Southwest Tennessee Community College
Memphis, Tennessee

ACADEMIC AUDIT

Electrical/Electronic Fundamentals Technical Certificate

SELF STUDY REPORT

Submitted to the Tennessee Board of Regents
For an Academic Audit Review

Engineering Technologies
Southwest Tennessee Community College
5983 Macon Cove
Memphis, Tennessee

January 29, 2010
I. INTRODUCTION

The Technical Certificate in Electrical/Electronic Fundamentals (TCEF) program emphasizes the basic skills students need to begin careers in either the electrical or telecommunications engineering technology fields. Designed for high school graduates or those entering industry for the first time, the program covers six important areas. These areas include an introduction to electrical/electronic technology; engineering technology techniques; electric circuits; electronic circuits; CAD drawing; and computer systems installation, maintenance, and applications such as word processing and spreadsheets.

Candidates for entrance into the program may not already hold a degree in either the Electrical Design or Telecommunications concentration of the Electrical Engineering Technology program. Candidates must also meet the requirements of a first-time college student or transfer student. Candidates must take at least 15 of the 18 hours at Southwest to be awarded the certificate upon completion of the program. Appendix 1 includes a list of required courses with course descriptions included in Appendix 2. Students who complete this certificate program will be qualified to enter the Cooperative Education (Co-op) program and/or entry-level positions in industry. Many of the students continue their educations and earn their AAS degrees in Electrical Engineering Technology.

Certificate holders can work as technicians in any area involving electricity and electronics, for example: warehousing and distribution, automation control systems, medical electronics, networks and telephones, power generation and distribution, safety and security, design, production, and maintenance. Four of the six courses (CPET 1114, ELET 1110, TLET 1010, TLET 2233) in the certificate program will transfer to the Design or Telecommunications concentration of the Electrical Engineering Technology AAS degree.

The Technical Certificate in Electrical/Electronic Fundamentals (TCEF) was created to solve several problems that had arisen for students in the Electrical Engineering Technology (ELET) associate degree program. Many of the associate degree students take multiple years to earn their degree. Many have to drop out or take only one or two classes a semester due to family or work obligations. The technical certificate option gives these students a short term goal that can be achieved in two semesters. If the student does have to drop out of school, the student has the
option to achieve a TCEF certificate and gain the basic skills needed for an entry level job in a technical field. The technical certificate option not only provides a short term goal for students, but also strengthens their fundamental technical skills. ENTC 1124 provides the students with applied math skills and ENTC 1114 provides an introduction to electricity and electrical circuits. The two ENTC courses give the students a stronger foundation for their remaining technical courses. Another benefit for certificate students is that they are introduced to the engineering technologies instructors and develop a connection with the college.

As a result of the technical certificate, the ELET program has something to offer high school students through the dual/joint enrollment program. There are currently 25 high school students from 5 different high schools enrolled in the program. Several high school students have gone on to universities to major in technical programs as a result of their involvement in the program while in high school.

Most of the TCEF graduates go on to seek the AAS degree. Appendix 3 contains a detailed report on the enrollment data.

II. OVERALL PERFORMANCE

The Electrical/Electronic Fundamentals technical certificate is a strong program as evidenced by the TAC/ABET accreditation of the Electrical Engineering Technology AAS degree that is the basis for the certificate program. The TCEF program was developed to be a feeder to the previously existing AAS degree. As a result, four of the six courses required for the TCEF are the same courses required for the TAC/ABET accredited degree. Since the faculty members are accustomed to adhering to requirements for TAC/ABET accreditation in the associate degree program, they extend the same guidelines and procedures to the certificate program to ensure its quality as well. The outcomes for the TCEF program were developed under the guidelines of the TAC/ABET criteria with additional valuable input from the program’s Advisory Committee.

The self-study process for this report was initiated several years ago in preparation for the TAC/ABET site visit in 2008. The faculty members developed program and learning outcomes in 2005 using the TAC/ABET criteria as a foundation for the outcomes. The Advisory Committee approved the outcomes in 2006. Several of the faculty members have taken part in workshops and seminars on developing measurable outcomes and methods of assessing those outcomes. The faculty members are still in the process of streamlining the assessment processes. The biggest weakness lies in compiling the assessment results from the various sources and documenting the improvements resulting from the evaluations. A new procedure was implemented in the fall 2009 semester in response to these issues. Each faculty member, including adjuncts, evaluated the outcomes of each of her/his courses with results sent to the program coordinator at the end of the semester. A standard format was used. Regular meetings with faculty members, department chair, and the program coordinators of the other programs in
the engineering technologies department are being established to discuss assessment and make decisions regarding program improvements.

As part of the program assessment process, the Career Services Office tracks TCEF graduates for up to 12 months (by calendar year) after graduation and collects employment measures including whether graduates are employed in a field related to their major, whether they are continuing their education, or whether they are in the military. The results are reported to the program coordinator annually including a list of graduates, their contact information, and their employment information. The program maintains the records of the graduates and evaluates them annually. The measures include graduates attending school for further education, in the military, employed in a related field, employed in an unrelated field, not employed – seeking employment, and not employed – not in the labor market. In addition, Career Services obtains the graduate’s employer, supervisor, job title, and salary.

