

Program: Bachelor of Science (BS), Industrial Engineering Technology (145)

Department of Engineering and Technology

College of Arts and Sciences

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Northwestern Mission. Northwestern State University is a responsive, student-oriented institution committed to acquiring, creating, and disseminating knowledge through innovative teaching, research, and service. With its certificate, undergraduate, and graduate programs, Northwestern State University prepares its increasingly diverse student population to contribute to an inclusive global community with a steadfast dedication to improving our region, state, and nation.

College of Arts and Sciences Mission. The College of Arts & Sciences, the largest college at Northwestern State University, is a diverse community of scholars, teachers, and students, working collaboratively to acquire, create, and disseminate knowledge through transformational, high-impact experiential learning practices, research, and service. The College strives to produce graduates who are productive members of society equipped with the capability to promote economic and social development and improve the overall quality of life in the region. The College provides an unequalled undergraduate education in the social and behavioral sciences, English, communication, journalism, media arts, biological and physical sciences, and the creative and performing arts, and at the graduate level in the creative and performing arts, English, TESOL, and Homeland Security. Uniquely, the College houses the Louisiana Scholars' College (the State's designated Honors College), the Louisiana Folklife Center, and the Creole Center, demonstrating its commitment to community service, research, and preservation of Louisiana's precious resources.

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 non-profit sectors, and promotes economic development and enrichment of the communities we serve.

Industrial Engineering Technology Mission Statement: The mission of the Industrial Engineering Technology program 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.

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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-level 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 cycle (AC) 2023-2024 show that targets were met or exceeded. Most of the students' performance indices for all SLOs were satisfactory. For those assessments where the targets were not met, action plans were devised for implementation in the next cycle.

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 that students meet and exceed target expectations.

SLO 1. Ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, and technology to solve broadly defined industrial engineering problems (ETAC of ABET Outcome 1).

Course Map: Tied to the course syllabus objectives.

IET 4700: Manufacturing Facilities

IET 4960: Project Design II

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Measure 1.1. Every spring semester, students are graded using a rubric on their ability to design and solve rotary tables for manufacturing facilities in IET 4700. The acceptable target is 80% of students score at least 12 out of 16 on the rubric-based assessment of the assignment.

Finding: Target was met.

Analysis: In AC 2022-2023, the target was met. Based on the analysis of the AC 2022-2023 results, the faculty implemented the following changes in AC 2023-2024 to drive the cycle of improvement. To promote the random selection of team members driven by the students, the instructor picked the best-performing students to serve as the leaders of the teams, and they were allowed to choose their members one at a time until all the students were selected. The motivation behind this was to promote team cohesiveness and eliminate instructor bias in team formation. As a result, the performance level was maintained.

In AC 2023-2024, the target was met with 5 out of 6 (83%) of the students scoring at least 12 out of 16 (75%) on a rubric-based assessment of the assignment on “design and solve rotary table for manufacturing facilities”. One student did not come to class on the day when the assignment was discussed, and the group was formed. Hence, this student could not format the report as expected.

Decision: Based on the results of AC 2023-2024, the faculty will implement the following changes in AC 2024-2025 to drive the cycle of improvement. The instructor will make a template for the report writing and supply that template before assigning the project. The instructor will also solve a similar exercise in the class.

Measure 1.2. Every spring semester, upon submission of IET 4960 project reports, ET faculty evaluate student performance concerning their ability to apply industrial engineering technology knowledge, skills, and tools to real-world problem-solving. The acceptable target is that 80% of the students rate at least 80 out of 100 (80%) on the checklist-based assessment of the technical portion of the project report.

Finding: Target was not met.

Analysis: In AC 2022-2023, the target was met. Based on the analysis of AC 2022-2023 results, the faculty made the following changes. The instructors of the course held review sessions on the technical topics relevant to the individual project for each team and provided related lecture notes which enhanced the quality of the technical portion of the final project report.

In AC 2023-2024, the target was not met, with 2 out of 3 (66.66 %) of IET students meeting the criteria on the checklist-based assessment of the technical portion of the project report. Two students received more than 80% of the score compared to 79.17% for the remaining one student. Therefore, the target was not met. One student left the group last semester because he was a visiting international student from France. In addition, this semester, another student joined the group late and this obviously affected the workload distribution among the group and the group's overall performance as well.

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Decision: Based on the analysis of the AC 2023-2024 and to drive the cycle of improvement, the faculty will implement the following changes in AC 2024-2025. The instructor will develop a bi-weekly self-reported form to ensure students hit milestones on time, report any rising issues, and provide any required feedback on time.

