

AC 2010-2261: IMPLEMENTATION OF A SYSTEMATIC OUTCOMES ASSESSMENT PLAN TO ENSURE ACCOUNTABILITY AND CONTINUOUS IMPROVEMENT IN A NON-TRADITIONAL ELECTRONICS ENGINEERING TECHNOLOGY PROGRAM

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Implementation of a Systematic Outcomes Assessment Plan to Ensure Accountability and Continuous Improvement in a Non-Traditional Electronics Engineering Technology Program

Abstract

The value of regional and professional accreditation is well established in the educational community and the literature¹. Establishing an effective outcome assessment plan has been an important part of the accreditation process for virtually every educational institution. The outcome assessment process is a very crucial source of input to the institution's continuous improvement program. It provides a metric against which the institution can assess its performance. It helps assure all stakeholders, students, faculty, and prospective employers of the value of this form of education. Most importantly, it provides a continuing reminder to the faculty of the professional goals of technology education, and provides a guidepost for the degree of rigor needed in coursework.

Accreditation is perhaps even more valuable at a non-traditional institution such as Excelsior College. The ABET-accredited BS in Electronics Engineering Technology (BSEET) degree program offered by Excelsior College is designed for adult learners who want to improve career prospects and expand individual horizons, but need a flexible learning format that enables learners to study at an individual pace and rate. This model of education equips successful students to further their careers through enhanced knowledge, understanding, and application of what was learned to their work environments. The differences among the credit sources recognized by Excelsior are self-explanatory as follows:

- Credits from regionally accredited institutions
- Credits for ACE/PONSI approved courses
- Credits through Exams - CLEP, DANTE, EC
- Credits through assessed certifications, training, and examinations
- Credits through Extra Institutional Learning process
- Credits through EC portfolio assessment for prior learning
- Credits from not regionally accredited institutions
- Credits earned through online courses at EC and preferred providers

The ease of integration of credits earned from various sources, absence of residency requirements, along with non-punitive transcripts might be misconstrued to mean that that EC is an easy place to gain a degree. In order to avoid any misconception, Excelsior has developed a system of checks and balances in the form of appropriate and robust policies, procedures, and mechanisms that make the EC an outstanding alternative education provider.

This paper describes the evolving assessment plan used by the School of Business and Technology at Excelsior College to assess student performance at three layers of attainable outcomes, program educational objectives, program outcomes, and TAC ABET Criteria. Multiple assessment tools consist of a capstone course, used as the direct measure of student

learning outcomes, post-graduation surveys, and a supervisor survey. Assessment results and lesson learned will also be presented in this paper.

Introduction

About Excelsior College (EC). Higher education in general struggles to keep up with the changes that are occurring at a lightning speed around us. In order to realign itself with these changes, higher education must be innovative in the areas of openness, connectedness, personalization, participation, as well as the infrastructure of teaching and learning. Openness is the key ingredient that enables innovation and improvement in the quality, accountability, affordability, and accessibility of higher education².

With this goal of increased openness in mind, Excelsior College (EC) in Albany, New York, was founded in 1971 by the New York State Board of Regents, and was originally known as Regents College. In 1998, it was granted a charter to operate as a private, independent college and changed its name to Excelsior College in 2001. Currently, it has approximately 33,000 enrolled students and is one of the most respected distance learning institutions in higher education.

Recognizing that there are many adult learners who have acquired their knowledge and capabilities through experiences other than formal classroom learning, at the center of the Excelsior College mission and strategic plan is the idea of “What you know is more important than where or how you learned it.” To that end Excelsior College has designed a model that is student centered and responsive to the needs of career-oriented adult learners at a distance.

Student profile. Excelsior College (EC) has a diverse student population, with 89% of the student body located outside of New York where the College is headquartered. Presented in Table 1 is a brief overview of the student profile at EC.

Table 1. Excelsior College Student Profile

Enrolled students	30813
Military	71.6%
Average age	39.4
Women	55.8%
Men	44.1%
Students of color	35%
Residence (Out-of-State)	88.3%

Specialized accreditation. Accreditation is perhaps even more valuable at a non-traditional institution such as Excelsior. The accreditation process is a very crucial source of input to the institution’s continuous improvement program. It provides a metric against which the institution can assess its performance. It helps assure all stakeholders, students, faculty, and prospective employers, of the value of this form of education. Most importantly, it provides a continuing reminder to the faculty of the professional goals of technology education, and provides a guidepost for the degree of rigor needed in coursework.