The TCEF program coordinator worked with Career Services to develop the online employer and graduate surveys in ensuring that both Career Services and the department get the information needed to measure the quality of the training provided to TCEF graduates. The surveys are reviewed in continuous quality improvement departmental meetings and in Advisory Committee meetings to assess and evaluate the program’s educational objectives. The employer survey includes contact information, whether the employer has hired graduates, and if so, how many, job titles, salary ranges, classification of technical function, ratings of graduates, and ratings of job related skills.

The graduate survey includes contact information, name of supervisor and contact information, length of current employment, job title, classification of technical function, rating of technical education, rating of job related skills, importance of degree in obtaining the job, certifications, professional organizations, community involvement, suggestions for improvement of the program, and salary ranges. Graduates and their supervisors also participate in the Advisory Committee meetings and the program solicits information on their status and achievements at that time.

The strengths of the program include the TAC/ABET accreditation of the core courses and the collaboration among the faculty members within the department. The computer engineering technology (CPET) and electrical engineering technology (ELET) programs work very closely together since many of the ELET students take classes in both areas of concentration. Evidence of the quality of the engineering technologies department includes the grants the department has received. The department received two Hewlett-Packard (HP) Technology for Teaching grants and several grants from Tennessee Valley Authority (TVA). The HP grants included tablet personal computers used to enable active learning activities in the classroom. The TVA grants are used to assist high school students who pursue technical certificates in the engineering technologies department. The quality of the laboratory and hands-on equipment is a major selling point of the TCEF program. The labs are equipped with the same type of equipment the students will see in the field. The Advisory Committee is consulted in the purchase of new equipment to ensure that the
latest technology is available to the students. The willingness of the faculty to try innovative teaching techniques in the classroom is another strength of the program. Two courses have been developed into hybrid or split courses. Most of the courses have become web-assisted courses with recommended tests, homeworks, and PowerPoint presentations to ensure consistent content and assessment of the courses. The adjuncts benefit from the documentation and structure that this practice provides.

III. PERFORMANCE BY FOCAL AREA

The purpose of this section is to address education quality processes related to the Electrical/Electronic Fundamentals Technical Certificate program in the Engineering Technologies (ENTC) department at Southwest Tennessee Community College. This section will describe the processes in which faculty draw upon evidence to assess strengths, weaknesses and needs associated with the program in an effort to produce, assure, and regularly improve the quality of teaching and learning. Initiatives and recommendations for improvement to address identified needs are also presented in the related focal areas.

Focal Area 1: Learning Objectives

1.1 Process for Developing Program Learning Objectives

The student learning objectives have been explicitly defined for each course in the program and are listed on the standardized course syllabi. The TCEF student learning objectives were proposed and approved by the program faculty and the Advisory Committee through meetings and surveys. The Advisory Committee is comprised of employers, former students, adjunct instructors, industry representatives and faculty from other institutions. A list of Advisory Committee members and their affiliations is provided in Appendix 5.

Course objectives that are deemed as most important for a student’s later success in the field make up the program objectives. In choosing the program objectives, what a student should think, know, or be able to do as a result of completion of the program is considered. Each student learning objective is written in such a way as to be specific, time-based and measurable. Program learning objectives are included in Appendix 7. In addition to industry requirements, TAC/ABET criteria are also instrumental in defining the program objectives. Four courses in the TCEF program are also included in the ABET accredited Electrical Engineering Technology associate’s degree program. These four courses are ELET 1110 – Electric Circuits I, CPET 1114 – Computer Systems Installation and Maintenance with Applications, TLET 1010 – Electronic Circuits I, and TLET 2233 – Electrical/Electronic CAD Drawing.
The program’s strength in the area of developing learning objectives is due to both the involvement of the Advisory Committee and the adherence to TAC/ABET criteria.

1.2 Evidence-Based Learning Objectives

The learning objectives for the TCEF program are based on the learning objectives TAC/ABET looks for in electrical engineering technology programs. Four of the six courses are part of the TAC/ABET accredited associate degree program. The remaining two courses follow the same standards and guidelines created by TAC/ABET. The Advisory Committee also approved the learning outcomes for the TCEF and the related courses.

In addition to following TAC/ABET guidelines, the learning objectives were also based on program surveys from employers and alumni/graduates as well as feedback from Advisory Committee members. The surveys provided information on employment status and the adequacy of education.

Student learning objectives are flexible and are periodically reviewed by the program faculty and the Advisory Committee for possible revisions. Proposed modifications to the objectives are carefully scrutinized to determine the continuous improvement value of the changes and to ensure that the objectives maintain reasonable alignment with the expectations of industry.

1.3 Best Practices for Learning Objectives

The accreditation process with TAC/ABET provides valuable best practices information in the area of engineering technologies. This process has made continuous improvement a priority for the Engineering Technologies department. To ensure that continuous improvement remains a priority, the learning objectives are communicated to students, employers, advisory board and adjunct faculty, who as program stakeholders, have the most interest in assuring that students are achieving these objectives. The students and adjunct faculty receive a copy of the learning objectives as a part of the course syllabi. The program’s advisory board reviews the learning objectives during the program’s annual Advisory Committee meeting.

