4 out of 7 with respect to the ability to communicate effectively as follows:

- Fall 2017, 19/19 (100%)
- Spring 2018, 8/8 (100%).

Similarly, in AY 17-18, the overall results were that 27 out of 27 (100%) students rated at least a 4 out of 7 with respect to the ability to communicate effectively in IET 4960. In a year-to-year comparison, students maintained the 100% performance level, and the target was met in both academic cycles.

On a semester-to semester-basis in AY 18-19, in IET 4960, students were rated at least a 4 out of 7 with respect to the ability to communicate effectively as follows:

- Fall 2018, 8/8 (100%)

On a semester-to semester-basis in AY 17-18, in IET 4960, students were rated at least a 4 out of 7 with respect to the ability to communicate effectively as follows:

- Fall 2017, 11/11 (100%)
- Spring 2018, 19/19 (100%).

Based on the AY 17-18 assessment results and classroom experience, IET faculty introduced a “tentative budget” for the project in EET 4940, and “revised budget” in IET 4960 report. The instructor was not successful in fully implementing this strategy in AY 18-19 though it was started in AY 17-18. However, IET faculty agreed that overall quality of the report has increased with the addition of this item in the reports. The evidence indicates that students are continuing to perform well on this measure.

Action - Decision or Recommendation: Based on the AY 18-19 assessment results, the following changes will be implemented in AY 19-20:

1. Fully implement requirement of the itemized budget in the project report.

2. Students should be participating in the mock presentations at least twice before their final oral presentation.

3. To emphasize coherent team effort to achieve a common goal in solving engineering problems, it was determined that the projects teams must use MS Office 365 software ‘Teams’ or any equivalent platform.

Measure 5.2. (Direct –Skill/Ability)

Every semester, students’ grades on EET 4940 written proposal are used to assess the attainment of SLO 5. The acceptable target is 80% of students scoring a C or better on the technical portion of the written proposal.

Finding: The target was met.

Analysis: The target was met in AY 17-18 and AY 18-19. In AY 18-19, the overall results were that 23 out of 23 (100%) students rated C or better on a technical portion of

the written proposal in EET 4940 in fall 2018. In AY 17-18, the overall results were that 27 out of 27 (100%) students rated C or better on a technical portion of the written proposal in EET 4940. The targets were met with consistency. In a year-to-year comparison, students maintained the 100% performance level and the target was met in both academic cycles. On a semester-to semester-basis in AY 17-18, in EET 4940, students were rated at a C or better on a technical portion of the written proposal as follows:

- Fall 2018, 23/23 (100%)
- Spring 2019, 6/6 (100%)

On a semester-to semester-basis in AY 17-18, in EET 4940, students were rated at least a 4 out of 7 for the ability to function effectively on a team as follows:

- Fall 2017, 19/19 (100%)
- Spring 2018, 8/8 (100%).

Based on the AY 17-18 assessment, in AY 18-19, the instructor decided to review final reports by all IET faculty before the final student submissions of the report for grading. All IET faculty provide feedback on technical content as well as formatting and grammar for each group report. Each group then incorporates recommendations by faculty into their report to make a final report. This additional round of review by faculty has contributed to maintaining the performance index for this SLO.

Action - Decision or Recommendation: Based on the AY 18-19 assessment results, it was decided to implement the following starting AY 19-20.

1. Student group will communicate with the instructor with their weekly meeting agenda/minutes.

2. Any conflicts within the group will be brought forward to the instructor only after formal resolution is attempted within the group meetings.

SLO 6. Ability to perform self-directed professional development (ETAC of ABET Outcome f).

Course Map: Tied to course syllabus objectives.

IET 3150: FLUID POWER
IET 4720: QUALITY CONTROL
EET 4950 or IET 4960: PROJECT DESIGN II

Measure 6.1. (Direct – Knowledge/Skills)

Every spring semester, students' grades on the IET 4720 Test 2 are used to assess the attainment of SLO 6. The acceptable target is 80% of students scoring a C or better on Test 2.

Finding: The target was not met.

Analysis: The target was met in AY 17-18 but not in AY 18-19. In AY 18-19, 30 out of 36 (83%) students scored a C or better on Test 2 in IET 4720. Previously, in AY 17-18, 25 out of 35 (71%) students scored a C or better in Test 2 in IET 4720. In a year-to-year comparison, the target was met for the first time in several years. In AY 18-19, PI exceeded the target by 3% even though, course delivery method was switched from face to face to online.

Based on the results of the AY 17-18 assessment, additional quizzes for the materials covered in Test 2 were made available to students. It is also noted that several lecture videos were added to students' resources.

