

AC 2019-2020 Assessment

BS Engineering Technology/ Industrial Engineering Technology

College of Arts and Sciences

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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 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 unequaled 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 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)

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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 academic cycle (AC) 2019-2020 show that targets were met or exceeded and, in some cases, not met. Most of the students' performance indices for all SLOs were found to be satisfactory. For those assessments, where the targets are not met, actions plans were devised and will be implement 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 students meet and exceed target expectations.

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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).

Measure 1.1. Every spring semester, students are graded based on rubric on their ability to design and solve rotary table for manufacturing process in IET 4700. The acceptable target is 80% of students score at least 9 out of 12 on rubric based assessment on assignment.

Finding: Target was met.

Analysis: In AC 2018-2019, Measure 1.1 was not assessed using the IET 4700 rotary project. Measure 1.1 was mapped to IET 2020's final exam. For that assessment device, the target was met in AC 2018-2019.

Using the IET 4700 rotary project as the new Measure 1.1, for AC 2019-2020, the target was met. In AC 2019-2020, 28/31 (90%) of students scored at least 9/12 (75%) on a rubric-based assessment on the design of a rotary table for the Manufacturing Processes course IET 4700.

Due to the COVID-19 restrictions, the assessment was done on an individual basis rather than on the planned team project approach. Instead of a timed, team approach, a more detailed, comprehensive project was prepared and given to each individual student. The students were given two days to complete the project rather than a one-hour time limit.

Decision: In AC 2019-2020, the target was met. Based on the results of AC 2019-2020, the faculty will implement the following changes in AC 2020-2021. The timed team project approach to the project will be implemented instead of the individual project assignment. This will improve the students' ability to solve industrial engineering technology related problems in a coordinated team format.

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).

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

Finding: The target was not met.

Analysis: In AC 2018-2019, the target was met. During that AC, 20/23 (87%) of students were rated at least 80 out of 100 on checklist-based assessment of the

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technical portion of the project report. Based on the analysis of the AC 2018-2019 results, the faculty made the following changes. Faculty feedback on the technical portion of the written report was expanded. An expanded version of the relevant technical literature review was added. Key points of the project (scope, constraints, and assumptions) were emphasized during team meetings. Possible alternative models, plans, and designs were added as a requirement to the written report.

In AC 2019-2020, the target was not met. Nine (9) out of 18 students (50%) were rated as at least 80% on checklist-based assessment of the technical portion of the project report. Of those not meeting the target, common issues were failure to cite literature, lack of clarity in design, failure to provide a project scope, failure to provide relevant calculations, etc.

Decision: In AC 2019-2020 the target was not met. Based on the analysis of the AC 2019-2020 results, the following changes will be made to drive the cycle of improvement. A separate section – named “Scope of the Project” – will be added to the “Introduction” section of the report. Two separate subsections – “Assumptions Made” and “Project Constraints” – will be made mandatory under the “Methodology” section of the report. Additionally, students will be asked to save all preliminary concepts and designs of the solution to allow them to compare the proposed solutions to alternate solutions in their report. Equations and calculations will be mandatory in the report and will follow proper writing style. Pertinent literature will be cited in the text and reference section. These changes will improve the students’ ability in gathering pertinent technical knowledge from the previous works, using constraints and assumptions for problem solving, articulate technical information and solutions in written format, etc., thereby continuing to drive the cycle of improvement.

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

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 80% of students score at least 12 out of 16 on the rubric based assessment of the project.

Finding: Target was met.

Analysis: In AC 2018-2019, Measure 2.1 was not mapped to IET 3510. For AC 2018-2019, Measure 2.1 was mapped to IET 3570 final exams. For that AC Measure, the target was met.

In AC 2019-2020, Measure 2.1 was tied to IET 3510 semester projects. For this new Measure, the instructors made group assignments, ensuring that groups can manage their project responsibilities. In AC 2019-2020, the target was met. Eighty-one percent (81%) of students (26/32) scored at least a 12/16 on a rubric-based assessment of a group assignment.

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Decision: In AC 2019-2020, the target was met. Based on the analysis of the AC 2019-2020 results, the faculty will implement the following changes in AC 2020-2021 to drive the cycle of improvement. The instructor of IET 3510 will place an increased emphasis on project expectations at the time of project assignment. An additional requirement of a mid-progress report will be included. This report will outline the project status along with the completion of data collection.

