BS Engineering Technology/Electronics 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 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.

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, andcontrols. It prepares students for entry positions in government ore 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 onassuring 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 Outcome1).

Measure 1.1. Every spring semester, students in EET 3340 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 2021-2022, the target was met. Based on the analysis of the AC 2021-

2022 results, the faculty made the following changes in 2022-2023. The instructor guided 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.

As a result of these changes, in 2022-2023, the target was met. In AC 2022-2023, 11 out of 13 (85%) students scored at least 12 out of 16 (75%) on the rubric-based assessment of their integrator circuit. The results showed a slight decrease relative to those of AC 2021-2022 which can be attributed to the failure of two students in AY 2022-2023 who were not able to complete all assignments.

Decision: Based on the analysis of AC 2022-2023, the faculty will implement the following changes in 2023-2024 to drive the cycle of improvement. The instructor will work with every student to ensure the complete their assignments on time in terms of designing more comprehensive projects and problems in integrator circuits, ADC, and DAC interfacing circuits.

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 2021-2022, the target was met. Based on the analysis of the AC 2021-2022, the faculty made the following changes in 2022-2023 to drive the cycle of improvement. The instructor included new topics on FM communication with wider applications. The instructor explained the new materials with more practical examples. The students were provided with resources such as handouts and PowerPoint presentations (during class lectures and for their independent study). More exercises were given during class time and instantaneous feedback was provided for the students to accelerate learning.

As a result of these changes in AC 2022-2023, the target was met. In AC 2022-2023, 8 out of 9 (88.9%) students scored at least 9 out of 12 (75%) on the rubric-basedassessment of the assignment on the design of FM receivers.

Decision: Based on the analysis of AC 2022-2023, the faculty will implement the following changes in AC 2023-2024 to drive the cycle of improvement. The instructor will mandate that students submit written status reports on semester projects at the end of the 12th week of the semester. The instructor will give feedback and extra lectures to students based on these interim reports. The instructor will send a reminder email to students on the 14th week of the semester about the upcoming deadline for the semester project and encourage them to submit the final semester report on time. 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 3341 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 2021-2022, the target was met. Based on the analysis of the AC 2021-2022 results, the faculty made the following changes in 2022-2023. The instructor put more emphasis on the skill/knowledge required to reach the solution on the amplifier, adder, integrator, and differentiator problems. The instructor introduced more computer simulations to demonstrate the theory. The instructor spent more time explaining the relevant mathematics behind the theory. Students were provided with more practical lab assignments to facilitate their understanding of the concepts and methods related to the actual lab assignments.

Because of these changes in AC 2022-2023, the target was met. In AC 2022-2023, 11 out of 13 (85%) 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.

Decision: Based on the analysis of AC 2022-2023, the faculty will implement the following change in 2023-2024 to drive the cycle of improvement. In AC 2023-2024, the instructor will illustrate a powerful principle called the divide and conquer method. 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 ability to design 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 2021-2022, the target was met. Based on the results of the AC 2021-2022 assessment, in AC 2022-2023, the faculty made the following changes. The following strategies were implemented to drivethe cycle of improvement. The instructor continued the practice of pre-lab briefings which included safety items. The instructor asked students to compute relevant parameters and then set up the experiments to collect the data to compare with the calculation.

As a result of these changes in AC 2022-2023, the target was met. Eight out of nine (88.9%) 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 15th week of the semester, and the students had no problems handling the increased technical rigor of the lab.

Decision: Based on the analysis of AC 2022-2023, the faculty will implement the following

changes in AC 2023-2024 to drive the cycle of improvement. In AC 2023-2024, the instructor will put more emphasis on design topics required to obtain the optimal solution for FM modulator design. Students should submit a rough draft during the 12th week of the semester about this important lab project to get feedback from the instructor. This will provide an opportunity for students to take corrective actions on their data collection, tests, measurements, experiments, analysis, and interpretation. These changes will improve the students' ability to complete the lab report on or before the 15th week of the semester thereby continuing to push the cycle of improvement forward.