The College is accredited by the Commission on Higher Education of the Middle States Association of Colleges and Schools. All its programs are approved by the New York State Education Department and its examinations are recognized by the American Council on Education (ACE). The School of Business and Technology at Excelsior College offers a variety of degree programs, two that are accredited by TAC of ABET (Note: ABET is a non-profit organization that accredits United States postsecondary degree programs in applied science, computing, engineering, and technology.) They are the baccalaureate degree programs in Electronics Engineering Technology and Nuclear Engineering Technology.

Outcomes Assessment at SBT. The program level assessment is conducted at each representative school with close collaboration with the Office of Outcome Assessment. All programs should have a mechanism for their continuous monitoring and improvement. The Continuous Improvement Committee (CIC) at SBT performs this function, with the following composition and responsibilities:

- The CIC is comprised of a Chair, appointed by the Dean, Lead Faculty Members of the Business and Technology Faculty, Dean, Associate Dean, Program Directors, Director of Program Development and Assessment, and individuals as appointed by the Dean
- The CIC is a standing subcommittee of the Business and Technology Faculty
- It is responsible for reviewing various assessment tools and recommending and evaluating improvements needed in Business and Technology programs
- It continuously assesses the quality of the Business and Technology academic programs and directs improvements as needed

Assessment Plan for the BSEET Program

The academic progress of each individual student is subject to a periodic review. Per Excelsior College Program Evaluation Policy, each academic program at Excelsior College shall undergo a 5-year review cycle. In supporting this systematic review process, this annual assessment plan is developed to track and document results pertaining to the program level student outcomes. Ongoing review procedures related to the assessment of student learning are documented in the Institutional Assessment Plan of Student Learning (IAPSL). Under the College's assessment framework, the School of Business and Technology develop an assessment plan that incorporates a systematic process to measure the achievement of four interrelated categories of student learning outcomes – program educational objectives (PEOs), TAC ABET Criterion 3 Program Outcomes, and program outcomes (POs).

BSEET Program Outcomes. The program outcomes of the Bachelor of Science in Electronics Engineering Technology (BSEET) program are reviewed periodically by the Dean of the School of Business and Technology, Program Director, the BSEET Faculty and BSEET Industrial Advisory Committee. Ultimately, it is the BSEET Faculty that has the responsibility for revision of the program outcomes. However, the cyclical review of the program outcomes by the Industrial Advisory Committee provides the faculty with a dynamic way to identify and revise program outcomes that periodically become incongruent due to changes in technologies, economy, population characteristics, etc., as well as to act upon new opportunities to meet the stated program outcomes. The BSEET program has the

following program outcomes which are statements that describe what students are expected to know and be able to do by the time of graduation.

1. Demonstrate a fundamental knowledge of natural sciences, including physics.
2. Demonstrate the ability to measure, and provide quantitative expressions of natural science phenomena, including experimentation, observation, and accurate measurement.
3. Apply the fundamentals of algebra, trigonometry, and calculus to problem solving in Electronics technology areas.
4. Make oral technical presentations in English using language appropriate to the audience.
5. Demonstrate proficiency in the written communication of technical information using Standard English.
6. Demonstrate a working knowledge of computer usage, including knowledge of one or more computer languages or documentation of the use of one or more computer software packages for technical problem solving appropriate to the Electronics engineering technology discipline.
7. Demonstrate technical competency in electronics, circuit analysis, digital electronics, electronic communications, microprocessors, and systems.
8. Integrate knowledge of the functional areas of electronics engineering technology.
9. Demonstrate the ability to analyze, apply design concepts, and implement systems as appropriate to electronics engineering technology.
10. Participate effectively in groups, and apply project management techniques as appropriate to complete assignments.
11. Demonstrate an ability to understand professional, ethical and social responsibilities, including the impacts of culture, diversity, and interpersonal relations.
12. Demonstrate a commitment and ability to continue to engage in lifelong learning.
13. Demonstrate a commitment to quality, timeliness, and continuous improvement.

Direct Measure of Program Outcomes. The primary direct assessment of program outcomes to determine the level of achievement is through the Integrated Technology Assessment (ITA) Capstone. The ITA is the mandatory capstone assessment for all students in the program. This assessment requires students to address all of the outcomes of the program in a single coherent portfolio document. In preparing the ITA, students reflect on past academic and professional experiences and develop written narrative statements related to each program outcome. Documented evidence must be provided to substantiate that program outcomes have been met. This evidence can include term papers, tests, laboratory reports, homework or other class assignments, presentations given, and letters from employers or professors. The ITA is the most significant aspect of ensuring that program outcomes are achieved by all graduates.