SLO 2. Ability to perform tests, measurements, and experiments to analyze and improve processes. (ETAC of ABET Outcome 4).

Course Map: Tied to the course syllabus objectives.

IET 3510: Methods and Work Design

IET 4720: Quality Control

Measure 2.1. Every fall semester, students' grades on the semester projects in IET 3510 are used to assess the attainment of SLO 2. The acceptable target is for 80% of students to score at least 12 out of 16 on the rubric-based assessment of the project.

Finding: Target was met.

Analysis: In AC 2022-2023, the target was met. Based on the analysis of AC 2022-2023 results, the faculty implemented the following changes in AC 2023-2024 to drive the cycle of improvement. The instructor of IET 3510 (1) explained how a professional technical report needs to be prepared, (2) provided a template on the learning management system for students to download and use, and (3) offered an additional review of the draft or practice session for calculations required for the project if needed by any student(s).

As a result of these changes in AC 2023-2024, the target was met. Ten out of 12 (83%) of the students scored at least 12 out of 16 (75%) on a rubric-based assessment of a group assignment. Students were able to perform a time study on the real industry sponsor's site. Students experienced and learned how to work in a group. They also gained knowledge on the effect of upstream workstations on downstream workstations in a line processing environment. The students worked in small teams (12 students made up 6 groups). This experience helped them learn how to draft a technical report as well. The instructor observed that students were utilizing templates as final documents rather than using them as guiding documents.

Decision: Based on the analysis of the AC 2023-2024 results, the faculty will implement the following changes in AC 2024-2025 to drive the cycle of improvement. The instructor of IET 3510 will (1) encourage students to view templates as flexible frameworks for organizing their ideas, allowing room for creativity while ensuring all essential components are incorporated and (2) provide at least one feedback session where students can share their customized adaptations of the templates and receive guidance on effectively balancing structure with creative expression.

Measure 2.2. Every spring semester, students are graded on an assignment of creating, analyzing, and interpreting control charts for variables or attributes in IET 4720 to assess the attainment of SLO 2. The acceptable target is 80% of students score at least 75% (12 out of

16) on the rubric-based assessment of the assignment.

Finding: Target was met.

Analysis: In AC 2022-2023, the target was met. Based on the analysis of AC 2022-2023, the instructor implemented the following changes in AC 2022-2023 to drive the cycle of continuous improvement. The instructor introduced and implemented the following changes. The instructor introduced an individual practice problem on control charts for variables using Minitab software for Statistical Process Control (SPC). There were short videos on how to analyze using Minitab software that were also provided.

As a result of these changes in AC 2023-2024, the target was met with 83.3% (10 out of 12) of the students scoring at least 12 out of 16 (75%) on a rubric-based assessment of the assignment on control charts for variables. One typically high-performing student did not meet the threshold due to a recent medical procedure, while another student appeared to have rushed their work at the last minute, resulting in lower-quality output.

Decision: Based on the analysis of the AC 2023-2024 results and to drive the cycle of continuous improvement for AC 2024-2025, the instructor will implement the following changes. The instructor plans to create brief tutorial videos detailing the step-by-step process for solving control charts for variables, including solving several practice problems. These videos will be uploaded to our Moodle platform. Students will be able to review the concepts of control charts for variables and refresh their skills using Minitab software and Excel for Statistical Process Control (SPC).

SLO 3. Ability to design systems, components, or processes meeting specified needs related to industrial engineering technology discipline (ETACof ABET Outcome 2).

Course Map: Tied to course syllabus objectives.

IET 3510: Methods and Work Design

IET 4700: Manufacturing Facilities

Measure 3.1. Every fall semester, students' grades on the "assignment on ergonomics principles in a workplace" in IET 3510 are used to assess the attainment of SLO 3. The acceptable target is for 80% of students to score at least 12 out of 16 (75%) on the rubric-based assessment of the assignment.

Finding: Target was not met.

Analysis: In AC 2022-2023, the target was met. Based on the analysis of the AC 2022-2023 results, the faculty implemented the following changes in AC 2023-2024 to drive the cycle of improvement. These changes included (1) students being asked to provide sufficient theoretical background in their report with a relevant brief review of the chapters related to the ergonomics principles, (2) students being asked to show the relevant guidelines to make their case for the recommended design attributes, and 3) the instructor offered help to review to any report before the due date.

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As a result of these changes in AC 2023-2024, the target was not met. Only 9 out of 12 students (75 %) students scored at least 12 out of 16 (75%) on the rubric-based assessment. Despite using the provided template, students failed to incorporate their observations and their relevance to specific ergonomics principles and guidelines in their reports. The instructor observed insufficient inclusion of relevant theory, design attributes, and calculations. One explanation for this shortfall was the simultaneous undertaking of both a time study project and an ergonomic project, both sponsored by the same industrial entity, potentially placing strain on the students. Furthermore, the projects were conducted on an individual basis, eliminating the opportunity for group collaboration.