Action - Decision or Recommendation: Based on the AY 18-19 results, the practices from AY 17-18 should be built upon. In AY 19-20, additional practice opportunities (such as an assignment or quiz) prior to Test 2 will enable students to perform self-directed professional and educational development and additional videos will help as well. As the course was switched to an online delivery method, building a robust set of resources for online students will be an ongoing project.

Measure 6.2. (Direct – Knowledge/Skills)

Every fall semester, students' grades on the IET 3150 Tests 2 and 3 are used to assess the attainment of SLO 6. The acceptable target is 80% of students scoring a C or better on Tests 2 and 3.

Finding: The target was met.

Analysis: The target was met in AY 17-18 and AY 18-19. In AY 18-189, 28 out of 30 (93.3%) students scored C or better in Test 2 and Test 3. In AY 17-18, 50 out of 58 (89.3%) students scored C or better in Test 2 and Test 3. The performance index increased by 4% compared to AY 17-18.

Based on the assessment of AY 17-18, the instructor pointed out that the rigor of the test was slightly increased for AY 18-19; however, comprehensive reviews of the materials were done prior to the tests along with more practice examples during the class meetings.

Action - Decision or Recommendation: Based on the results of the AY 18-19 assessment process, the faculty have a better idea of student weaknesses and where to focus future review and practice materials during AY 19-20, and those modifications will be made. The rigor of the test questions will be maintained until data from the next

assessment cycle (AY 19-20) are available. This year (AY 18-19) was the baseline data for the test with increased difficulty, and one year is not enough for a trendline comparison. Such a comparison is helpful for making data-driven changes to the program.

Measure 6.3. (Indirect – Knowledge/Ability/Skill)

Every semester, upon presentation of capstone projects, ET faculty evaluate student performance with respect to the ability to perform self-directed professional development. The acceptable target is 80% of IET students score at least a C.

Finding: The target was met.

Analysis: The target was met in AY 17-18 and AY 18-19. In AY 18-19, the overall results were that 8 out of 8 (100%) students were scored at least a C or better by faculty on student performance evaluations with respect to the ability to perform self-directed professional development in IET 4960 for mid-year assessment. In AY 17-18, the overall results were that 27 out of 27 (100%) students scored at least a C or better by faculty on student performance evaluations with respect to the ability to perform self-directed professional development in IET 4960.

As compared to AY 17-18, student performance was retained at 100% level. The target was met. In a year-to-year comparison, students maintained the 100% performance level, and the target was met in both academic cycles. The target was met both years, and the results were stable.

On a semester-to semester-basis in AY 18-19, in IET 4960, students scored at least a C or better by faculty on student performance evaluations with respect to the ability to perform self-directed professional development in IET 4960 as follows:

- Fall 2018, 8/8 (100%)

On a semester-to semester-basis in AY 17-18, in IET 4960, students scored at least a C or better by faculty on student performance evaluations with respect to the ability to perform self-directed professional development in IET 4960 as follows:

- Fall 2017, 11/11 (100%)
  Spring 2018, 19/19 (100%).

Based on the assessment from AY 17-18, the instructor of the course introduced mandatory meeting agendas in AY 18-19 whenever student groups met among themselves. Team leaders were assigned to each group for the first time. Meeting minutes were made mandatory for student group meetings. This allowed students to prioritize their tasks and guide themselves to achieve a few goals at a time towards solving the main goal (objective) of the project in their own pace, motivation, and direction. Initiating practices designed to foster better group communication and

functioning helped enhance the student experience in the course and played a role in keeping results stable at 100% from year-to-year.

Action - Decision or Recommendation: Based on the results of the AY 18-19 assessment, in AY 19-20 the instructor will assign team members, team leaders, and require weekly meetings, meeting agendas, and meeting minutes. This will emphasize team effort to achieve a common goal in solving engineering problems. Also, based on the AY 18-19 assessment results, efforts will be made to ensure that team leaders are not unfairly overburdened with responsibilities as compared to their peers, and the faculty will research other methods of enhancing the group learning experience.

SLO 7. A commitment to address ethical considerations involved in solving industrial engineering technology problems (ETAC of ABET Outcome g).

Course Map: Tied to course syllabus objectives.

EET 1321: ELECTRICAL PRONCIPLES II LAB
ENGL 3510: MOTION AND TIME STUDY
EET 4940: PROJECT DESIGN I

Measure 7.1. (Direct –Skill)

Every spring semester, student's laboratory reports in EET 1321 are evaluated. The acceptable target is 80% of IET students graded at a C or better on laboratory reports.

Finding: The target was met.