The student must satisfactorily address each program outcome by developing appropriate learning statements and providing supporting evidence. The learning statements for each program outcome are graded on the following scale:

- 0 – Not Responsive to Outcome (Evidence not provided for relevant courses or experiences. Coursework and other examples not demonstrative of required

knowledge. The student will need to improve the learning statement and/or supporting evidence under the guidance of the instructor.)

- 1 – Minimally Responsive to Outcome (Presents appropriate course evidence with a few examples from coursework and a few connections between coursework and applications)
- 2 – Responsive to Outcome (Presents multiple examples of applications of advanced coursework, on the job, or in other life experiences)
- 3 – Highly Responsive to Outcome (Presents many detailed examples of applications to coursework, job, and other life experiences)

Example of acceptable supporting evidence. For purposes of the ITA, all evidence in support of a learning statement must be in the form of a document. Let us review some typical examples. Examples include a report that the student wrote that demonstrates his or her knowledge or competence; a circuit diagram, systems flow chart, entity-relation diagram or computer source code that the student developed; professional certificates or licenses that the student has earned; completed course assignments, lab reports, a term paper or an exam the student took; a letter of praise from the students manager or professor attesting to the students knowledge, competence or character. It should be emphasized that a college transcript that lists the courses and grades the student has taken is **NOT** evidence in itself. Let us look at some examples of learning statements from the IT program.

Indirect Measures of Program Outcomes. The level of achievement of program outcomes was also collected through the six months post-graduation, one year post-graduation and three years post graduation surveys. The aggregate responses for each question are analyzed and those responses below midpoint (3.5 on a 7-point Likert scale) or those that are significantly lower than the others are investigated further.

Benchmarks for the Attainment of Program Outcomes. Listed in the following are the articulated benchmarks set to evaluate the attainment of each program outcome:

1. Metric 1: The average score for ELEC 495 students' learning statements and supporting evidence for the related program outcome will be 2.0 (where grading scale is 0-3) or better.
2. Metric 2: The mean of the graduates' perceptions of their achievement on the related program outcome will be 3.5 or higher on a 7-point Likert-scale.

Program Educational Objectives. The following six program educational objectives were established to produce graduates who are prepared with the depth of knowledge, breadth of experiences and an attitude of professionalism that will enable them to:

1. Apply general and discipline specific concepts and methodologies to identify, analyze and solve technical problems.
2. Demonstrate an individual desire and commitment to remain technically current with,

- and adaptive to, changing technologies through continuous learning and self-improvement.
3. Demonstrate independent thinking, function effectively in team-oriented settings, and maintain a high level of performance in a professional/industrial environment.
 4. Communicate effectively in a professional/industrial environment.
 5. Perform ethically and professionally in business, industry and society.
 6. Attain increasing levels of responsibility and leadership in one's chosen career field.

Benchmarks for the Attainment of Program Educational Objectives. The achievement of program educational objectives is measured through the use of the one-year post-graduate survey, the three-year-post graduate survey, and a supervisor survey. Benchmarks to evaluate the attainment of each program educational objectives are listed in the following:

1. Metric 1: The mean of the graduates' perceptions of their achievement on the related program educational objectives will be 3.5 or higher on a 7-point Likert-scale.
2. Metric 2: The mean of the supervisors' perceptions of the graduates' achievement of the related program educational objectives will be 3.5 or higher on a 7-point Likert-scale.

Evaluation of TAC ABET Criterion 3 Program Outcomes. The achievement of TAC of ABET Criterion 3 program outcomes is measured through the level of the achievement of the related program outcomes. Annually, the Continuous Improvement Committee will review the results and make recommendation and adoption of changes to address any resulting concerns. The relationship between the TAC of ABET Criterion 3 program outcomes is provided in Appendix A.

Evaluation TAC ABET Program Criteria Outcomes. The achievement of TAC of ABET Program outcomes is measured through the level of the achievement of the related program outcomes. Annually, the Continuous Improvement Committee will review the results and make recommendation and adoption of changes to address any resulting concerns. The relationship between the TAC of ABET Program Criteria Outcomes is provided in Appendix B.

Evaluation of BSEET Program Outcomes. The level of achievement of the program outcomes is determined by collecting, analyzing, and evaluating the ITA performance data and the data obtained by the surveys. The Continuous Improvement Committee is responsible for biannually reviewing the ITA data and annually analyzing the survey data and evaluating how well students are achieving the program outcomes. Recommendations based upon these evaluations are made by the CIC to the program faculty.