Best practices are continually sought by program instructors through multiple sources. Informally, faculty members consult other institutions through the use of web-based materials detailing program content. Another resource utilized for best practices is faculty membership in the Engineering Technology Listserv. This email listing provides a forum for engineering technology educators to share ideas, concerns and information. Within the Engineering Technologies department at Southwest, faculty members informally consult with one another on ways to make program improvements. Those instructors with more experience mentor the less experienced ones.
Improvement Needs for Focal Area 1

- Since the Learning Objectives for the program were developed following the guidelines from TAC/ABET, this is considered to be a strong focal area for the program and there are no immediate improvement needs identified for this area.

Focal Area 2: Curriculum and Co-Curriculum

2.1 Faculty Collaboration on Curriculum Design and Improvement

The curriculum choice is directly derived from the learning objectives which are based on the TAC/ABET criteria. Collaboration among program faculty and the advisory board regarding curriculum design and improvement occurs on a continuing basis. If changes to the curriculum are required, those changes are submitted to the College’s Curriculum Committee whose members come from various representative areas within the college. The College’s Curriculum Committee reviews curriculum and manages all course change recommendations to ensure that the guidelines of the college are met.

Faculty members from the four Engineering Technology programs collaborate regarding improvements to the curriculum. In particular, the development of ENTC 1124 was done with the input of all programs within the department since it is a course that is common to all technical certificates in the department. With input from all program coordinators and the department chair, the course was designed to cover the applied math concepts needed for all four programs. Another example of collaboration was the conversion of ENTC 1124 to a hybrid course. Specifically, ENTC 1124 was converted to a hybrid course after a lengthy e-mail discussion between faculty members across programs regarding whether this course could easily be converted to a hybrid course and whether such a conversion would benefit students.

The TCEF and the Industrial Computer Fundamentals Technical Certificate (TCCF) offered by the Computer Engineering Technology program are very similar. The two certificates share four of the same courses. Many of the students who earn an electrical/electronic fundamentals certificate also earn an industrial computer fundamentals certificate. Since the programs serve many of the same students, there is close communication between the Computer Engineering Technology faculty and the Electrical Engineering Technology faculty regarding ways to better prepare students. Faculty members from both programs collaborated on the switch to the new printed wiring boards used in the labs of ENTC 1114. Faculty members of the Electrical Engineering Technology program had input into the development and assessing of CPET 1114. The CPET 1114 course was created in the spring of 2009 to address a need pointed out by ABET that the Computer Engineering Technology graduates needed more hands-on experience building and maintaining personal computers.

Collaboration among faculty members is partially ensured by the sharing of courses that is practiced when faculty members are qualified for teaching in more than one area. Often
Computer Engineering Technology faculty members teach Electrical/Electronic Fundamentals courses and Electrical Engineering Technology faculty members teach Industrial Computer Fundamentals courses. Faculty members in the Mechanical Engineering Technology program also teach Electrical/Electronic Fundamentals courses. Discussions among the faculty in different concentrations on the best way to teach the material and the best texts to use are ongoing conversations.

Ultimately, the College’s Curriculum Committee reviews curriculum and manages all significant course change recommendations to ensure that the guidelines of the college are met.

2.2 Course Content and Sequencing to Achieve Learning Objectives

In order to achieve the program learning objectives effectively, the students must complete the courses in a predetermined order. The curriculum has been analyzed and pre-requisites are in place for each course in the program. The program recently updated the pre-requisites in the ELET program courses to create a seamless transfer of credits from the certificate program to the associate degree program. Course pre-requisites are explained to the students during advising and are documented in the College’s catalog.

The material and texts for each course in the TCEF/ELET program are standardized and reviewed each semester. Full-time and adjunct faculty members use the same material and texts. When new texts are proposed, they are circulated throughout the department for approval by the faculty. New editions of text are adopted to keep the courses up to date. Recently, a text that can be used in two TCEF courses was selected over the old texts that required a separate text for each of two TCEF courses. The new single text is closely aligned to the learning objectives for the two courses and is more cost effective for the students.

2.3 Soundness of Curriculum, Including Best Practices

As an integral part of the accredited associate degree program, the curriculum for the certificate program is also based on TAC/ABET criteria. In addition, input from Advisory Committee members and collaboration of the faculty contribute to the soundness of the TCEF curriculum. Best practices for teaching and measuring student learning outcomes also contribute to the soundness of the curriculum.

The program subscribes to an engineering technology education Internet discussion group that often collaborates regarding best practices in curriculum and instruction techniques specific to the engineering technology community.

Keeping the courses up to date with the latest technology is a never-ending concern. As an example of the program’s push to keep the curriculum current, solar energy technology is being added to the curriculum in the spring of 2010. Input from the Advisory Committee is continually being sought for advice regarding new technology and equipment for the curriculum.
Improvement Needs for Focal Area 2

- Since the curriculum for the program was developed following the guidelines from TAC/ABET, this is a strong focal area for the program and there are no immediate improvement needs identified for this area.