Analysis: The target was met in AY 17-18 and AY 18-19. 10 out of 12 (83%) of the students graded C or better in course EET 1321 in Spring 2018. The target was met. This is a changed criterion for assessment implemented in Fall 2017. In AY 17-18, 27 out of 32 (84%) of the students graded C or better in course EET 1321. The target continues to be met.

Note: In AY 16-17 involved students' course grades from COMM 1010. This data was collected at the university level. However, as engineering faculty have no control over this course, the assessment of measure 7.1 was moved to EET 1321 in AY 17-18. This change gave the engineering faculty enhanced control over the assessment process and made sure that students are getting experience and learning communications skills specific to their major. As in AY 16-17, intellectual thievery and plagiarism were explained in AY 17-18 in every lab-class and students are warned of severe punishment if the policy of ethics is not followed in report writing. Students are continuously instructed not to plagiarize in any form in their laboratory reports.

Based on the AY 17-18 assessment results, in AY 18-19 a sample report was planned, but was not implemented because the instructor decided it would not only hamper student's creativity but also make all reports too similar. However, the instructor did

provide itemized guidelines for the lab report. These changes served to keep the results stable in AY 18-19 but did not lead to clear improvement in student learning.

Action - Decision or Recommendation: Based on the AY 18-19 results, in AY 19-20 the instructor will cover in detail each item in the report guideline so that students will have a clear understanding of what is expected of them in the report. Since this was only the second time the current course was selected to assess this measure, it was decided to wait until the next assessment cycle before making any major changes. A more robust data set will better enable faculty to identify course enhancements. In the meantime, small changes like more examples and practice can help students improve

Measure 7.2. (Direct –Skill)

Every fall semester, students' final reports on their semester projects will be assessed in IET 3510. The acceptable target is 80% of graduating IET students graded at a C or better on the semester report in IET 3510.

Finding: The target was met.

Analysis: The target was met in AY 17-18 and AY 18-19. In AY 18-19, 25 out of 25 (100%) scored C or better in Fall 2018. The target was met, whereas, in AY 17-18, 30 out of 33 (90%) scored C or better. There was a net increase of 10% in this AY compared to the last AY.

This is a changed criterion for assessment implemented in Fall 2017. A standardized format for the report was introduced in AY 17-18. Throughout the semester, students were encouraged to follow the format of the standardized report, including citations and bibliography. Students were instructed not to plagiarize in any form. Intellectual thievery is explained during the course and students are warned of severe punishment if the ethics policy is not followed in report writing.

In addition, in AY 17-18, one group did not perform well because they were a group of international students and were heavily involved in a music program, the Christmas Gala, and they did not do their project to the level of expectation.

Based on the AY 17-18 assessment results, in AY 18-19, group formation was closely monitored to avoid similar situations, where all students are heavily involved in the same extracurricular activity, particularly the Christmas Gala. This increase in student performance was likely due to the increased monitoring of the Christmas Gala schedule against when assignments were due.

Action - Decision or Recommendation: Based on the AY 18-19 assessment results, the instructor assigned members to each group. Previously, in AY 17-18 the instructor had only supervised and made minor changes to group formation. As in AY 17-18, this change will help ensure that each group has a diverse student population in hopes that

this will decrease the problems associated with all group members sharing a single extracurricular activity such as band or a common sports team.

Measure 7.3. (Direct – Knowledge/Ability/Skill)

Every semester, upon presentation of capstone projects, ET faculty evaluate student performance on an oral presentation and written proposal (report). The acceptable target is 80% of students scoring a C or better on the oral presentation and written proposal.

Finding: The target was met.

Analysis: The target was met in AY 17-18 and AY 18-19. In AY 18-19, the overall results were that 23 out of 23 (100%) students scored a C or better on the oral presentation and written proposal in EET 4940. Meanwhile, in AY 17-18, the overall results were that 27 out of 27 (100%) students scored a C or better on the oral presentation and written proposal in EET 4940. The student performance was retained at 100% level. In a year-to-year comparison, students maintained the 100% performance level, and the target was met in both academic cycles.

In AY 17-18, the overall results were that 27 out of 27 (100%) students scored a C or better on the oral presentation and written proposal in EET 4940. Meanwhile, in AY 16-17, the overall results were that 23 out of 23 (100%) scored C or better on oral presentation and written proposal in EET 4940. As compared to AY 16-17, student performance was retained at 100% level. The target was met. In a year-to-year comparison, students maintained the 100% performance level, and the target was met in both academic cycles.

