

**NORTH CAROLINA AGRICULTURAL AND TECHNICAL
STATE UNIVERSITY**

**Program Assessment and Improvement Report
Department of Applied Engineering Technology**

Bachelor of Science in Automotive Engineering Technology

One full-time faculty (tenure-track) and two part-time instructors deliver the program. Located in the College of Science and Technology, it follows university's guidelines for assessing educational programs. Our BS in Automotive Engineering Technology (AMET) program is accredited by ATMAE (Association of Technology, Management, and Applied Engineering).

1. Expected Outcomes for the Educational Program and Its Student Learning Outcomes

a. Program Outcomes

- (1) The BS program in Automotive Engineering Technology will offer a curriculum that promotes mastery of engineering technology competencies and prepare students for success in transforming society through innovation and technology leadership.
- (2) The BS program in Automotive Engineering Technology will enhance the intellectual productivity of faculty to support instruction and create innovative and responsible solutions to global challenges.

b. Student Learning Outcomes

- (1) Communication Skills. Students will exhibit effective communication skills (written, oral, and interpersonal) appropriate for professionals in this field of study.
- (2) Critical Thinking Skills. Students will effectively use quantitative and qualitative analytical problem-solving skills appropriate for professionals in this field of study.
- (3) Disciplinary Expertise. Students will demonstrate a level of discipline-specific expertise (knowledge, skills, and professionalism) appropriate for professionals in this field of study.
- (4) Research/Creative Engagement. Students will demonstrate ability to engage productively in the review and conduct of disciplinary research appropriate for professionals in this field of study.

2. Analysis of Expected Program Outcomes Assessment

a. Program Outcomes

The two program outcomes for the BS in Applied Engineering Technology are summarized in **Table 1**, showing the relationship between the outcomes, the assessment, the results, and the improvements made. A more detailed narrative follows the table.

Table 1: Program Outcomes, Assessments, and Improvements

Name of Program	Program Outcome	Method of Assessment	Results of Assessment	Use of Assessment Results for Improvement
BS in Automotive Engineering Technology	The BS program in Automotive Engineering Technology will offer a curriculum that promotes mastery of engineering technology competencies and prepare students for success in transforming society through innovation and technology leadership.	The primary measures of this outcome include enrollment, retention rate, graduation rate, and student placement.	Table 1.a shows the enrollment trend, retention and graduation rates, and student placement.	The program's name was changed from Motorsports Technology to Automotive Engineering Technology in Fall 2019. A curriculum revision was made during 2019-2020. The revised curriculum will be effective in Fall 2020.
	The BS program in Automotive Engineering Technology will enhance the intellectual productivity of faculty to support instruction and create innovative and responsible solutions to global challenges.	This outcome is measured by the level of intellectual productivity of the faculty, including referred publications, submitted proposals, and funded projects.	Table 1.b lists the number of referred publications, submitted proposals (number and funding amount), and funded projects (number and funding amount).	The program will hire more full-time faculty and encourage mentoring new faculty to enhance the ability to obtain external funding.

- (1) *The BS program in Automotive Engineering Technology will offer a curriculum that promotes mastery of engineering technology competencies and prepare students for success in transforming society through innovation and technology leadership.*

Measures of this outcome are student success data including enrollment trend, number of degrees awarded, first year retention rate, 5 Years graduation rate, and student placement data is from graduating senior survey. Please refer to **Table 1.a** for AMET student success data since AY 2016-2017. The enrollment for the Motorsports Technology/Automotive Engineering Technology program has been low. In AY2018-2019, the name of the program was changed from Motorsports Technology (MTSP) to Automotive Engineering Technology. Promotion of the renamed program was undertaken during AY2019-2020. Early enrollment data in Spring 2020 has shown significant enrollment growth after the renaming and rebranding of the program. The Retention Rate and Graduation Rate have been increased gradually in the recent three academic years.

Table 1.a: Automotive Engineering Technology Student Success Data

Academic Year	2016-2017	2017-2018	2018-2019	2019-2020
Enrollment	33	33	26	30
Degrees Awarded	4	3	4	N.A.
Retention Rate (%)	66.7	51.9	82.4	117.6
Graduation Rate (%)	33.3	28.6	45.8	48.1
Placement (%)	100	100	100	N.A.