Focal Area 3: Teaching and Learning

3.1 Focus on Teaching and Learning

This program primarily utilizes traditional lecture/lab methods with classes offered days, evenings, and weekends to accommodate both the traditional and non-traditional students’ schedules. The program is based on hands-on training. Most instructors approach learning through first lecturing on a topic and then reinforcing the new information with lab exercises or computations. Instructors use several different methods of promoting active learning in the classroom. In addition to the hands-on laboratory work, there is use of clicker (personal response system) technology, tablet PCs with digital ink, and web-assisted technology used in the classroom to promote student learning.

In 2005 and again in 2006, the Engineering Technology department received grants from Hewlett Packard as one of only ten colleges and universities worldwide receiving these awards. The grants included 63 HP Tablet PCs and a faculty stipend. The ELET program led the department in the preparation of the grant proposal and the application of the tablet PCs in teaching and student use in the classroom. In addition to the grants, the College received an award from HP at the 2007 Foundation Board meeting for its commitment to student success and for seeking innovative ways to transform teaching and learning through the effective use of technology. One faculty member went to two conferences held by Hewlett-Packard (HP) in Monterey, California as a result of the department receiving two Technology in Teaching grants from HP. The conferences emphasized the use of technology in the classroom to promote active learning. University and community college faculty from all over the world gave presentations on their efforts and participated in workshops.

The program has implemented active learning using the tablet PCs in several classes. The tablet PCs allow students to answer questions and solve problems posed by the teacher in writing/digital ink. All of the teacher’s presentations and student written exercises are submitted to an online server for immediate review in the classroom or for student review from any Internet location after class.

3.2 Use of Instructional Methods and Materials for Mastery

Since TCEF shares classes with the ELET program which is fully TAC/ABET accredited, the faculty are held to a plan to continually strive for improvement in instructional methods and materials according to strict accreditation guidelines. Student assessments indicate when
teaching methods require modifications. These modifications are implemented and then re-evaluated to confirm effectiveness. Applied problem solving, critical thinking, and hands-on technology applications are integrated throughout the courses through a variety of methods including classroom instruction, laboratory work, and outside-of-class assignments. Adjunct faculty members are provided with instructional materials and are monitored to ensure that effective teaching methods are being used.

The program has initiated active learning in several classes using the TBR online PAWS (D2L) distance education system that provides automated presentation and grading of assignments and digital data archiving. All of the courses in the TCEF curriculum are web-assisted or hybrid classes except TLET 2233 (the computer aided drawing course) which does not lend itself to being web-assisted.

Clicker (or personal response system) technology has been implemented in several courses to promote active learning in the classroom. It also gives the instructor immediate feedback on the students’ grasp of the new material.

The program will continue developing teaching methods which foster active learning.

3.3 Collaboration in the Design and Delivery of the Teaching-Learning Process

Program faculty members have given workshops for the department and for the college on the different technologies the program is using to promote active learning such as the clicker technology, tablet PCs, and web-assisted courses. Best teaching practices are shared with other departments at Southwest through professional development during Faculty Development Day and the Summer Institute. Faculty Development Day is held once a year and all faculty members are encouraged to participate. Summer Institute is a two day event that provides a forum for faculty from different areas within and outside of the college to present on teaching methods and new classroom technologies. Both full-time and adjunct faculty members are encouraged to participate.

*Improvement Needs for Focal Area 3*

- Faculty members should be provided institutional support and encouragement in continually adopting new techniques and technologies in the classroom.

Focal Area 4: Student Learning Assessment

4.1 Key Quality Indicators for Learning Objectives

Key quality indicators for the assessment of learning objectives are in place for the program. These indicators include traditional testing, lab exercises and research paper assignments.
Grading rubrics or custom assessment forms are utilized to assess each learning objective. The program faculty collaboratively develop and implement assessment of learning objectives on an annual basis. A major field exit exam is not administered to completers of the TCEF program, but some of the courses are shared with the Electrical Engineering Technology program which does require an exit exam. This exit exam is divided into course sections which can be tied to individual learning outcomes. Although an exit exam might prove useful for the TCEF program, the current emphasis for student learning assessment has been appropriately placed at the course level to reflect the level of student learning.

The program has incorporated the use of a 4 column model for listing: (1) program objectives, (2) assessment methods tied to the individual objectives, (3) assessment results, and (4) use of the assessment results in closing the loop. Documentation of the continuous improvement process for the program has been both improved and simplified through the use of the 4 column model. In the fall semester of 2008, all programs at Southwest TN Community College began using this model and posting it in the college’s online Planning System. This documentation effort helps to validate that program assessments are aligned with the learning objectives and that assessment results are used for enhancing student learning. A portion of the program’s completed 4 column assessment model for 2008-09 may be found in Appendix 8.

4.2 Best Practices for Assessing Student Learning

The program’s plan for assessing student learning incorporates guidelines given by ABET and the use of a 4 column model. Assessments are tied to the individual learning objectives and are not based on a student’s overall course grade. The program faculty members identify key indicators and develop rubrics/custom assessment forms that are completed for each student. The individual results are then compiled to capture an overall assessment of the learning objective. Some learning objectives are covered in more than one course and in that case the program faculty alternate using data from different courses to assess the learning objectives. This practice ensures that each course is being evaluated at least every other assessment cycle.