On a semester-to semester-basis in AY 18-19, in EET 4940, students were rated at least a 4 out of 7 for the ability to function effectively on a team as follows:

- Fall 2018, 23/23 (100%)

On a semester-to semester-basis in AY 17-18, in EET 4940, students were rated at least a 4 out of 7 for the ability to function effectively on a team as follows:

- Fall 2017, 19/19 (100%)
- Spring 2018, 8/8 (100%).

Based on AY 17-18 assessment, in AY 18-19, senior faculty conducted their own mock presentations including review of the written reports and the presentation slides. During this mock presentation, the reviewing faculty also gave the students suggestions about best practices to follow during a formal presentation. The students that made the changes and followed the suggestion had relatively better overall oral presentations, written reports, and markedly better PowerPoints.

Action - Decision or Recommendation: Based on the AY 18-19 assessment report, in AY 19-20 the faculty the instructor will require all student groups to go through the mock presentation review process not only with the course instructor but also with at least one senior faculty member before the final presentation.

A comprehensive summary of the key evidence of continuous improvement based on analysis of results

SLO 1. Ability to apply the industrial engineering technology knowledge, skills, and tools to real-world problem solving (ETAC of ABET Outcome a).

- G-code programming has become fully integrated into the curriculum. One dedicated lab exercise using CNC router is also now a part of the curriculum. Year-to-year, the results for measure 1.1 stayed the same, but it should be noted that some students traveled for music or sports, which may have contributed to the lack of improvement.

- The industry projects (as a part of QEP) in IET 4960 were more comprehensive and technically challenging. The rigor was increased. In addition, the grading format was converted to a rubric based allowing faculty to more rigorously grade specific IET based knowledge and skill sets. As result of the increased rigor, student performance decreased from 100% in AY 17-18 to 90% in AY 18-19.

SLO 2. Ability to perform tests, measurements and experiments (ETAC of ABET Outcome b).

- The instructor of IET 4700 demonstrated how to approach each type of engineering economics problems by solving many different problems in class, using board as well as MS Excel software. Students were also given additional assignments that needed MS Excel to solve. The instructor again held a comprehensive exam review session before the final but emphasized student weaknesses in the review. These changes may have helped the results for AY 18-19 increase slightly, by 4.9%) over AY 17-18. This measure, 2.1, is based on the overall final examination score in IET 3570.

- While the faculty held review sessions for the exam, but the faculty also implemented more rigorous test questions. It was evident that more rigorous test questions resulted in a slight decrease in the performance index, which was expected. The comprehensive review before the test was likely to have had an impact on the PI even though the rigor of the test was increased. Overall, the AY 18-19 target was met with a performance index of 94%. This measure, 2.1, is based on embedded questions in the IET 3570 final exam.

- An increased emphasis on punctuality led to generally increased student performance in the Timed Lighting design project (measure 2.3), but one group

still struggled with punctuality. This group harmed the AY 18-19 results, which showed a 2% decrease in results. However, the target was still met. Faculty noticed that making all students come on time helped in reduction of group dissention based on some students always being late.

SLO 3. Ability to conduct continuous improvement projects (ETAC of ABET Outcome c).

- In IET 3150, in AY 18-19, instructor supervised group formation, and did not accept all student-initiated groups or team leader appointments. The results were encouraging (PI increased from 75% to 90%). Additionally, no latecomers were put together in the last group and no students missed the assignment in AY 18-19 as was the case in AY 17-18. As a result, the target for measure 3.1 was met in AY 18-19, while it was not met in the previous year.

- Changes group formation increased ease of communication, feedback, and scheduling meeting times with the instructor. Also, the projects were assigned very early in the semester, giving students also had more time to visit clients' facility. This led to increased results in AY 18-19 (100%) vs AY 17-18 (85%) on measure 3.2.

SLO 4. Ability to function effectively on a team (ETAC of ABET Outcome d).

- Instructors assigned a team leader for the first time for every group in these courses. Mock presentations were introduced to give students extra presentation practice. This additional practice helped students to identify their weaknesses, plan, and organize better as a team when they presented their reports to faculty and the clients. In review, the faculty felt that the mock presentations were very beneficial to student learning and helped maintain the 100% result for this measure (4.1).

- The instructor assigned a team leader for the first time for every group and the team leader's responsibility (in addition to functioning as a group member) was to oversee each task assigned to each member in a group and ensure that the project was progressing as per the project guideline. Those responsibilities included calling meetings, reviewing progress and preparing revised action plans until the final report and presentation were delivered to the client. This change helped the student groups function more smoothly and lead to continued evidence of student learning in the assessment results. The target for measure 4.2 was met at 100% in AY 18-19.

SLO 5. Ability to communicate effectively (ETAC of ABET Outcome e).