(Enrollment number is from the Fall semester in the academic year under the program name Motorsports Technology (2016-2020) and Automotive Engineering Technology (Fall 2019 only). Retention Rate is first year retention rate. Graduation Rate is 5 Years graduation rate. Student Placement data is from graduating senior survey.)

- (2) *The BS program in Automotive Engineering Technology will enhance the intellectual productivity of faculty to support instruction and create innovative and responsible solutions to global challenges.*

This outcome is measured by the level of intellectual productivity of the faculty. **Table 1.b** lists six intellectual productivity items from the AMET faculty since AY 2017-2018, where other publications include book chapters, conference articles, technical reports etc. Intellectual productivity has increased almost in all categories in the recent three academic years. The MTSP/AMET program did not have a full-time faculty until Fall 2019. The program had been supported by three part-time instructors. This had a negative impact on the program. The first full-time tenure-track faculty in AMET was hired in Fall 2019. More AMET full-time tenure-track faculty will be hired in the following years to support and grow the program.

Table 1.b: Automotive Engineering Technology Faculty Intellectual Productivity

Academic Year	2017-2018	2018-2019	2019-2020*
Journal Publications	0	0	1 (in progress)
Other Publications	0	0	0
Submitted Proposals	0	0	2
Requested Funding	0	0	\$1,373,892
Funded Projects	0	0	0
Funded Amount	0	0	0

*: Data as of March 2020.

b. Student Learning Outcomes (SLOs)

The four student learning outcomes (SLOs) for the BS in Automotive Engineering Technology program are summarized in **Table 2**, showing the relationship between the outcomes, the assessment and results, and the improvements made. More detailed narrative follows the table.

Table 2. Student Learning Outcomes, Assessments, and Improvements

Name of Program	Student Learning Outcome	Method of Assessment	Results of Assessment	Use of Assessment Results for Improvement
BS in Automotive Engineering Technology	Communication Skills. Students will exhibit effective communication skills (written, oral, and interpersonal) appropriate for professionals in this field of study.	This SLO is assessed annually by directly measuring the final project report in AET 445. The target score of 80% of class would score 80% or better on the assignment was set as the threshold to measure whether the outcome is met. The outcome is that students will demonstrate proficiency in communicating technical information to a diverse audience.	Results for the Spring semester in recent academic years are shown in Table 3.	
	Critical Thinking Skills. Students will effectively use quantitative and qualitative analytical problem-solving skills appropriate for professionals in this field of study.	This SLO is assessed annually by directly measuring the class project in AET 445. The target score of 80% of class would score 80% or better on the assignment was set as the threshold to measure whether the outcome is met. The outcome is that students will be able to identify engineering technology problems and develop technology-based solutions.	Results for the Spring semester in recent academic years are shown in Table 3.	
	Disciplinary Expertise. Students will demonstrate a level of discipline-specific	This SLO is assessed annually by directly measuring an exam problem in AET 445. The target	Results for the Spring semester in recent academic	

expertise (knowledge, skills, and professionalism) appropriate for professionals in this field of study.	score of 80% of class would score 80% or better on the assignment was set as the threshold to measure whether the outcome is met. The outcome is that students will be able to apply technical knowledge and modern tools to solving emerging engineering technology problems.	years are shown in Table 3.	
Research/Creative Engagement. Students will demonstrate ability to engage productively in the review and conduct of disciplinary research appropriate for professionals in this field of study.	This SLO is assessed annually by directly measuring an exam problem in AET 445. The target score of 80% of class would score 80% or better on the assignment was set as the threshold to measure whether the outcome is met. The outcome is that students will be able to apply research methods in engineering technology, including research design, data analysis, and interpretation.	Results for the Spring semester in recent academic years are shown in Table 3.	

Table 3 summarizes the consolidated results for Student Learning Outcome 1-4 in the spring semester in recent academic years. The process is continuing, and data collection and analysis is performed annually in the spring semester.

Table 3: Consolidated Results for Student Learning Outcomes – Percentage Meeting Benchmark

Academic Year	SLO1 Communication Skills	SLO2 Critical Thinking Skills	SLO3 Disciplinary Expertise	SLO4 Research/Creative Engagement
2017-2018*	69%	77%	77%	85%
2018-2019	63%	57%	77%	67%
2019-2020**	N.A.	N.A.	N.A.	N.A.