The College and the Liberal Studies and Education department sponsored a workshop on Embedded Assessment June 16, 2004. One of the program’s faculty members attended the workshop and learned about rubrics for measurements of written communications, oral presentations, problem solving, information technology, and other assignments that are not easily measured by tests. The information was shared with the rest of the department and used to develop standard rubrics which are now used by the program faculty.

Faculty members attended the Best Assessment Processes IX April 12-14, 2007 in Terre Haute, Indiana. Returning from the summit, the faculty members requested input in the form of sample tests and suggestions from faculty and then created standardized tests for several courses in
program. The tests have been very successful in providing stable measurements of student ability from test-to-test and semester-to-semester in these select courses.

4.3 Continuous Assessment-Based Program Improvements

The TCEF program is included in the ELET program continuous quality improvement plan that is guided by the TAC/ABET accreditation criteria and the college’s four column model as discussed in Section 4.1. Documentation of the continuous improvement process for the program has been both improved and simplified through the use of the four column model. In the fall semester of 2008, all programs at Southwest Tennessee Community College began using this model and posting it in the college’s online Planning System. This documentation effort helps to validate that program assessments are aligned with the learning objectives and that assessment results are used for enhancing student learning. A partial copy of the program’s four column assessment for 2008-09 may be found in Appendix 8.

Faculty members are ultimately responsible for assessment in each course. The instructors collaborate closely on assessment design using traditional exams, lab assignments and written papers. These assessment methods are discussed with other faculty in the department and reviewed for needed changes.

4.4 Multiple Measures in Assessing Learning and Program Effectiveness

Multiple measures for assessing learning and program effectiveness are used. Written tests, hands-on lab assignments, and written reports are measures currently used for assessing learning. Program effectiveness is measured primarily through the assessment results, student evaluation of teaching surveys (SET) and graduating student job placement rates.

Improvement Needs for Focal Area 4

- There is a need for additional assessments of laboratory techniques. The program is going to be a participant in the pilot program for a National Science Foundation sponsored program for assessing laboratory skills. The program is called Simulations for Performance Assessments that Report on Knowledge and Skills (SPARKS).

Focal Area 5: Systematic Quality Assurance

5.1 Commitment to Continuous Quality Improvements

The TCEF program at Southwest is committed to continuous improvement. To keep up with technology and provide the students with the tools they need for industry, the program makes continuous improvement a top priority. The Engineering Technologies department is devoted to providing a quality education to its students. All members of the department collaborate to maintain high standards. These standards are readily apparent through the work completed to maintain TAC/ABET accreditation for all the programs in the department. Faculty members
Faculty members meet regularly with other faculty members in the department, the department chair, and the Director of Assessment to evaluate and improve the success of the programs.

Faculty members receive valuable feedback through the results of the Student Evaluation of Teaching surveys (SET) performed each semester. Quality assurance practices are periodically reviewed and improved as needed. Faculty members also receive valuable feedback from the department chair in annual review of the faculty development plan and the chair’s evaluation of faculty. In the 2008-09 year, both the Student Evaluation of Teaching instrument and Department Chair’s Evaluation for faculty instrument were developed or revised through formal processes which included regular input from faculty committees and ultimate approval by the Faculty Senate, Department Chairs, Deans, and the Provost. The administration at Southwest is committed to providing opportunities for professional growth and development for faculty members. Numerous opportunities throughout each academic year related to enhancing teaching effectiveness are offered free of charge to faculty members through the Center for Faculty Development.

5.2 Systematic Quality Assurance

Institutional Efforts:

The IE planning cycle is a formal internal process at Southwest used for systematic quality assurance. This process requires that all departments establish annual objectives, conduct assessments, and use assessment results to improve programs. Training in writing program outcomes for student learning was undertaken as a college-wide effort in the fall semester of 2008 with documentation of the student learning outcomes on the college’s online Planning System continuing as an ongoing process at Southwest. Other forms of quality assurance regarding teaching effectiveness include the student evaluation of teaching (SET) for each faculty member and the follow-up department chair’s evaluation of faculty each spring semester.

The institution is committed to providing quality services to meet the distinct needs of its diverse student population. The Academic Support Center (ASC) provides free tutoring services and resources for students to provide support that may enable them to successfully reach their educational goals. Through the services of the Advising and Counseling Centers at Southwest, professional advisors along with assigned departmental advisors provide students with a high caliber of advising deemed essential for their academic success. As part of the commitment to systematic quality assurance, Southwest has purchased a program called AdvisorTrac to be used for tracking advisees and maintaining records of content in advising sessions. The Advising and Counseling Centers provide valuable assistance with articulation issues for students who plan to transfer to other colleges and universities. Many of the Southwest students are first generation college students and find the support of the Advising and Counseling Centers invaluable. The Career Services Department at Southwest serves all students who request assistance with job-search strategies, resume writing, interviewing techniques, and career counseling. Five libraries
are available for student, faculty and staff use and an InfoNet Library provides additional valuable online services in assuring that all students have access to library services.

Southwest Tennessee Community College is accredited by the Southern Association of Colleges and Schools – Commission on Colleges. As part of the reaffirmation of accreditation process, Southwest has responsibility for documenting compliance with 72 standards of quality and effectiveness and the Commission has responsibility for reviewing the College in accordance with those standards. In meeting the high standards required for accreditation, Southwest assures that quality education practices are in place.

