

**Program: Bachelor of Science (BS), Electronics Engineering Technology (141)**

**Department of Engineering 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 nonprofit sectors, and promotes economic development and enrichment of the communities we serve.

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

**Purpose:** The Bachelor of Science in electronics engineering technology program will prepare students to: 1) analyze, test, build, operate, and maintain electronic systems, and 2) manage, maintain, and install low voltage/power systems, automation, and controls. It prepares students for entry-level positions in government or 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 Electronics 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 Electronics 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 2022-2023 showed that some targets were met or exceeded and, in other cases, not met. Most of the student performance indices for all SLOs were found to be satisfactory. For those assessments where the targets are not met, action plans were devised and will be implemented 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.

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

**Measure 1.1.** Every spring semester, students in EET 2350 are graded using a rubric measuring their ability to design Integrator Circuits. The acceptable target is 80% of students scoring 12 out of 16 (75%) 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 the AC 2022-

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2023 results, the faculty made the following changes in 2023-2024. The instructor worked with every student to ensure they completed their assignments on time in terms of designing more comprehensive projects and problems in integrator circuits, ADC, and DAC interfacing circuits.

As a result of these changes, in 2023-2024, the target was met. In AC 2023-2024, 19 out of 21 (86%) students scored at least 12 out of 16 (75%) on the rubric-based assessment of their integrator circuit.

**Decision:** Based on the analysis of AC 2023-2024, the faculty will implement the following changes in 2024-2025 to drive the cycle of improvement. The instructor will guide students in person through their first performance of the theoretical design and analysis of circuits using Algebra and Calculus and then use the MultiSim simulation program to verify their calculations experimentally. The instructor will request students apply more extensive use of Multisim in the analysis of circuit systems.

**Measure 1.2.** Every fall semester, students in EET 4310 are graded using rubrics designed to measure their ability to design FM receivers. The acceptable target is 80% of students scoring 9 out of 12 (75%) on the rubric-based assessment of the semester project.

**Finding:** Target was met.

**Analysis:** In AC 2022-2023 the target was met. Based on the analysis of the AC 2022-2023, the faculty made the following changes in 2023-2024 to drive the cycle of improvement. The instructor mandated that students submit written status reports on semester projects at the end of the 12th week of the semester. The instructor gave feedback and extra lectures to students based on these interim reports. The instructor sent a reminder email to students on the 14th week of the semester about the upcoming deadline for the semester project and encouraged them to submit the final semester report on time.

As a result of these changes in AC 2023-2024, the target was met. In AC 2023-2024, 5 out of 6 (83.3%) students scored at least 9 out of 12 (75%) on the rubric-based assessment of the assignment on the design of FM receivers. The students are still struggling with practical examples.

**Decision:** Based on the analysis of AC 2023-2024, the faculty will implement the following changes in AC 2024-2025 to drive the cycle of improvement. The instructor will include new topics on FM communication with wider applications. The instructor will explain the new materials with more practical examples. More exercises will be given during class time and instantaneous feedback will be provided for the students to accelerate learning. These changes will improve the students' ability to complete semester projects on or before the due date, thereby continuing to push the cycle of improvement forward.

**SLO 2. Ability to conduct standard tests, measurements, and experiments and to**

**analyze and interpret the results to improve processes(ETAC of ABET Outcome 4).**

**Measure 2.1.** Every spring semester, students in EET 2351 are graded using a rubric designed to measure their ability to design Op-Amp Circuits. The acceptable target is 80% of students scoring 12 out of 16 (75%) on rubric-based assessment of projects.

**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 made the following changes in 2023-2024. The instructor illustrated a powerful principle called the divide and conquer method.

As a result of the changes in AC 2023-2024, the target was met. In AC 2023-2024, 18 out of 22 (82%) students scored at least 12 out of 16 (75%) on the rubric-based assessment of lab assignments on the analysis and design of op-amps circuits. The students still struggle with theory analysis.

**Decision:** Based on the analysis of AC 2023-2024, the faculty will implement the following changes in 2024-2025 to drive the cycle of improvement. In AC 2024-2025, the instructor will introduce more computer simulations to demonstrate the theory. The instructor will teach students using Multisim AC voltage and current meters to measure the power gain of circuit systems. This change will improve the troubleshooting skills of the students.

**Measure 2.2.** Every fall semester, students in EET 4311 are graded using rubrics designed to measure the ability to design an FM Modulator. The acceptable target is 80% of students scoring 9 out of 12 (75%) on rubric-based assessment of projects.

**Finding:** Target was met.

**Analysis:** In AC 2022-2023, the target was met. Based on the results of the AC 2022-2023 assessment, the faculty made the following changes in AC 2023-2024. The following strategies were implemented to drive the cycle of improvement. The instructor put more emphasis on design topics required to obtain the optimal solution for FM modulator design. Students were asked to submit a rough draft during the 12th week of the semester about this important lab project to get feedback from the instructor. This has provided an opportunity for students to take corrective actions on their data collection, tests, measurements, experiments, analysis, and interpretation.