The Evaluation of BSEET Program Educational Objectives. The level of achievement of the program educational objectives is determined by collecting, analyzing and evaluating the survey results. The Continuous Improvement Committee is involved in formulating the assessment tools and in annually evaluating the assessment data. Recommendations based upon evaluation of assessment data are made by the CIC to the program faculty.

Assessment Results - Academic Year 2008 -2009 (AY 2009)

Presented in this section is an overview of the results from the assessment of the students' attainment of program outcomes in AY 2009.

Program Outcome Assessment Results. Presented in Table 2 is a summary of the results of the achievement of each program outcome.

Table 2. BSEET Program Outcome Assessment Results

Program Outcomes	Related TAC of ABET Criterion Program Outcomes (CPO) TAC of ABET Program Criteria Outcomes (PC)	Metric 1 (ELEC 495)	Metric 2 (Alumni Surveys)
1	CPO: a, b, f PC: AAS-b, BS-a	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome 1 is 2.5 (out of 3.0 scale).	The mean of graduates' perceptions of their achievement of program outcome 1 is 5.58 (out of 7.0 scale).
2	CPO: a, c, f PC: AAS-a, BS-a	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome 2 is 2.5 (out of 3.0 scale).	The mean of graduates' perceptions of their achievement of program outcome 2 is 5.27 (out of 7.0 scale).
3	CPO: a, b, c, f PC: AAS-b, BS-c	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome 3 is 2.0 (out of 3.0 scale).	The mean of graduates' perceptions of their achievement of program outcome 3 is 5.55 (out of 7.0 scale).
4	CPO: g PC: BS-a, BS-b	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome 4 is 3 (out of 3.0 scale).	The mean of graduates' perceptions of their achievement of program outcome 4 is 5.50 (out of 7.0 scale).
5	CPO: g PC: BS-a, BS-b	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome 5 is 2.5 (out of 3.0 scale).	The mean of graduates' perceptions of their achievement of program outcome 5 is 5.50 (out of 7.0 scale).
6	CPO: a, b, c, f PC: AAS-a, BS-a, BS-b	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome	The mean of graduates' perceptions of their achievement of program outcome 6 is 4.38 (out of 7.0

		6 is 2.5 (out of 3.0 scale).	scale).
7	CPO: a, b, c, d, f, g PC: AAS-a, AAS-b, BS-b	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome 7 is 2.5 (out of 3.0 scale).	The mean of graduates' perceptions of their achievement of program outcome 7 is 5.67 (out of 7.0 scale).
8	CPO: a, b, c, d, f PC: BS-a, BS-b	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome 8 is 2.0 (out of 3.0 scale).	The mean of graduates' perceptions of their achievement of program outcome 8 is 5.83 (out of 7.0 scale).
9	CPO: c, d, f PC: AAS-a, BS-a	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome 9 is 2.5 (out of 3.0 scale).	The mean of graduates' perceptions of their achievement of program outcome 9 is 5.72 (out of 7.0 scale).
10	CPO: e, g, i, j, k PC: BS-a, BS-b	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome 10 is 2.5 (out of 3.0 scale).	The mean of graduates' perceptions of their achievement of program outcome 10 is 6.08 (out of 7.0 scale).
11	CPO: i, j PC: AAS-c	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome 11 is 2.5 (out of 3.0 scale).	The mean of graduates' perceptions of their achievement of program outcome 11 is 5.64 (out of 7.0 scale).
12	CPO: h PC: AAS-c	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome 12 is 2.5 (out of 3.0 scale).	The mean of graduates' perceptions of their achievement of program outcome 12 is 5.95 (out of 7.0 scale).
13	CPO: k PC: BS-b	The average score for ELEC 495 students' learning statements and supporting evidence for program outcome 13 is 2.5 (out of 3.0 scale).	The mean of graduates' perceptions of their achievement of program outcome 13 is 6.33 (out of 7.0 scale).

Overall analysis. Overall results indicate that program outcomes have been met. The results from the students' performance in ELEC 495 Integrated Technology Assessment indicated that the students had successfully provided evidence to demonstrate their competencies in achieving each of the program outcomes. In reviewing the results from the alumni surveys, it is indicated that the graduates, in general, rated themselves as either equal to be proficient or more than proficient in achieving most of the program learning outcomes (e.g., a rating

higher than 5.0 out of a 7.0 Likert scale).. Through the assessment of the related program outcomes, the results also indicated that the TAC of ABET Program Criterion Outcomes and TAC of ABET Program Criteria have been met.