Program Efforts:

The program works closely with the newer members of the faculty and adjunct faculty to ensure teaching and learning processes are being implemented appropriately and consistently and that assessments are being collected as planned. The program has an informal mentor program.

The ELET Advisory Committee also reviews issues related to The TCEF program. The TCEF certificate program is affected by TAC/ABET accreditation as was discussed in prior sections.

The program has a plan in place to ensure that quality assurance is a systematic and regular process. First, the course student learning objectives have been defined and conveyed to the instructors and students on the course syllabi. Secondly, a plan to measure and assess the student learning objectives is in place with each program objective being assessed at the end of the fall and spring semesters. Finally, the results of the assessment are reported to the program faculty, adjunct faculty, and advisory committee and the results used to make improvements to the program. After changes have been made, the program objectives will be re-assessed to determine the success of the improvements. This process will be repeated each academic year not only for the TCEF program, but also for the Electrical Engineering Technology associate degree program. The college’s online planning system will be utilized to document the process.

With regards to academic advisement, each student at Southwest TN Community College is assigned an advisor, but is not required to meet with the advisor. TCEF students are individually advised by a program faculty member, and the student’s academic progress is tracked each semester. A file is kept for each student with an academic audit form that is used for planning.

**Improvement Needs for Focal Area 5**

- The biggest weakness of the program is the execution and documentation of the use of the assessment results or “closing the loop”. The campus-wide adoption of the college’s four-column model for keeping track of the student learning objectives will enhance the department’s acceptance of the continuous improvement process including documentation.
IV. POTENTIAL RECOMMENDATIONS AND ASSOCIATED INITIATIVES

Having assessed the overall educational quality of the Technical Certificate in Electrical/Electronic Fundamentals (TCEF) program in the self-study, the purpose of this section will be to present some specific initiatives for improvement. The program’s faculty members are committed to working intensively on the following quality improvement initiatives:

**Initiative 1, Section 3:**

What needs to be accomplished: Faculty members need to be encouraged to continue to adopt new techniques and technologies in the classroom.

The tasks required to accomplish the objective. Faculty members will attend seminars, workshops, and conferences on best practices in teaching methodologies.

How it will be determined whether the initiative is being implemented as planned: It will be determined that the initiative is being implemented if faculty members attend workshops, seminars, or conferences and implement and document the success of new trial methodologies.

Demonstration that the unit is capable of carrying out the initiative: Faculty members have already adopted many new methodologies including web-assisted and active learning strategies. The new faculty development plan should serve as an incentive since the faculty will be evaluated on how well they have updated their teaching skills.

**Initiative 2, Section 4:**

What needs to be accomplished: There is a need for additional assessments of laboratory techniques.

The tasks required to accomplish the objective: The program will participate in the National Science Foundation sponsored program for assessing laboratory skills. The program is called Simulations for Performance Assessments that Report on Knowledge and Skills (SPARKS).

How it will be determined whether the initiative is being implemented as planned: Determination will be made that the initiative is being implemented as planned if SPARKS is used in the curriculum (ENTC 1114, ELET 1110, and/or TLET 1010) with documentation of the results made.

Demonstration that the unit is capable of carrying out the initiative: Faculty members have already incorporated new technologies into the curriculum. Adding a new tool should not pose a problem. It can be added to the web-assisted courses without too much difficulty.
Initiative 3, Section 5

What needs to be accomplished: embedding the continuous improvement process into the mindset of all faculty members including the adjuncts.

The tasks required to accomplish the objective: having all faculty members assess and evaluate their courses each semester.

How it will be determined whether the initiative is being implemented as planned: a) if faculty turn-in their assessments each semester; b) if evaluations of whether students are meeting learning outcomes are performed on an annual or semi-annual basis; c) if recommendations are made and implemented for improving learning outcomes.

Demonstration that the unit is capable of carrying out the initiative: The campus wide adoption of the college’s four-column model for tracking the student learning objectives and the program’s desire to maintain TAC/ABET accreditation will continue to drive the full adoption of the continuous improvement process.

V. MATRIX OF IMPROVEMENT INITIATIVES

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<thead>
<tr>
<th>Recommended Improvement Action</th>
<th>Leadership</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Name</strong>: Faculty Development</td>
<td><strong>Coordination</strong>: Department Chair</td>
<td><strong>Beginning</strong>: Now</td>
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<tr>
<td><strong>Description of Initiative</strong>: Encourage faculty to adopt new techniques in the classroom</td>
<td><strong>Participants</strong>: All faculty members including adjuncts</td>
<td><strong>Ending</strong>: Ongoing</td>
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<tr>
<td><strong>Intended Result</strong>: Improve student learning through more active learning activities in the classroom and providing more online resources for the students through web-assisted courses.</td>
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<tr>
<th><strong>Project Name</strong>: SPARKS</th>
<th><strong>Coordination</strong>: Program Coordinator</th>
<th><strong>Beginning</strong>: Spring 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of Initiative</strong>: Increase laboratory technique assessments</td>
<td><strong>Participants</strong>: Faculty members</td>
<td><strong>Ending</strong>: To be determined</td>
</tr>
<tr>
<td><strong>Intended Result</strong>: A new more effective measure or assessment of laboratory skills</td>
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<td>Recommended Improvement Action</td>
<td>Leadership</td>
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</table>
| **Project Name:** Faculty Buy-In for Continuous Improvement  
**Description of Initiative:** Involvement of all faculty including adjuncts in continual assessment and evaluation of student learning outcomes  
**Intended Result:** Comprehensive data with continual assessments of student learning outcomes and improvements to the program as a result of the evaluation of the assessments. | **Coordination:** Program Coordinator and/or Department Chair  
**Participants:** All faculty members including adjuncts | **Beginning:** Now  
**Ending:** Ongoing |
# Appendices