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 AM 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 2021-2022, the target was met. Based on the results of the AC 2021-2022 assessment, in AC 2022-2023, the faculty made the following changes. The following strategies were implemented to drive the cycle of improvement. The instructor asked the students to compute the necessary parameters needed for the lab. The instructor made necessary changes in the handout for emphasizing the design aspects of the AM modulator to measure the maximum and minimum voltages of the AM envelope and to compare with the computational values. The instructor continued the practice of pre-lab briefing (including safety) and a standardized format for the formal laboratory report.

As a result of these changes in AC 2022-2023, the target was met. In AC 2022-2023, 8 out of 9 (88.9%) of the students scored at least 9 out of 12 (75%) on the rubric-based assessment of AM Modulator design.

Decision: Based on the analysis of AC 2022-2023, the faculty will implement the following changes in AC 2023-2024 to drive the cycle of improvement. The instructor will first prepare students for this lab by introducing the concepts of AM modulator circuits in the theory class (EET 4310) with examples before assigning the lab exercise. The rigor of the project will also be increased by including design components for a high efficiency AM Modulator.

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 2021-2022, the target was met. Based on the results of the AC 2021-2022 assessment, in AC 2021-2022, the faculty made the following changes. The following

strategies were implemented to drive the cycle of improvement. Students were advised to become familiar with the applications of various PLC instructions to develop programs within eight weeks and dedicate the rest of the semester to completing and testing the project. During one-half of the lab time, the instructor will explain the full project to the students. In addition to this extra time of help in the laboratory, the instructor will allow the students to use the entire lab time in the final week to finish the final project on time.

As a result of these changes, in AC 2022-2023, the target was met. In AC 2022-2023, 7out of 7 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 2022-2023, the faculty will implement the following changes in AC 2023-2024 to drive the cycle of improvement. The project will include the implementation of timers and counters which they will learn about within ten weeks. The instructor will also make grammar and spell check mandatory for the final laboratory project report. 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 (ETACof 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 80% of students are rated at least 20 out of 25 on the checklist-based survey.

Finding: The target was met.

Analysis: In AC 2021-2022, the target was met. Based on the analysis of AC 2021-2022, the faculty made the following changes in AC 2022-2023. Clearly defined roles and responsibilities of the team members as well as the leader of the team were developed, distributed, and explained to the students at the beginning of the semester. The students were reminded again after four weeks. Communicationchannels (proper procedure) were established for the team members to notify the instructor of any conflicts in the group and/or stagnancy in project progress so that the instructor could mediate the situation in a timely manner.

As a result of these changes in 2022-2023, the target was met. Seven out of seven (100%) of the students were rated at least 20 out of 25 (80%) on the checklist-based peer-review survey.

Decision: In AC 2022-2023, the target was met. Based on the analysis of AC 2022- 2023, the faculty will implement the following changes in AC 2023-2024 to drive the cycle of improvement. The students will be 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 (proper procedure) will be

established for the team members to notify the instructor of any conflicts that developed within the group including any situation that has caused the project to reach a standstill. All groups will be required to use WebEx or similar software for the projects. This will allow them to learn and experience how to be an effective member or leader of a technical project team.

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 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 2021-2022, the target was met. Based on the analysis of AC 2021-2022, the faculty made the following changes in AC 2022-2023. Clearly defined roles and responsibilities of the team members as well as the leader of the team were developed, distributed, and explained to the students at the beginning of the semester. The students were reminded again after four weeks. Communication channels (proper procedure) were established for the team members to notify the instructor of any conflicts in the group and/or stagnancy in project progress so that the instructor could mediate the situation in a timely manner.

As a result of these changes in 2022-2023, the target was met. Fourteen out of fourteen (100%) of the students were rated at least 20 out of 25 (80%) on the checklist-based peer-review survey.

Decision: In AC 2022-2023, the target was met. Based on the analysis of AC 2022- 2023, the faculty will implement the following changes in AC 2023-2024 to drive the cycle of improvement. The students will be 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 (proper procedure) will be established for the team members to notify the instructor of any conflicts that developed within the group including any situation that has caused the project to reach a standstill. All groups will be required to use WebEx or a similar online meeting platform for the projects. This will allow them to learn and experience how to be an effective member or leader of a technical project team.