*: Data from AET 392.

**.: Data will be available by the end of the Spring 2020 semester.

(1) Communication Skills. Students will exhibit effective communication skills (written, oral, and interpersonal) appropriate for professionals in this field of study.

This SLO is assessed annually in the spring semester by directly measuring the final project report in AET 445. The target score of 80% of class would score 80% or better on the assignment was set as the threshold to measure whether the outcome is met. The outcome is that students will demonstrate proficiency in communicating technical information to a diverse audience.

Table 3 shows that performance in Communication Skills did not meet the outcome expectation in AY2018-2019. Students may need additional exposure to skills necessary to prepare written and oral communications for specific audiences.

(2) *Critical Thinking Skills. Students will effectively use quantitative and qualitative analytical problem-solving skills appropriate for professionals in this field of study.*

This SLO is assessed annually in the spring semester by directly measuring the class project in AET 445. The target score of 80% of class would score 80% or better on the assignment was set as the threshold to measure whether the outcome is met. The outcome is that students will be able to identify engineering technology problems and develop technology-based solutions.

Table 3 shows that performance in Critical Thinking Skills did not meet the outcome expectation in AY2018-2019. Students may need additional assistance with transitioning from theoretical applications to practical hands-on applications.

(3) *Disciplinary Expertise. Students will demonstrate a level of discipline-specific expertise (knowledge, skills, and professionalism) appropriate for professionals in this field of study.*

This SLO is assessed annually in the spring semester by directly measuring an exam problem in AET 445. The target score of 80% of class would score 80% or better on the assignment was set as the threshold to measure whether the outcome is met. The outcome is that students will be able to apply technical knowledge and modern tools to solving emerging engineering technology problems.

Table 3 shows that performance in Disciplinary Expertise did not meet the outcome expectation in AY2018-2019. Students may need additional assistance for quantitative assignments that require computations to determine budgeted costs, etc.

(4) *Research/Creative Engagement. Students will demonstrate ability to engage productively in the review and conduct of disciplinary research appropriate for professionals in this field of study.*

This SLO is assessed annually in the spring semester by directly measuring an exam problem in AET 445. The target score of 80% of class would score 80% or better on the assignment was set as the threshold to measure whether the outcome is met. The outcome is that students will be able to apply research methods in engineering technology, including research design, data analysis, and interpretation.

Table 3 shows that performance in Research/Creative Engagement did not meet the outcome expectation in AY2018-2019. Students may need additional assistance with assessments when it pertains to evaluating criteria and making decisions or finding solutions to problems.

3. Evidence of Program and SLO Improvements Using the Results of the Assessment (Closing the Loop)

a. Program Outcomes

(1) *The BS program in Applied Engineering Technology will offer a curriculum that promotes mastery of engineering technology competencies and prepare students for success in transforming society through innovation and technology leadership.*

The program faculty meets on a regular basis to solicit input for improvement strategies and/or report recommended changes. Curriculum enhancement is a regular topic at our faculty meetings, where faculty recommendations requiring formal curriculum changes to the catalog are considered and approved by the department faculty. We also collected inputs from the Department Advisory Board as well as the senior exit interviews conducted by the College's Office of Student Success in Spring 2019.

Table 4. Changes in the AMET Curriculum (Effective Fall 2020)

Course	Issue	Change
Gen Ed (HIST 106, PSYC 101, SPCH 250, PHIL 201)	Gen Ed courses are too specific	Change to any approved AA/ SBS/ HFA/GL electives
AET 110	Need to prepare students for a digital world, avoid duplication in CoST	Replace with CGT121
AET 202	Need to prepare students for a digital world, avoid duplication in CoST	Replace with CGT124
AET 281	Avoid duplication in CoST	Replace with MATH224
AET 311 (elective)	Prereq: Senior Standing and AET 395	Change prereq to Math 224
AET 312	Lab course with two credits (differ from AET 211), no prereq	Change to one credit, add AET 211 as the prereq.
AET 392	Title is too long (Statics for Tech Major), description needs update, no prereq	Change to Applied Statics, update description, PHYS 225 as prereq
AET 395	Prereq: Junior Standing, too vague Name is too long	Add Prereq MATH 224 Change name to Quality Control
AET 421 (elective)	Prereq: Junior Standing, too vague	Add Prereq MATH224 or AET 281
AET 492	Title is too long (Mech. of Materials for Tech. Major), description needs update	Change title to Applied Mechanics of Materials, update description
AET 493	Title is too long (Fund. of Dynamics and Kinetics for Technology Major), description needs update	Change title to Applied Dynamics, update description
AET Electives	Electives are specific to AET courses and concentrate in the senior year	Allow more open electives, spread them out in Junior and Senior years
AET 500 Capstone	One semester (3 credits) is too short for some projects, course number 500 is not in line with university policy	Create AET 470 and 480 (Capstone Project I and II, 2 credits each, in two semesters) to replace AET 500