Decision: Based on the analysis of the AC 2023-2024 results, in AC 2024-2025, the instructor will implement the following changes: (1) provide clearer instructions on incorporating personal observations into reports and relating them to specific principles and guidelines, (2) implement a more organized schedule to alleviate strain from concurrent projects, ensuring students have ample time for each assignment, and (3) promote collaborative learning where applicable, leveraging diverse perspectives for improved outcomes.

Measure 3.2. Every spring semester, students are graded on a timed assignment of a warehouse lighting project in IET 4700 to assess the attainment of SLO 3. The acceptable target is 80% of students score at least 12 out of 16 (75%) on the rubric-based assessment of the assignment.

Finding: Target was met.

Analysis: In AC 2022-2023, the target was met. Based on the analysis of AC 2022-2023 results, the faculty implemented the following changes in AC 2023-2024 to drive the cycle of continuous improvement. Each group was assigned to different warehouse rooms. Therefore, the students had to collect the dimensions of that room and produce reasonable assumptions on certain parameters with unassigned values. Thus, the team had to produce reasonable assumptions about the room size, and the minimum initial luminance values to solve the problem.

In AC 2023-2024, the target was met with 6 out of 6 (100%) of the students scoring at least 9 out of 12 (75%) on the rubric-based assessment of the warehouse-lighting project. The assessment was assigned in groups with two members, which helped the students measure the assigned room dimensions and make appropriate assumptions on certain parameters. Even though the updated version of the assessment included certain parameters with unassigned values, the performance level was maintained.

Decision: Based on the analysis of the AC 2023-2024 results, the faculty will implement the following changes in AC 2024-2025 to drive the cycle of continuous improvement. The faculty will provide a template for report writing and revisit the drawing software to prepare the students for the required drawing of the room and light fixtures layout.

SLO 4. Ability to function effectively as a member of a team or as its leader (ETACof ABET Outcome 5).

Course Map: Tied to the course syllabus objectives.

IET 4940: Project Design I
IET 4960: Project Design II

Measure 4.1. Every fall semester, students in IET 4940 assess their peers on a technical team concerning their ability and skill as a member or a leader of the team based on a checklist-based peer-review survey. The acceptable target is that 80% of IET students are rated at least 20 out of 25 (80%) on a checklist-based peer-review survey.

Finding: Target was met.

Analysis: In AC 2022-2023, the target was met. Based on the analysis of the AC 2022-2023 results, the faculty implemented the following changes in AC 2023-2024 to drive the cycle of improvement. As soon as there was an indication of non-participation or reduced participation in team-related activities, the team leader needed to have a one-on-one meeting with the concerned team member to understand the situation. The team leader was required to make it clear that participation was expected from each member to deliver their part of the group assignment on time. In case of a persistent problem, the course instructor had to be notified immediately. The instructor would then meet with this individual to explain the consequences of subpar participation. The instructor needed to remind the students that 20% of the semester grade was for professionalism, which could adversely affect their grade if not adhered to. This approach was to be taken only as a last resort after all efforts to motivate the student to be an effective team member had been exhausted.

As a result of these changes, in AC 2023-2024, the target was met. In AC 2023- 2024, 3 out of 3 (100%) of the students were rated at least 20 out of 25 (80%) on the checklist-based peer-review survey. Only one student did not participate in the peer review survey as he was an international exchange student and had to leave the country before he could submit his review form.

Decision: Based on the analysis of the AC 2023-2024 results and to drive the cycle of improvement, the following changes will be applied in AC 2024-2025. Peer review forms will be required to be submitted for pre-evaluation at least two weeks before the final report submission deadline. Furthermore, students will be encouraged to attend professional and academic conferences together, which will promote interaction, team cohesiveness, and teamwork among them.

Measure 4.2. Every spring semester, the instructor of the course rates students in IET 4960 based on their ability and skill as a member or a leader of the team on a checklist-based review survey. An instructor will use the overall impression of the team based on a semester-long interaction with the team to rate the team members and leaders. The acceptable target is that 80% of students are rated at least 20 out of 25 (80%) on a checklist-based survey.

Finding: Target was not met.