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 2021-2022, the target was met. Based on the analysis of AC 2021-2022 results, the faculty implemented the following changes in AC 2022-2023 to drive the cycle of improvement. Each team had to make their presentation template ready by the midterm. All the sections of the presentation that the team could complete were prepared and submitted to the instructor for feedback. The instructor of the course made the guidelines for the presentation available to the students in the first week of the semester. This helped all groups to perform better in both the oral presentations and the written final reports.

As a result of the changes, the target was met in AC 2022-2023. In AC 2022-2023, 14 out of 14 (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. There were minor comments regarding the attire of some of the students. In addition, no teams implemented all the comments and feedback provided by the faculty during the practice run. It was also felt that the teams could have used better PowerPoint skills in their presentation.

Decision: Based on the analysis of the AC 2022-2023 results and to drive the cycle of improvement, faculty will implement the following changes in AC 2023-2024: (1) teams will be notified that business casual attire is accepted attire while business formal attire is recommended for presentation, (2) teams will be penalized harder for not addressing all the comments/suggestions provided by the faculty during the practice run, and (3) teams will be asked to add audio-video aids and get feedback from the instructor in a timely manner to enhance the quality of the presentation.

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 2021-2022, the target was met. The faculty made the following changesin AC 2022-2023 to drive the cycle of improvement. The students were required to submit the draft report three weeks before the final presentation. Then, the faculty provided feedback on the quality of the contents and formatting of the final draft at least two weeks before the due date to ensure the students had ample time for addressing changes and comments.

As a result of the changes in AC 2022-2023, the target was met. In AC 2022-2023, the overall results were that 7 out of 7 (100%) of the students were rated at least 80 out of 100 (80%) on the checklist-based assessment of the written project report.

Decision: Based on the analysis of AC 2022-2023 results, the faculty will implement the following changes in AC 2023-2024 to drive the cycle of improvement. To ensure that the students have made the required corrections in the project reports as indicated by the

instructor and other faculty reviewers, they must submit them to the instructor for one final review by the instructor before the final submission. This will allow them to learn commitment to quality and improvement on technical report preparation thereby continuing to push the cycle of improvement forward.

Comprehensive Summary of Key evidence of seeking improvement based on the analysis of the results. Program faculty made several decisions after examiningthe results of data analysis from AC 2021-2022 which resulted in improved student learning and program improvement in AC 2022-2023.

- In EET 3340 (SLO 1.1), the instructor guided students through their first attempts at performing 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 included new topics on FM communication with wider applications. The instructor explained the new materials with more practical examples. The students were provided with resources such as handouts and PowerPoint presentations (during class lectures and for their independent study). More exercises were given in class time and instantaneous feedback was provided for the students to accelerate learning.

- In EET 3341 (SLO 2.1), the instructor put more emphasis on the skill/knowledge required to reach the solution on the amplifier, adder, integrator, and differentiator problems. The instructor introduced more computer simulations to demonstrate the theory. The instructor spent more time explaining the relevant mathematics behind the theory. Students were provided with more practical lab assignments to help their understanding of the concepts and methods related to the actual lab assignments.

- In EET 4311 (SLO 2.2), the instructor employed the use of prelab briefings which included safety items. The instructor asked students to compute relevant parameters and then set up the experiments to collect the data to compare with the calculation.

- In EET 4311 (SLO 3.1), the instructor asked the students to compute the necessary parameters needed for the lab. The instructor made necessary changes in the handout for emphasizing the design aspects of the AM modulator to measure the maximum and minimum voltages of the AM envelope and to compare with the computational values. The instructor employed the use of prelab briefing (including safety) and a standardized format for the formal laboratory report.

- In EET 4351 (SLO 3.2), students were advised to become familiar with the applications of various PLC instructions to develop programs within eight weeks and dedicate the rest of the semester to completing and testing the project. In one-

half of lab time, the instructor explained the full project to the students. In addition to this extra time of help in the laboratory, the instructor allowed the students to use the entire lab time in the final week to finish the final project in time.