Program Educational Assessment Result. Presented in Table 3 is a summary of the results of the achievement of each program educational objective.

Table 3. BSEET Program Educational Objectives (PEOs) Assessment Results

PEOs	Metric 1 (Alumni Surveys)	Metric 2 (Supervisor Survey)
1	The mean of the graduates' perceptions of their achievement of program educational objective 1 is 4.94 (out of 7.0 scale).	The mean of supervisors' perceptions of their achievement of program educational objective 1 is 6.04 (out of 7.0 scale).
2	The mean of the graduates' perceptions of their achievement of program educational objective 2 is 5.27 (out of 7.0 scale).	The mean of supervisors' perceptions of their achievement of program educational objective 2 is 5.73 (out of 7.0 scale).
3	The mean of the graduates' perceptions of their achievement of program educational objective 3 is 4.7 (out of 7.0 scale).	The mean of supervisors' perceptions of their achievement of program educational objective 1 is 6.91 (out of 7.0 scale).
4	The mean of the graduates' perceptions of their achievement of program educational objective 1 is 4.68 (out of 7.0 scale).	The mean of supervisors' perceptions of their achievement of program educational objective 1 is 4.77 (out of 7.0 scale).
5	The mean of the graduates' perceptions of their achievement of program educational objective 1 is 5.19 (out of 7.0 scale).	The mean of supervisors' perceptions of their achievement of program educational objective 1 is 5.83 (out of 7.0 scale).
6	The mean of the graduates' perceptions of their achievement of program educational objective 1 is 3.63 (out of 7.0 scale).	The mean of supervisors' perceptions of their achievement of program educational objective 1 is 5.43 (out of 7.0 scale).

Overall analysis. Overall results indicate that program educational outcomes have been met. In general, supervisors rate BSEET graduates as better than their peers on most items related to program outcomes. While graduates do not believe that Excelsior College provided them

with sufficient educational preparation in leadership skills, supervisors rated graduates as somewhat better to much better in those areas that contribute to leadership. While there are no direct items on the three-year graduate survey directly asking about leadership, many items on the survey are important to leadership abilities.

Lesson Learned

The results from the students' performance in ELEC 495 Integrated Technology Assessment indicated that the students had successfully provided evidence to demonstrate their competencies in achieving each of the program outcomes. In reviewing the three surveys, the results indicated that in general, the graduates rated themselves as either having achieved or highly achieved most of the program outcomes, and the supervisors rate BSEET graduates as better than their peers on most items related to program educational objectives.

In reviewing the assessment results, the Continuous Improvement Committee has identified the following issues concerning the designing and the administration of these measurements:

1. More formalized and precise metrics is needed to enhance the validity of the assessments.
2. These positive results, however, also imply that the standards in the assessment plan have been set too low. In order to provide more meaningful information for continuous program improvement, the assessment plan needs to be revised so that appropriate standards for assessing program outcomes are clearly defined.
3. In ELEC495, rubrics on the expected characteristics with each outcome are needed to enhance the consistency in the grading among the instructors.
4. A mixture of the six-month, three-year, and supervisor survey items where used to assess the achievement of the POs. Using this method makes it difficult to obtain an overall rating for each PO.
5. This survey is somewhat valid for assessing the program's POs; however, there were no survey items directly assessing achievement of POs. The survey items pertaining to the POs need to be reworded to enhance the content validity of the surveys.

Improvement Actions

This section summarizes the improvements on the assessment process implemented in the following academic year.

Improvement on the Program Outcome Assessment Plan AY 2009-2010. Recognizing that the assessment processes would benefit from more formalized and precise metrics, the School has formed a task force to develop, propose, and implement new performance criteria that meet this need. Specifically, the following are the improvements made on the proposed new assessment plan:

1. Multiple direct measures: in addition to the designated ELEC 495 learning statements, for most of the program outcomes, two course embedded assessments will be selected as additional direct measures of the associated program outcome.

2. More precise metrics: percentage data instead of average scores on the designated ELEC 495 assignments will be collected to more precisely capture the level of student achievement of each program outcome.
3. Well defined level of achievement: In the assessment plan for academic year 2008-2009, only the acceptable level of achievement had been defined. Levels of achievement (e.g., highly achieved, moderately achieved, and minimally achieved) are clearly defined in the assessment plan for academic year 2009-2010.
4. Longitudinal Perspective: assessment data collected from previous academic year (i.e., 2008-2009) will also be used and documented in the assessment report to evaluate the effectiveness of the changes made on the programs.