Analysis: In AC 2022-2023, the target was met. Based on the analysis of the AC 2022-2023 results, faculty implemented new instructions hence each member and the leader of the team submitted a detailed progress report including action plans and their corresponding

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due dates at the end of each month. At the beginning of the semester, each group submitted the schedule for the semester that includes due dates for the draft report chapter-wise, presentation slides, and poster such that there was enough time for faculty feedback, correction, and updates. Also, students were reminded every two weeks about the importance of teamwork in real-life (industry environments) as recommended by the IAC (Industry Advisory Committee) members. Communication channels were established to notify the instructor of any conflicts that developed within the group that might cause the project to reach a standstill.

As a result of these changes, in AC 2023- 2024, the target was not met, with 2 out of 3 (66.6%) of students receiving more than 80% score thus meeting the criteria. However, one student received a 70% score. This student joined the group late in the Spring 2024 semester to finish the degree. This student was not registered for the previous semester due to some personal circumstances.

Decision: Based on the analysis of the AC 2023-2024 results, and to drive the cycle of improvement, the faculty will implement the following change in AC 2024-2025. The instructor will ensure that there are no serious issues among the group by continuously monitoring the performance by developing and using the bi-weekly self-report form.

SLO 5. Ability to communicate effectively (ETAC of ABET Outcome 3).

Course Map: Tied to course syllabus objectives.

IET 4940: Project Design I
IET 4960: Project Design II

Measure 5.1. Every fall semester, upon presentation of capstone projects in IET 4940, ET faculty evaluate student performance concerning the ability to communicate effectively in the oral presentation of the technical report. The acceptable target is for 80% of IET students to score at least 80 out of 100 (80%) on a checklist-based assessment of the oral presentation.

Finding: Target was met.

Analysis: In AC 2022-2023, the target was met. Based on the analysis of AC 2022-2023 results, the faculty implemented the following changes in AC 2023-2024 to drive the cycle of improvement. The team was notified that business casual attire was accepted while business formal attire was recommended for presentations. More penalties were assessed for the team not addressing all the comments/suggestions provided by the faculty during the practice run. Teams were asked to consider using audio-video aids and to get feedback from the instructor on time to enhance the efficacy of the presentation.

As a result of these changes, the target was met in AC 2023-2024. In AC 2023-2024, 3 out of 3 (100%) of the IET students were rated at least 80 out of 100 (80%) on the checklist-based assessment of an oral presentation by the ET faculty.

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Decision: Based on the analysis of the AC 2023-2024 results and to drive the cycle of improvement, faculty will implement the following change in AC 2024-2025: Students will be encouraged to attend professional and academic conferences for oral and/or poster presentations before their final presentation in the ET department

Measure 5.2: Every spring semester, upon submission of capstone project reports in IET 4960, ET faculty evaluate students concerning their ability to draft a technical report using relevant literature, graphs, charts, results, and recommendations adhering to the format prescribed by the instructor to assess the attainment of SLO 5. The acceptable target is that 80% of IET students are rated at least 80 out of 100 (80%) on a checklist-based assessment of the written project report.

Finding: Target was met.

Analysis: In AC 2022-2023, the target was met. Based on the analysis of the AC 2022-2023 results, in AC 2023-2024, the instructors of the course held a tutorial session on MS Word and Excel focusing on formatting, including mathematical notations/equations, and auto-referencing. Also, to ensure that the students have made the required corrections in the project reports as indicated by the instructor and other faculty reviewers, they submitted reports to the instructor for one final review by the instructor before the final submission.

As a result of these changes in AC 2023-2024, 3 out of 3 (100%) of the students scored at least 80 out of 100 (80%) on the checklist-based assessment of the written project report.

Decision: Based on the analysis of the AC 2022-2023 results and to drive the cycle of improvement, the following changes will be implemented in AC 2023-2024. The instructor will encourage students to use AI apps to help them write effectively. For example, AI-Powered Writing Assistant by Grammarly and AI-Document Editor by Canva.

Comprehensive Summary of the Key Evidence of Improvement Based on Analysis of Results:

The following reflects all the changes implemented to drive the continuous process of seeking improvement in AC 2023-2024. These changes are based on the knowledge gained through the analysis of AC 2022-2023 results.

- In IET 3510 (SLO 2), the instructor of IET 3510 (1) explained how a professional technical report needs to be prepared, (2) provided a template on the learning management system for students to download and use, and (3) offered an additional review of the draft or practice session for calculations required for the project if needed by any student(s).
- In IET 3510 (SLO 3), the following changes were incorporated into the course by the instructor: They included: (1) students being asked to provide sufficient theoretical background in their report with a relevant brief review of the chapters related to the ergonomics principles, (2) students being asked to show the relevant guidelines to make their case for the recommended design attributes,

and 3) the instructor offered help to review to any report before the due date.