The changes in the AMET curriculum as shown in **Table 4** were approved by the faculty and will be effective in Fall 2020. In addition to changes in specific courses in the AET curriculum shown in Table 4, some program-wide changes were initiated with input from students, alumni, and the Department Advisory Board. These changes are related

to the general education courses in the curriculum. In the current AET curriculum, each general education course is limited to one specified course, such as HIST 106 for Student Learning Outcome in knowledge of African American culture and history. However, the university approved a list of courses for each general education Student Learning Outcome. Students should have more flexibility in choosing general education courses. This will help students with their scheduling and will improve retention rate and graduate rate.

Results of evaluation processes for student outcomes are regularly reviewed and systematically employed as drivers for program improvement. We are also continuously evaluating the efficacy of our assessment processes to determine when improvements in process or measures might also enhance and improve our ability to assess achievement of outcomes.

- (2) *The BS program in Automotive Engineering Technology will enhance the intellectual productivity of faculty to support instruction and create innovative and responsible solutions to global challenges.*

This program needs more full-time faculty. The program will hire more full-time tenure-track faculty and encourage mentoring new faculty to enhance the ability to obtain external funding.

b. Learning Outcome Improvements

- (1) *Communication Skills. Students will exhibit effective communication skills (written, oral, and interpersonal) appropriate for professionals in this field of study.*

Students did not meet the expected student learning outcome. Students may need additional exposure to skills necessary to prepare written and oral communications for specific audiences. This may be improved by assigning one short presentation to hone delivery skills for students individually before they begin group projects. Faculty should provide guidelines to assist students with limited research and allow class participation to create one short presentation to hone delivery skills for students individually before they begin group projects. The improvement results will be analyzed and reported by the end of Spring 2020 semester.

- (2) *Critical Thinking Skills. Students will effectively use quantitative and qualitative analytical problem-solving skills appropriate for professionals in this field of study.*

Students did not meet the expected student learning outcome. Students may need additional assistance with transitioning from theoretical applications to practical hands-on applications. Faculty may assign additional case study to quantitatively evaluate

project, objectives, and deliverables. Faculty may also incorporate additional in-class interactive exercises to assist students in critical thinking along with synthesis of project management materials. The improvement results will be analyzed and reported by the end of Spring 2020 semester.

(3) Disciplinary Expertise. Students will demonstrate a level of discipline-specific expertise (knowledge, skills, and professionalism) appropriate for professionals in this field of study.

Students did not meet the expected student learning outcome. Students may need additional assistance for quantitative assignments that require computations to determine budgeted costs, etc. Faculty can assign research paper that provides opportunities for student(s) to gain exposure and research appropriate and relevant sources. For example, faculty may select one technical paper from a scientific/technical journal and require research and identification of appropriate sources. The improvement results will be analyzed and reported by the end of Spring 2020 semester.

(4) Research/Creative Engagement. Students will demonstrate ability to engage productively in the review and conduct of disciplinary research appropriate for professionals in this field of study.

Students did not meet the expected student learning outcome. Students may need additional assistance with assessments when it pertains to evaluating criteria and making decisions or finding solutions to problems. Faculty may assign group assessment to initiate creative engagement and to drive research on a small scale. Faculty may also expand semester team project evaluations to bridge the semester and require students to research the semester project and present findings of research to the class. The improvement results will be analyzed and reported by the end of Spring 2020 semester.

Submitted by,
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March 27, 2020