- IET faculty introduced a "tentative budget" for the project in EET 4940, and "revised budget" in IET 4960 report. However, the instructor was not successful in fully implementing this strategy in AY 18-19 though it was started in AY 17-18.

However, IET faculty agreed that overall quality of the report has increased with the addition of this item in the reports.

- The instructor reviewed final reports by all IET faculty before the final student submissions of the report for grading. And, as in measure 4.2, the instructor assigned a team leader for the first time for every group and the team leader's responsibility (in addition to functioning as a group member) was to oversee each task assigned to each member in a group and ensure that the project was progressing as per the project guideline. This led to consistent (100% target met) year-to-year results for measure 5.2.

SLO 6. Ability to perform self-directed professional development (ETAC of ABET Outcome f).

- In IET 4720, additional quizzes for the materials covered in Test 2 were made available to students. It is also noted that several lecture videos were added to students' resources. For measure 6.1, the target was not met, but the target has only been met once in several years.

- The rigor of the measurement instrument (tests 2 and 3 in IET 3150) for measure 6.2 was increased in AY 18-19. However, comprehensive reviews of the materials were done prior to the tests and more practice examples were added during class meetings. Despite the increased rigor, the results increased by 4% and the target was met.

- As with measure 4.2 and 5.2, changes were made to the group project leadership and group member assignment process in addition to the inclusion of meeting minutes and agendas and other group project enhancements. The target for measure 6.3 was met at 100%.

SLO 7. A commitment to address ethical considerations involved in solving industrial engineering technology problems (ETAC of ABET Outcome g).

- The instructor did provide itemized guidelines for the lab report. This change served to keep the results stable in AY 18-19, and the target was met, but the change did not lead to clear improvement in student learning in measure 7.1.

- Group formation and the scheduling of assignments was closely monitored to avoid situations in which extracurricular activities and their schedules, particularly the Christmas Gala, interfered with coursework. This change lead to increased results in measure 7.2 and the target was met at 100%.

- Senior faculty conducted mock presentations including review of the written reports and the presentation slides. During the mock presentations, the reviewing faculty also gave the students suggestions about best practices to follow during a formal

presentation. The students that made the changes and followed the suggestion had relatively better overall oral presentations, written reports, and markedly better PowerPoints. The target for measure 7.3 as met at 100%.

Plan of action moving forward.

Industrial Engineering Technology assessment data for the academic year 2018-2019 show that targets were mostly stable with PIs still needing improvement. As a part of continuous improvement, the following action plans were identified.

1. In many courses, particularly those with group projects, an increased emphasis on punctuality has led to increased student performance, the faculty will place even greater emphasis on punctuality and expand this emphasis to include all classes.

2. Comprehensive review sessions with examples will be required for students in order to allow them to focus on important topics and guide their study before the final exam for courses such as IET 4700. In an enhancement to past years, faculty will give special emphasis to material that the students have shown weakness in.

3. For the last two years, the class size in all classes that require hands-on experiences, such as IET 2020, has been intended to be limited to 25 students per section. This is still an ongoing project yet to be fully met. Also, while G-code programming examples have been introduced in IET 2020, additional examples will be implemented as the faculty are now experienced with teaching G-code.

4. Microsoft Excel and Macros will be a part of the course (IET 3570) to help students solve difficult engineering economic problems. As in the past, for courses which require rigorous calculations such as IET 3570, IET 3150, and IET 4720, the instructor will explain expectations and responsibilities for students at the beginning of every semester, making them aware of what to expect in that semester. Excel will also be further integrated into courses which require financial calculations.

5. For courses which assess communication skills such as EET 1321, the instructor will cover in detail each item in the report guideline so that students will have a clear understanding of what is expected of them in the report.

6. In courses requiring students to work in teams (such as IET 4700, IET 3150, EET 4940, EET 4950 and IET 4960) the instructors will again supervise group formation for the project. The faculty will supervise student group-formation and assign group leaders, or at least develop criteria for assigning group members. Special care will be paid to assigning group members with diverse schedules and extracurricular activities so that group work is not severely hampered by campus events, sports, or activities. The faculty will develop best practices and other criteria for assigning group members and ensuring smooth group operations.

7. In IET 3150, more non-graded practice quizzes will be made available for students to practice on different kinds of fluid power problems.

8. Additional resources, such as videos and assignments, will be added to online courses to further enhance student learning.

In conclusion, ET faculty has reflected on the assessment results from AY 18-19 as well as previous years and identified some explicit changes to improve student learning. Continued commitment and attention to assessment and evidence of student learning will improve the quality of education offered through the IET program. Data will be continually analyzed to ensure continuous improvement in moving forward.