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<thead>
<tr>
<th>Appendix</th>
<th>Description/Requirements</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>
Appendix 1 – Program Description/Requirements

ELECTRICAL/ELECTRONIC FUNDAMENTALS

Technical Certificate

The Electrical/Electronic Fundamentals program emphasizes the basic skills needed to begin careers in either the electrical or telecommunications engineering technology fields. Designed for high school graduates or those entering industry for the first time, the program covers six important areas. These areas include an introduction to electrical/electronic technology; engineering technology techniques; electric circuits; electronic circuits; CAD drawing; and computer systems installation, maintenance, and applications such as word processing and spreadsheets.

Candidates cannot already hold a degree in either the Electrical Design or Telecommunications concentration of the Electrical Engineering Technology program. Candidates must also meet the requirements of a first-time college student or transfer student (see the Admissions section of the current Southwest Catalog). Candidates must take at least 15 of the 18 hours at Southwest. Each student should assure that he or she has met the prerequisites before attempting to register for a course.

Students who complete this certificate program will be qualified to enter the Cooperative Education (Co-op) program and/or entry-level positions in industry. The purpose of the Co-op program is to train students in the industrial world, combining classroom with industrial experience. Many employers participating in Co-op provide tuition for students who wish to continue their education.

Certificate holders can work as technicians in any area involving electricity and electronics, for example: warehousing and distribution, automation control systems, medical electronics, networks and telephones, power generation and distribution, safety and security, design, production, and maintenance. Four of the six courses (CPET 1114, ELET 1110, TLET 1010, TLET 2233) in the certificate program will transfer to the Design or Telecommunications concentration of the Electrical Engineering Technology A.A.S. degree.

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Required Courses</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTC 1114</td>
<td>Introduction to Electrical/Electronic Technology</td>
<td>3</td>
</tr>
<tr>
<td>ENTC 1124</td>
<td>Engineering Technology Techniques</td>
<td>3</td>
</tr>
<tr>
<td>CPET 1114</td>
<td>Computer Systems Installation and Maintenance with Applications</td>
<td>3</td>
</tr>
<tr>
<td>ELET 1110</td>
<td>Electric Circuits I</td>
<td>3</td>
</tr>
<tr>
<td>TLET 1010</td>
<td>Electronic Circuits I</td>
<td>3</td>
</tr>
<tr>
<td>TLET 2233</td>
<td>Electrical/Electronic CAD Drawing</td>
<td>3</td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>18</strong></td>
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</table>
### Appendix 2 – Course Descriptions

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTC 1114</td>
<td>Introduction to Electrical/Electronic Technology</td>
<td>This course introduces the student to the electrical and computer engineering technology fields. Emphasis is on electrical and electronic terminology, measurements, safety, and test equipment usage. Electronic unit analysis, conversion, and functions using the calculator are discussed along with use of the volt–ohm meter and oscilloscope. This course covers career opportunities, industrial safety, review of technical math, problem solving, and is suitable for fundamental applications of electricity and electronics in all disciplines. Prerequisite: ENTC 1124 or permission of program coordinator.</td>
</tr>
<tr>
<td>ENTC 1124</td>
<td>Engineering Technology Techniques</td>
<td>This course introduces the student to engineering technology and the techniques and methods of technical problem solving. It covers such topics as the field of engineering technology, career orientation, technical math, hand-held calculator usage, applied algebra, trigonometry applications, measurement systems, unit conversions, reading scales, measuring devices, geometry applications, constructing graphs, systematic problem solving and library usage. Prerequisite: Permission of program coordinator.</td>
</tr>
<tr>
<td>CPET 1114</td>
<td>Comp Systems Installation and Maintenance with Applications</td>
<td>This course provides hands-on experience in the building, installation, testing, and maintenance of microcomputer systems. Emphasis is given to developing the student's ability to install new systems and maintain existing systems. This course also provides an introduction to various microcomputer application programs. Emphasis is given to developing the student's ability to use Microsoft Windows-based applications software including word processing, spreadsheet processing. This course also includes an introduction to the C++ programming language.</td>
</tr>
<tr>
<td>ELET 1110</td>
<td>Electric Circuits I &amp; Lab</td>
<td>Electric Circuits I introduces the student to the fundamental principles of DC circuits. Emphasis is placed on the solution of circuit problems using series and parallel circuit definitions, Ohm's law, Kirchhoff's laws, and equivalent circuits. Inductance and capacitance are introduced as time constants in transient circuits. The course concludes with network analysis techniques including loop equations, Thevenin's theorem, and superposition. Prerequisite: ENTC 1114 and ENTC 1124, or permission of program coordinator.</td>
</tr>
<tr>
<td>TLET 1010</td>
<td>Electronic Circuits I</td>
<td>This course explores the function and utilization of today's electronic circuits. These are designed and tested using diodes, transistors, and integrated circuits for applications in op-amps, photosensitive devices, integrators, differentiators, etc. Both digital and analog situations are examined along with applications for all electronic areas. Devices selected for investigation are used in later courses where they are presented in greater depth. Prerequisite: ENTC 1114 and ENTC 1124, or permission of program coordinator.</td>
</tr>
<tr>
<td>TLET 2233</td>
<td>Electrical/Electronic CAD Drawing</td>
<td>This course introduces the student to the use of the computer for making electronic drawings. The primary goal of this course is to familiarize the student with the menus and commands of a computer-aided-drafting system. Skills will be developed to enable the student to manipulate lines, symbols, and text on the computer screen to produce an acceptable drawing before it is plotted. Block, logic, schematic, and printed circuit drawings will be covered in this course. Prerequisite: ENTC 1114 or permission of program coordinator.</td>
</tr>
</tbody>
</table>
Appendix 3 – Enrollment Data
Electrical/Electronic Fundamentals Certificate Profile