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

Measure 2.2. Every spring semester, students are graded on an assignment 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 9 out of 12 on the rubric based assessment on assignment.

Finding: Target was not met.

Analysis: In AC 2018-2019, Measure 2.2 was mapped to IET 4700. For AC 2019-2019, the target was met with 94% of students meeting the required score on the final exam. In AC 2019-2020, Measure 2.2 was mapped to IET 4720. The instructor of IET 4720 added multiple examples of control charts with their analyses. Additionally, these charts included methodology to create a new or modified control chart. Videos were added to the course material for students to have reinforcement of concepts. The instructor also offered online tutoring sessions to help students affected by COVID-19 displacement. In AC 2019-2020, the target was not met. Sixteen (16) out of twenty-four (24) students (67%) scored at least 9 out of 12 on the rubric-based assessment. Due to the restrictions placed on campuses nationwide, some students were unable to access the required software to complete the assignments satisfactorily.

Decision: In AC 2019-2020, the target was not met. Based on the analysis of the AC 2019-2020 results, and to drive the cycle of improvement, the faculty will implement the following changes. Faculty will produce video instructions showing some calculations and control charts similar to the assignments. Students will be provided with additional examples with which they may practice. Faculty will provide more instructions and alternative software before the assignment.

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

Measure 3.1. Every fall semester, students' grades on assignment on ergonomics principles in a workplace in IET 3510 are used to assess the attainment of SLO 3. The

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acceptable target is 80% of students score at least 12 out of 16 on the rubric based assessment on assignment.

Finding: Target was met.

Analysis: In AC 2018-2019, Measure 3.1 was tied to a fluid power circuit experiment in IET 3150. For AC 2018-2019, the target was met. Twenty-seven out of thirty (27/30, 90%) of student achieved the target score.

In AC 2019-2020, the instructor of IET 3510 added multiple examples of ergonomics in action in the workplace. The instructor also led consultation sessions to help students successfully complete their assignments. As a result, in AC 2019-2020, the target was met. Twenty-eight out of thirty-two (28/32, 88%) of students achieved the target score on the rubric-based assessment. Of those students who did not achieve the score, two did not submit an assignment, and two did not follow the guidelines for the assignment.

Decision: In AC 2019-2020, the target was met. Based on the analysis of the AC 2019-2020 results, in AC 2020-2021, the faculty will implement the following changes. More detailed guidelines will be provided for the formatting of the final report. Current guidelines for the assignment process will be revised to alleviate confusion. A properly formatted example final report will be given to the students. These changes will improve students' ability to appropriately format the report with all necessary subject matters, thereby continuing to drive the cycle of improvement forward.

In 2019-2020 the target was 80% of students score at least 12 out of 16 on the rubric based assessment on assignment.

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

Measure 3.2. Every spring semester, students are graded on a timed assignment on warehouse lighting project in IET 4700 to assess the attainment of SLO 3. The acceptable target is 80% of students score at least 9 out of 12(75%) on the rubric based assessment on assignment.

Finding: Target was met.

Analysis: In AC 2018-2019, the target was met. Twenty-seven out of thirty-one (27/31, 87%) students achieved the target score on the rubric. Based on the AC 2018-2019 results, faculty put emphasis on being punctual for the timed experiment to have time to complete the assignment. Additionally, the one-hour timed team project was converted to an individual project with a two-day period allowed for completion.

As a result of these changes, in AC 2019-2020, the target was met. In AC 2019-2020, 27/31 students (87%) of the students scored at least 9 out of 12 on the rubric based

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assessment on the warehouse lighting project in the Manufacturing Processes class IET 4700.

Decision: In AC 2019-2020, the target was met. Based on the analysis of the AC 2019-2020 results, the faculty will implement the following changes in AC 2020-2021. Faculty will alter the project parameters to represent a higher level of rigor in the project. Punctuality will be further emphasized along with returning to the team-based format.

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

Measure 4.1. Every fall semester, students in EET 4940 assess their peers in a technical team with respect to 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 80% of IET students are rated at least 20 out of 25 on checklist-based peer review survey.

Finding: Target was met.

Analysis: In AC 2018-2019, the target was met. All participating students (23/23, 100%) were rated at least 4 out of 7 by their peers on the peer review survey. Based on the analysis of the AC 2018-2019 results, the faculty more clearly defined roles and responsibilities of team members and team leader at the start of the course. A proper communication channel for teamwork was established for team members to notify the course instructor of any conflicts in the group and/or stagnancy in the progress of the project.

