NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

Program Assessment and Improvement Report
Department of Applied Engineering Technology

Bachelor of Science in Applied Engineering Technology

Five full-time faculty (three are tenured or tenure-track) and five 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 AET program is accredited by the Engineering Technology Accreditation Commission of ABET (http://www.abet.org) and 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 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.
(2) The BS program in Applied 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 Applied Engineering Technology	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 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.	Major curriculum revision and course changes were made during 2019-2020. The revised curriculum and courses will be effective in Fall 2020.
	The BS program in Applied 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 encourage mentoring new faculty to enhance the ability to obtain external funding.

(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.

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 AET student success data since AY 2016-2017. Enrollment peaked at 151 in AY2017-2018. In AY2018-2019, the program awarded the greatest number of degrees. The Retention Rate and Graduation Rate have been increased gradually in the recent three academic years.

Table 1.a: Applied Engineering Technology Student Success Data

Academic Year	2016-2017	2017-2018	2018-2019	2019-2020
Enrollment	146	151	147	119
Degrees Awarded	37	31	46	27
Retention Rate (%)	66.7	51.9	82.4	117.6
Graduation Rate (%)	33.3	28.6	45.8	48.1
Placement (%)			53.8	

(Enrollment number is from the Fall semester in the academic year. 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 Applied 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 AET 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.

Table 1.b: Applied Engineering Technology Faculty Intellectual Productivity

Academic Year	**2017-2018**	**2018-2019**	**2019-2020***
Journal Publications	8	11	8
Other Publications	4	5	7
Submitted Proposals	2	3	9
Requested Funding	$ 329,564	$ 430,000	$ 2,433,126
Funded Projects	0	1	2
Funded Amount	$ 0	$ 280,000	$ 44,220

*: Data as of March 2020.

b. Student Learning Outcomes (SLOs)

The four student learning outcomes (SLOs) for the BS in Applied 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 Applied 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 a capstone class project in AET 500 Capstone Class. 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.	Some students had no concept of utilizing the APA structure. This is an area in need of improvement, for example, including a brief lecture on APA styling in the syllabus and learning topics. This may help student improve in reference citing and listing. Students will be familiar with the APA styling.
	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 conceptual design report in AET 500 Capstone Class. 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.	Students need more industry-driven projects. Students may garner more knowledge while working with real-world problems of industry. The program has been working with several industry partners to develop real-world industry problems and raise financial support for projects.
	Disciplinary Expertise. Students will demonstrate a level of discipline-specific expertise (knowledge,	This SLO is assessed annually by directly measuring the technical portion of the project in	Results for the spring semester in recent academic years are shown in Table 3.	The timeframe of one semester for students to complete their projects presented a challenge to

	skills, and professionalism) appropriate for professionals in this field of study.	AET 500 Capstone Class. 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.		25% of the groups. The capstone course will be extended to two semesters in our new curriculum effective Fall 2020.
	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 the project prototype document in in AET 500 Capstone Class. 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.	The program should bring industry-driven projects into the classroom for the students to explore. It was recommended that establishing memberships and participation in on-campus student chapters of organizations such as American Society for Quality (ASQ) should be encouraged. An ASQ student chapter at N.C. A&T has been approved and is expected to be fully operational in Fall 2020.

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

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	100%	90%	100%	90%
2018-2019	100%	100%	100%	100%
2019-2020*	N.A.	N.A.	N.A.	N.A.

*: Data for AY2019-2020 will be available at the end of 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 by directly measuring the final project report in a capstone class project in AET 500 Capstone Class. 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 exceeded the outcome expectation.

(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 by directly measuring the conceptual design report in AET 500 Capstone Class. 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 exceeded the outcome expectation in the past two academic years.

(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 by directly measuring the technical portion of the project in AET 500 Capstone Class. 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 exceeded the outcome expectation in the past two academic years.

(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 by directly measuring the project prototype document in in AET 500 Capstone Class. 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 exceeded the outcome expectation in the past two academic years.

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 AET Curriculum (Effective Fall 2020)

Course	Issue	Change
MATH 131 and 132	Same as traditional engineering, stay true to our mission of applied approach to engineering education	Change to MATH 110 and 131
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 276	Prereq: Sophomore Standing, too vague Course title is not clear (Introduction to PLC's)	Change prereq to CST 112 Change course title to "Programmable Logic Controller"
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 (elective)	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 441	Prereq AET 496 is not offered, description needs update	Change prereq to AET 293, update course description
AET 484	Prereq: senior Standing, too vague	Change prereq to AET 276
AET 492 (elective)	Title is too long (Mech. of Materials for Tech. Major), description needs update	Change title to Applied Mechanics of Materials, update description
AET 493 (elective)	Title is too long (Fund. of Dynamics and Kinetics for Technology Major), description needs update	Change title to Applied Dynamics, update description
AET Electives (elective)	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

After the AY2018-2019 assessment cycle, the changes in the AET curriculum as shown in **Table 4** were approved by the faculty and will be effective in Fall 2020. For example, to increase enrollment, the MATH requirement has been revised. 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 Applied Engineering Technology will enhance the intellectual productivity of faculty to support instruction and create innovative and responsible solutions to global challenges.

While the publication productivity of the faculty is excellent, the funded research part needs improvement. The program has decided to 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.

Although students exceeded expectations in Communication Skills overall, it was observed that some students had no concept of utilizing the APA structure. This is an area in need of improvement, for example, including a brief lecture on APA styling in the syllabus and learning topics. This may help student improve in reference citing and listing. Students will be familiar with the APA styling.

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

The various projects undertaken by the students required critical thinking skills highlighting a focus on problem-solving and planning. We need more industry-driven projects, e.g., bringing in industry-driven projects into the classroom for the students to explore. This will expose students to current technical challenges in industry. A partnership with industry leaders might allow students to develop and employ new engineering technology graduates when working to solve problems or create new opportunities. Students may garner more knowledge while working with real-world problems of industry. The program has been working with several industry partners to develop real-world industry problems and raise financial support for projects.

(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 showed great interest and enthusiasm in working on practical projects. It was observed that the timeframe (one semester) given students to complete their respective projects presented a challenge to 25% of the groups. The recommendation that the AET 500 course should be extended from one semester to two semesters has been implemented in our new AY2020 curriculum (two new 2-hour courses AET 470 and AET 480).

(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.*

All assignments were done in a timely manner as requested. The program should bring industry-driven projects into the classroom for the students to explore. The rubric category related to productivity, work standards and costs would be affected most by a collaboration with industry. It was recommended that establishing memberships and participation in on-campus student chapters of organizations such as American Society for Quality (ASQ) should be encouraged. An ASQ student chapter at N.C. A&T has been approved and is expected to be fully operational in Fall 2020.

Submitted by,
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