Improvement on ELEC 495, the capstone experience. To enhance the delivery of this portfolio assessment course, the following improvements has been made to ELEC 495 after reviewing the outcome results:

1. More precise grading rubric: the grading rubric has been modified to incorporate the characteristics of the achievement of each program outcome.
2. Enhanced interpersonal interactivities: a series of graded discussion topics were created to increase student-student and instructor-student interactivity and foster community building among all members in the course.

Improvement on the Survey Instruments. To address the issues related to the survey instruments, the Continuous Improvement Committee met with the EC Director of Outcome Assessment several times and redesigned these instruments in November 2008. Specifically, the following is the changes made on the new survey instruments:

1. Restructure the timing of the surveys: in the past, surveys were conducted at six months and three years post-graduation. The three-year survey included a component collecting contact information for employer supervisors for further surveying purposes. The decision was made to revise the surveys for administration at exit, one year, and three years post-graduation.
2. Add items for program educational objectives and program outcomes: questions directly addressing students' perspectives on their achievement of the program educational objectives and program outcomes have been added to the exit and one year post-graduation surveys (refer to the attached new surveys).
3. Add items related to program educational objectives to the supervisor survey.

Conclusion

Establishing an effective outcome assessment plan has been an important part of the accreditation process for virtually every educational institution. While it is crucial to use assessment data to demonstrate accountability to external accreditation agencies, the assessment data should also be utilized in an ongoing process to guide internal institutional improvement in programs and services⁸.

The management of SBT places a high premium on on-going self-assessment to monitor the rigor, quality, and effectiveness of each of its academic programs. With the on-going self-assessment, SBT not only assesses the results of program outcomes but also continuously evaluates its “assessment process” to establish a systematic and sustained assessment approach and create an assessment environment that is receptive, supportive and enabling.

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Appendix A: Relationship of Program Outcomes to Criterion 3 Program Outcomes

Excelsior College BSEET Program Outcomes	a. Mastery of Discipline	b. Apply current knowledge	c. Conduct/ analyze/ interpret experiments	d. Apply creativity in design	e. Function effectively on teams	f. Identify, analyze, solve technical problems	g. Communicate effectively	h. Lifelong Learning	i. Professional, ethical, social responsibilities	j. Diversity/ Contemporary issues	k. Quality, Timeliness, Continuous Improvement
1. Natural sciences including physics	X	X				X					
2. Provide quantitative expressions of natural science phenomena	X		X			X					
3. Algebra, trigonometry, and calculus	X	X	X			X					
4. Make technical presentations in English							X				
5. Technical information using English.							X				
6. Computer usage including knowledge of computer	X	X	X			X					
7. Technical competency in core	X	X	X	X		X	X				
8. Integrate functional areas	X	X	X	X		X					
9. Analyze, apply design concepts implement systems			X	X		X					
10. Participate in groups, and apply project management techniques					X		X		X	X	X
11. Professional, ethical and societal responsibilities									X	X	
12. Engage in lifelong learning.								X			
13. Quality, timeliness, and continuous improvement											X

Appendix B: Matrix 3 –Relationship of BSEET Program Outcomes to Program Educational Objectives

BSEET Program Outcomes	1. Apply general and EET concepts and methodologies to identify, analyze, and solve technical problems.	2. Demonstrate an individual desire and commitment to remain technically current with, and adaptive to, changing technologies through continuous learning and self-improvement.	3. Demonstrate independent thinking, function effectively in team-oriented settings, and maintain a high level of performance in a professional/industrial environment.	4. Communicate effectively in a professional/industrial environment.	5. Perform ethically and professionally in business, industry, and society.	6. Attain increasing levels of responsibility and leadership in one's chosen career field.
1. Natural sciences including physics	X					
2. Provide quantitative expressions of natural science phenomena	X					
3. Algebra, trigonometry, and calculus	X					
4. Make technical presentations in English			X	X		X
5. Technical information using English.				X		X
6. Computer usage including knowledge of computer	X					
7. Technical competency in core	X					
8. Integrate functional areas	X					
9. Analyze, apply design concepts implement systems	X					
10. Participate in groups, and apply project management techniques			X	X		X
11. Professional, ethical and societal responsibilities		X			X	X
12. Engage in lifelong learning.		X				X
13. Quality, timeliness, and continuous improvement		X			X	X