As a result of these changes, in AC 2019-2020 the target was met. In AC 2019-2020, 14 out of 17 (82%) of the students were rated at least 20 out of 25 on checklist-based peer review survey. Students who did not meet the target were either fulltime working students or in one case, the leader of the team did not delegate work and did not communicate in time with the fellow team members.

Decision: In AC 2019-2020, the target was met. Based on the analysis of the AC 2019-2020 results, and to drive the cycle of improvement, the following changes will be applied in AC 2020-2021. All groups will be required to use Microsoft Teams (or similar software) for the projects. Team roles will be discussed further, stressing the importance of proper communication for team members and delegation for team leaders.

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

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

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acceptable target is 80% of students are rated at least 20 out of 25 on a checklist-based survey.

Finding: Target was met.

Analysis: In AC 2018-2019, the target was met. In AC 2018-2019, 23 out of 23 (100%) students were rated at least 20 out of 25 by the faculty on a checklist-based survey. Based on the analysis of the AC 2018-2019 results, faculty required team meeting agendas and meeting minutes to be communicated to the course instructor. A reelection of the team leader was introduced.

As a result of these changes, in AC 2019-2020, the target was met. Based on a semester-long interaction with the team to rate the team members and leaders, 16 out of 18 (89%) of the students were rated at least 20 out of 25 on the checklist-based survey by the instructor of the course. The two students who did not meet the target in this assessment were both rated at 76% by the instructor. Their lack of participation in the group meetings, meeting with the instructor, and their minimalistic approach towards contribution to the project requirements were the primary causes for their not meeting the target rating.

Decision: In AC 2019-2020, the target was met. Based on the analysis of the AC 2019-2020 results, and to drive the cycle of improvement, the faculty will implement the following changes in AC 2020-2021. A mid-year peer evaluation will be introduced. This evaluation will be a confidential survey administered to every student in which they will assess peers' performance with respect to their project requirements. The instructor of the course will more closely monitor team activities through meeting agendas and minutes. A project progress report along with the draft of the project report will be mandatory for the midterm for students in IET 4960.

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

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

Finding: Target was not met.

Analysis: In AC 2018-2019, the target was met. In AC 2018-2019, 23 out of 23 (100%) students met the target rating with respect to the ability to communicate effectively in EET 4940. Based on the analysis of the AC 2018-2019 results, students presented mock presentations prior to their final presentations. Faculty provided feedback on the visual and oral presentation aspects prior to the final presentation.

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As a result of the changes, in AC 2019-2020, the target was not met. In AC 2019-2020, 13 out of 17 (76%) of the students are rated at least 80 out of 100 on checklist-based assessment on oral presentation. The group of four students that did not achieve the target rating did not participate in the practice session of oral presentation.

Decision: In AC 2019-2020, the target was not met. Based on the analysis of the AC 2019-2020 results, and to drive the cycle of improvement, faculty will implement the following changes in AC 2020-2021. It will be mandatory for all groups to participate in the mock presentation. The mock presentations will be graded, and students will be provided with feedback from the faculty. These changes will improve the student's ability in oral communication. This will allow them to learn proper technical report preparation following the accepted writing style thereby continuing to push the cycle of improvement forward.

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

Measure 5.2. Every spring semester, upon submission of capstone project reports in IET 4960, ET faculty evaluate students with respect to their ability to write 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 80% of IET students rated at least 80 out of 100 on checklist-based assessment of the written project report.

Finding: Target was not met.

Analysis: In AC 2018-2019, the target was met. In AC 2018-2019, 23 out of 23 (100%) students were rated at least 80% on the final project report. Based on the analysis of the AC 2018-2019 results, faculty clearly communicated the responsibilities of team leaders. Faculty encouraged work to be evenly distributed among the team members without overwhelming any one member.

As a result of the changes, in AC 2019-2020, the target was not met. In AC 2019-2020, the overall results showed 14 out of 18 (78%) of the students were rated at least 80 out 100 on the checklist-based assessment of the written project report. One project team of four students failed to be rated at least 80% however, they were rated at 78%. This team had several meetings with the instructor of the course before the lockdown because of the pandemic. Communication among members was severely impacted by the COVID 19 pandemic.