As a result of these changes in AC 2023-2024, the target was met. Five out of 6 (83.3%) of the students scored at least 9 out of 12 (75%) on the rubric-based assessment of FM Modulator design. The timing of the lab was on the 15<sup>th</sup> week of the semester, and the students had no problems handling the increased technical rigor of the lab. One of the students did not submit the report in due time because of personal difficulties. Students are still struggling with time management.

**Decision:** Based on the analysis of AC 2023-2024, the faculty will implement the following changes in AC 2024-2025 to drive the cycle of improvement. In the 2024-2025 academic year, the instructor will conduct this experiment just after the mid-term. Students will submit their

draft reports to the instructor for review at least two weeks before the final submission. Toward the end of the semester, the instructor will remind students weekly about the draft report submissions and offer technical assistance for report writing.

**SLO 3. Ability to design systems, components, or processes meeting specified needs for broadly defined engineering problems appropriate to the discipline (ETAC of ABET Outcome 2).**

**Measure 3.1.** Every fall semester, students in EET 4311 are graded using rubrics designed to measure their ability to design FM Modulator. The acceptable target is 80% of students scoring 9 out of 12 (75%) on rubric-based assessment of laboratory assignments.

**Finding:** Target was met.

**Analysis:** In AC 2022-2023, the target was met. Based on the results of the AC 2022-2023 assessment, in AC 2023-2024, the faculty made the following changes. The following strategies were implemented to drive the cycle of improvement. The instructor first prepared students for this lab by introducing the concepts of FM modulator circuits in the theory class (EET 4310) with examples before assigning the lab exercise. The rigor of the project was increased as well by including design components for a high-efficiency FM Modulator.

As a result of these changes in AC 2023-2024, the target was met. In AC 2023-2024, 5 out of 6 (83.3%) of the students scored at least 9 out of 12 (75%) on the rubric-based assessment of AM Modulator design. One of the students did not submit the report in due time because of personal difficulties. One student failed to submit the assignment at all. The students are still struggling with theory comprehension.

**Decision:** Based on the analysis of AC 2023-2024, the faculty will implement the following changes in AC 2024-2025 to drive the cycle of improvement. During the lab experiment, the instructor will review the theory once more and address the experiment results individually.

**Measure 3.2.** Every spring semester, students in EET 4351 are graded using a rubric designed to measure their ability to design Two-way Traffic Controllers with PLCs. The acceptable target is 80% of students scoring 9 out of 12 (75%) on the rubric-based assessment of the project.

**Finding:** The target was met.

**Analysis:** In AC 2022-2023, the target was met. Based on the results of the AC 2022-2023 assessment, in AC 2023-2024, the faculty made the following changes. The following strategies were implemented to drive the cycle of improvement. The project included the implementation of timers and counters which they learned over the first ten weeks of the semester. The instructor also required grammar and spelling checks for the final laboratory project report.

As a result of these changes, in AC 2023-2024, the target was met. In AC 2023-2024, 6

out of 6 students (100%) of the students scored at least 9 out of 12 (75%) on the rubric-based assessment of the project “Design of Two-way Traffic Controllers using PLCs.”

**Decision:** Based on the analysis of AC 2023-2024, the faculty will implement the following changes in AC 2024-2025 to drive the cycle of improvement. The instructor will allow one complete laboratory session for the students to work on the semester project. The instructor will assist students with questions. These changes will broaden the students’ ability to implement new devices using PLCs, thereby continuing to push the cycle of improvement forward.

### **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 spring semester, the instructor of the course rates students in EET 4950 based on their ability and skill as a member or a leader of the team using a checklist-based review survey. The instructor uses 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 on the checklist-based survey.

**Finding:** The target was met.

**Analysis:** In AC 2022-2023, the target was met. Based on the analysis of the AC 2022-2023 results, the faculty has 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 included 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 met with 6 out of 6 (100%) of EET students receiving more than 80% score thus meeting the criteria. However, one IET student, who scored 70%, joined late with a group of EET students in the Spring 2024 semester. This student had not been registered in the previous semester due to personal circumstances, leading to miscommunication and issues with group integrity.

**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. If a student registers for Project Design II (EET 4950 or IET 4960) after a year/semester break, the instructor will ensure the student fully understands the ongoing projects and that the existing group members communicate clearly with the new member.

**Measure 4.2.** 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 using a checklist-based peer-review survey. The acceptable target is that 80% of EET students are rated at least 20 out of 25 on a checklist-based peer-review survey.