- In EET 4950 (SLO 4.1), clearly defined roles and responsibilities of the team members, as well as the leader of the team, were developed, distributed, and explained to the students at the beginning of the semester. The students were reminded again after four weeks. Communicationchannels (proper procedure) were established for the team members to notify the instructor of any conflicts in the group and/or stagnancy in project progress so that the instructor can mediate the situation in a timely manner.

- In EET 4940 (SLO 4.2), clearly defined roles and responsibilities of the team members, as well as the leader of the team, were developed, distributed, and explained to the students at the beginning of the semester. The students were reminded again after four weeks. Communication channels (proper procedure) were established for the team members to notify the instructor of any conflicts in the group and/or stagnancy in project progress so that the instructor can mediate the situation in a timely manner.

- In EET 4940 (SLO 5.1), each team had to make their presentation template ready by the midterm. All the sections of the presentation that the team could complete were prepared and submitted to the instructor for feedback. The instructor of the course made the guidelines for the presentation available to the students in the first week of the semester. This helped all groups to perform better in both the oral presentations and the written final reports.

- In EET 4950 (SLO 5.2), the students were required to submit the draft report three weeks before the final presentation. Then, the faculty provided feedback on the quality of the contents and formatting of the final draft at least two weeks before the due date to ensure the students had ample time for addressing changes and comments.

Plan of action moving forward

- In EET 3340 (SLO 1.1), the instructor will coordinate with every student to complete 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 will mandate students submit written status reports on semester projects at the end of the 12th week to get some extra time. The instructor will give feedback and extra lectures to students based on these interim reports. The instructor will send a reminder email on the 14th week to students about the upcoming deadline for the semester project to submit the final semester report in due time. 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.

- In EET 3341 (SLO 2.1), the instructor will illustrate a powerful principle called the divide and conquer method. This change will improve the troubleshooting skills of the students.

- In EET 4311 (SLO 2.2), the instructor will put more emphasis on design topics required to obtain the optimal solution for FM modulator design. Students will submit a rough draft during the 12th week of the semester about this important lab project to get feedback from the instructor. This will provide an opportunity for students to take corrective actions on their data collection, tests, measurements, experiments, analysis, and interpretation. These changes will improve the students' ability to complete the lab report on or beforethe 15th week, thereby continuing to push the cycle of improvement forward.

- In EET 4311 (SLO 3.1), the instructor will first prepare students for this lab by introducing the concepts of AM modulator circuits in the theory class (EET 4310) with examples before assigning the lab exercise. The rigor of the project will also be increased by including design components for a high efficiency AM Modulator.

- In EET 4351 (SLO 3.2), the project will be expanded to include the implementation of timers and counters which they will learn within ten weeks. The instructor will also make grammar and spell check mandatory for the laboratory project report. 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 students will be 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 (proper procedure) will be established for the team members to notify the instructor of any conflicts that developed within the group including any situation that has caused the project to reach a standstill. All groups will be required to use WebEx or similar software for the projects. This will allow them to learn and experience how to be an effective member or leader of a technical project team.

- In EET 4940 (SLO 4.2), the students will be 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 (proper procedure) will be established for the team members to notify the instructor of any conflicts that developed within the group including any situation that has caused the project to reach a standstill. All groups will be required to use WebEx or similar software for the projects. This will allow them to learn and experience how to be an effective member or leader of a technical project team.

- In EET 4940 (SLO 5.1), (1) teams will be notified that business casual attire is accepted attire while business formal attire is recommended for presentation, (2) teams will be penalized harder for not addressing all the comments/suggestions provided by the faculty during the practice run, and (3) teams will be asked to add audio-video aid and get feedback from the instructor in a timely manner to enhance the quality of the presentation.

- In EET 4950 (SLO 5.2), to ensure that the students have made the required corrections in the project reports as indicated by the instructor and other faculty reviewers, they must submit a draft report to the instructor for one final review by the instructor before the final submission. This will allow them to learn commitment to quality and improvement on technical report preparation thereby continuing to push the cycle of improvement forward.