Decision: In AC 2019-2020, the target was not met. Based on the analysis of the AC 2019-2020 results, and to drive the cycle of improvement, the following changes will be implemented in AC 2020-2021. All groups will be required to submit a mid-semester project report adhering to the guidelines. This report will be incorporated into the course midterm grade. Faculty will provide feedback on the quality of the contents and formatting of the report. A written responsibility of team leaders/members will be made

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available in Moodle with periodic reminders about it sent to students. Faculty will also provide feedback on the quality of the contents and formatting of the final draft at least two weeks prior to the due date to provide students ample time for addressing changes and comments.

Comprehensive Summary of the Key Evidence (AC 2019-2020)

The following section outlines the comprehensive summary of actions taken to drive continuous improvement towards the attainment of students learning outcomes taken in AC 2018-2019.

- Using the IET 4700 rotary project as the new Measure 1.1.
- Faculty feedback on the technical portion of the written report was expanded.
- An expanded version of the relevant technical literature review was added.
- Key points of the project (scope, constraints, and assumptions) were emphasized during team meetings.
- Possible alternative models, plans, and designs were added as a requirement to the written report.
- Measure 2.1 was tied to IET 3510 semester projects.
- Measure 2.2 was mapped to IET 4700.
- The instructor of IET 4720 added multiple examples of control charts with their analyses.
- Videos were added to the course material for students to have reinforcement of concepts.
- Faculty offered online tutoring sessions to help students affected by COVID-19 displacement.
- The instructor of IET 3510 added multiple examples of ergonomics in action in the workplace.
- Faculty led consultation sessions to help students successfully complete their assignments.
- Faculty put emphasis on being punctual for the timed experiments in order to have time to complete the assignment.
- Faculty more clearly defined roles and responsibilities of team members and team leaders at the start of the courses.
- Faculty required team meeting agendas and meeting minutes to be communicated to the course instructor.
- A reelection of the team leader was introduced.
- Students presented mock presentations prior to their final presentations.
- Faculty provided feedback on the visual and oral presentation aspects prior to the final presentation.
- Faculty clearly communicated the responsibilities of team leaders.
- Faculty encouraged work to be evenly distributed among the team members without overwhelming any one member.

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Plan of action moving forward

As a part of continuous improvement, the following action plans were identified for AC 2020-2021.

- A timed team project approach to the projects will be implemented instead of the individual project assignments.
- A separate section – named “Scope of the Project” – will be added to the “Introduction” section of the report. Two separate subsections – “Assumptions Made” and “Project Constraints” – will be made mandatory under the “Methodology” section of the report.
- Students will be asked to save all preliminary concepts and designs of the solution to allow them to compare the proposed solutions to alternate solutions in their report.
- Equations and calculations will be mandatory in the report and will follow proper writing style.
- Pertinent literature will be cited in the text and reference section.
- The instructor of IET 3510 will place an increased emphasis on project expectations at the time of project assignment.
- An additional requirement of a mid-progress report will be instituted. This report will outline the project status along with the completion of data collection.
- Faculty will produce video instructions showing some calculations and control charts similar to assignments.
- Students will be provided with additional examples with which they may practice.
- Faculty will provide more instructions and alternative software before assignments.
- Current guidelines for the assignment processes will be revised to alleviate confusion.
- A properly formatted example final report will be given to the students.
- Faculty will alter project parameters to represent a higher level of rigor in the projects.
- All groups will be required to use Microsoft Teams (or similar software) for the projects.
- Team roles will be discussed further, stressing the importance of proper communication for team members and delegation for team leaders.
- A mid-year peer evaluation will be introduced. This evaluation will be a confidential survey administered to every student in which they will assess peers’ performance with respect to their project requirements.
- A project progress report along with the draft of the project report will be mandatory for the midterm for students in IET 4960.
- It will be mandatory for groups to participate in mock presentations.
- The mock presentations will be graded, and students will be provided with feedback from the faculty.
- Groups will be required to submit a mid-semester project report adhering to the guidelines. This report will be incorporated into the course midterm grade.

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- Faculty will provide feedback on the quality of the contents and formatting of the report.
- A written responsibility of team leaders/members will be made available in Moodle with periodic reminders about it sent to students.
- Faculty will provide feedback on the quality of the contents and formatting of the final draft at least two weeks prior to the due date to provide students ample time for addressing changes and comments.