**Finding:** The target was met.

**Analysis:** In AC 2022-2023, the target was met. Based on the analysis of AC 2022-2023, the faculty made the following changes in AC 2023-2024. 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 2023-2024, the target was met. Six out of 6 (100%) of the students were rated at least 20 out of 25 (80%) on the checklist-based peer-review survey. Students still struggle with group responsibility at times.

**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.

**SLO 5. Ability to apply written, oral, and graphical communication in broadly defined technical and non-technical environments; and an ability to identify and use appropriate technical literature (ETAC of ABET Outcome 3).**

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

**Finding:** The 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

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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 the changes, the target was met in AC 2023-2024. In AC 2023-2024, 6 out of 6 (100%) of the students were rated at least 80 out of 100 (80%) on the checklist-based assessment of an oral presentation by the ET faculty. Students did struggle with keeping their presentations fresh and interesting.

**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 EET 4950, 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 EET students rated at least 80 out of 100 (80%) on the checklist-based assessment of the written project report.

**Finding:** The 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, 6 out of 6 (100%) of the students scored at least 80 out of 100 (80%) on the checklist-based assessment of the written project report. Students struggled with proper grammar and some content related material.

**Decision:** Based on the analysis of the AC 2023-2024 results and to drive the cycle of improvement, the following changes will be implemented in AC 2024-2025. 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 Key evidence of seeking improvement based on the analysis of the results.** Program faculty made several decisions after examining the results of data analysis from AC 2022-2023 which resulted in improved student learning and program improvement in AC 2023-2024.

- In EET 2350 (SLO 1.1), the instructor worked with every student to ensure they



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completed their assignments on time in terms of designing more comprehensive projects and problems in integrator circuits, ADC, and DAC interfacing circuits.

- In EET 4310, (SLO 1.2), the instructor mandated that students submit written status reports on semester projects at the end of the 12<sup>th</sup> week of the semester. The instructor gave feedback and extra lectures to students based on these interim reports. The instructor sent a reminder email to students on the 14<sup>th</sup> week of the semester about the upcoming deadline for the semester project and encouraged them to submit the final semester report on time.
- In EET 2351 (SLO 2.1), the instructor illustrated a powerful principle called the divide and conquer method.
- In EET 4311 (SLO 2.2), the instructor put more emphasis on design topics required to obtain the optimal solution for FM modulator design. Students were asked to submit a rough draft during the 12<sup>th</sup> week of the semester about this important lab project to get feedback from the instructor. This provided an opportunity for students to take corrective actions on their data collection, tests, measurements, experiments, analysis, and interpretation.
- In EET 4311 (SLO 3.1), the instructor first prepared students for this lab by introducing the concepts of FM modulator circuits in the theory class (EET 4310) with examples before assigning the lab exercise. The rigor of the project was increased as well by including design components for a high-efficiency FM Modulator.
- In EET 4351 (SLO 3.2), the project included the implementation of timers and counters, which they learned over the first ten weeks of the semester. The instructor also required grammar and spelling checks for the final laboratory project report.
- In EET 4950 (SLO 4.1), to ensure group coherence and efficient teamwork performance, the faculty has 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 included 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 EET 4940 (SLO 4.2), 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.

- In EET 4940 (SLO 5.1), 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.
- In EET 4950 (SLO 5.2), 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

- In EET 2350 (SLO 1.1), the instructor will guide students in person through their first performance of the theoretical design and analysis of circuits using Algebra and Calculus and then use the MultiSim simulation program to verify their calculations experimentally.
- In EET 4310 (SLO 1.2), the instructor will include new topics on FM communication with wider applications. The instructor will explain the new materials with more practical examples. More exercises will be given during class time and instantaneous feedback will be provided for the students to accelerate learning.
- In EET 2351 (SLO 2.1), the instructor will introduce more computer simulations to demonstrate the theory. The instructor will teach students using Multisim AC voltage and current meters to measure the power gain of circuit systems.
- In EET 4311 (SLO 2.2), the instructor will conduct this experiment just after the mid-term. Students will submit their draft reports to the instructor for review at least two weeks before the final submission. Toward the end of the semester, the instructor will remind students weekly about the draft report submissions and offer technical assistance for report writing.
- In EET 4311 (SLO 3.1), the instructor will review the theory once more during the lab experiment and address the experiment results individually.
- In EET 4351 (SLO 3.2), the instructor will allow one complete lab time for the students to work on the semester project. The instructor decides to assist the students if they have any questions. These changes will broaden the students' ability to implement new devices using PLCs thereby continuing to push the cycle of improvement forward.
- In EET 4950 (SLO 4.1), 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 EET 4940 (SLO 4.2), 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 EET 4940 (SLO 5.1), the students will be encouraged to attend professional and academic conferences for oral and/or poster presentations before their final presentation in the ET department.
- In EET 4950 (SLO 5.2), 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.