- In IET 4940 (SLO 4), as soon as there was an indication of non-participation or reduced participation in team-related activities, the team leader was required to have a one-on-one meeting with the concerned team member to understand the situation. The team leader needed to clarify that participation was expected from each member to deliver their part of the group assignment on time. In case of a persistent problem, the course instructor had to be notified immediately. The instructor would then meet with this individual to explain the consequences of subpar participation. The instructor needed to remind the students that 20% of the semester grade was for professionalism, which could adversely affect their grade if not adhered to. This approach was to be taken only as a last resort after all efforts to motivate the student to be an effective team member had been exhausted.
- In IET 4700 (SLO 1), to promote the random selection of team members driven by the students, the instructor picked the best-performing students to serve as the leaders of the teams, and they were allowed to choose their members one at a time until all the students were selected. The motivation behind this was to promote team cohesiveness and eliminate instructor bias in team formation. As a result, the performance level was maintained.
- In IET 4700 (SLO 3), each group was assigned to different warehouse rooms. This made the students collect the dimensions of that room and produce reasonable assumptions on certain parameters with unassigned values. Thus, the team had to produce reasonable assumptions about the room size, and the minimum initial luminance values to solve the problem.
- In IET 4720 (SLO 2), The instructor introduced Minitab software for Statistical Process Control (SPC) assignments in addition to individual practice problems on control charts for variables using Minitab software for Statistical Process Control (SPC). There were short videos on how to analyze using Minitab software that was also provided.
- In IET 4960 (SLO 1), to avoid a low degree of technical content in the final report, the instructors of the course held review sessions on the technical topics relevant to the individual project for each team and provided related lecture notes which enhanced the quality of the technical portion of the final project report.
- In IET 4960 (SLO 4), to ensure group coherence and efficient teamwork performance, faculty implemented new instructions hence each member and the leader of the team submitted a detailed progress report including action plans and their corresponding due dates at the end of each month. At the beginning of the semester, each group submitted the schedule for the semester that includes due dates for the draft report chapter-wise, presentation slides, and poster such that there was enough time for faculty feedback, correction, and updates. Also, students were reminded every two weeks about the importance of teamwork in real-life (industry environments) as recommended by the IAC (Industry Advisory Committee) members. Communication channels were established to notify the instructor of any conflicts that developed within the group that might cause the

project to reach a standstill.

- In IET 4960 (SLO 5), the instructors of the course held a tutorial session on MS Word and Excel focusing on formatting, including mathematical notations/equations, and auto-referencing. Also, to ensure that the students have made the required corrections in the project reports as indicated by the instructor and other faculty reviewers, they submitted reports to the instructor for one final review by the instructor before the final submission.

Plan of action moving forward:

- The instructor of IET 3510 will (1) encourage students to view templates as flexible frameworks for organizing their ideas, allowing room for creativity while ensuring all essential components are incorporated and (2) provide at least one feedback session where students can share their customized adaptations of the templates and receive guidance on effectively balancing structure with creative expression.
- In IET 3510 (SLO 3), the instructor will (1) provide clearer instructions on incorporating personal observations into reports and relating them to specific principles and guidelines, (2) implement a more organized schedule to alleviate strain from concurrent projects, ensuring students have ample time for each assignment, and (3) promote collaborative learning where applicable, leveraging diverse perspectives for improved outcomes.
- In IET 4940 (SLO 4), peer review forms must be submitted for pre-evaluation at least two weeks before the final report submission deadline. Furthermore, students will be encouraged to attend professional and academic conferences together, which will promote interaction, team cohesiveness, and teamwork among them.
- In IET 4700 (SLO 1), the instructor will make a template for the report writing, and supply that template before assigning the project. The instructor will also solve a similar exercise in the class.
- In IET 4720 (SLO 2), the instructor will create brief tutorial videos detailing the step-by-step process for solving control charts for variables, including solving several practice problems. These videos will be uploaded to our Moodle platform. Students will be able to review the concepts of control charts for variables and refresh their skills using Minitab software and Excel for Statistical Process Control (SPC).
- In IET 4960 (SLO 1), The instructor will develop a bi-weekly self-reported form to ensure students hit milestones on time, report any rising issues, and provide any required feedback on time.
- In IET 4960 (SLO 4), The instructor will ensure that there are no serious issues among the group by continuously monitoring the performance by developing and using the bi-weekly self-report form.

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- In IET 4960 (SLO 5), The instructor will encourage students to use AI apps to help them write effectively. For example, AI- Powered Writing Assistant by Grammarly and AI-Document Editor by Canva.