Note: (1) Enrollment data is based on declared major as of 14th day of class. (2) Students awarded certificates in this program may include students who met graduation requirements for this program but had not declared the program as their major.

Fall 2009 Enrollment Profile

<table>
<thead>
<tr>
<th>Headcount</th>
<th>FTE</th>
<th>Female</th>
<th>Male</th>
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Electrical/Electronic Fundamentals Fall 2009 Enrollment Profile

Certificates Awarded

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
<td>17</td>
<td>20</td>
<td>16</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>29</td>
<td>27</td>
<td>20</td>
<td>15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: 14th day Census files and graduation files
Appendix 4 – Faculty Credentials

Full Time Faculty

Janet Sykes
  MSET degree, *Electronic Engineering Technology*, The University of Memphis
  BSET degree, *Computer Engineering Technology*, The University of Memphis
  AAS degrees, *Biomedical Engineering Technology* and *Computer Engineering Technology*, State Technical Institute at Memphis

Lisa Jones
  BSEE degree *Electrical Engineering*, Memphis State University
  MSEE degree, *Electrical Engineering*, Georgia Institute of Technology

Lucas Nwaobi
  MSET degree, *Engineering Technology*, The University of Memphis
  BSET degree, *Electrical Engineering Technology*, The University of Memphis
  AAS degrees, *Computer Engineering Technology* and *Telecommunications Engineering Technology*, State Technical Institute at Memphis

Maxwell Cutler
  MSET degree, *Computer Engineering Technology*, The University of Memphis
  BS degree, *Electrical Engineering*, University of Glasgow

Part Time Faculty

Stephen Browning
  BSEE degree, *Electrical Engineering*, Purdue University
  MSE degree, *Computer Information & Control Engineering*, University of Michigan

Hunter Purnell
  BSEE degree, *Electrical Engineering*, The University of Memphis

Jeffrey Stewart
  MS degree, *Mechanical Engineering*, The University of Memphis

James Northern
  MS degree, *Technology Education Electronics*, Memphis State University
## Appendix 5 – Advisory Board Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buz Ferguson</td>
<td>Regional Manager</td>
<td>Automated Dynamics Corporation</td>
</tr>
<tr>
<td>Gerald Sinkfield</td>
<td>Engineering Manager</td>
<td>Tennessee Valley Authority</td>
</tr>
<tr>
<td>Susan Bell</td>
<td>Regulatory Affairs Specialist</td>
<td>Smith &amp; Nephew</td>
</tr>
<tr>
<td>Kathleen O’Malley</td>
<td>Recruiter</td>
<td>Robert Half Technology</td>
</tr>
<tr>
<td>Alfred Chung</td>
<td>VP Engineering</td>
<td>Grace Medical</td>
</tr>
<tr>
<td>Lucas Nwaobi</td>
<td>Senior Technical Specialist</td>
<td>FedEx</td>
</tr>
<tr>
<td>Charlie Hale</td>
<td>Sr. Electrical Eng.</td>
<td>Alcoa</td>
</tr>
<tr>
<td>Daniel Harvey</td>
<td>Tech Analyst</td>
<td>FedEx</td>
</tr>
<tr>
<td>Jerry Newman</td>
<td>Assistant Professor</td>
<td>U of Memphis</td>
</tr>
<tr>
<td>James Tramnell</td>
<td>Sr. Tech Advisor</td>
<td>FedEx</td>
</tr>
<tr>
<td>Ken King</td>
<td>Owner &amp; Chief Engineer</td>
<td>King Engineering</td>
</tr>
<tr>
<td>Don Wilcher</td>
<td>Sr. Electronics Controls Engineer</td>
<td>Hunter Fan</td>
</tr>
<tr>
<td>David Griggs</td>
<td>Associate Engineer</td>
<td>Memphis Light, Gas and Water</td>
</tr>
<tr>
<td>Allan Long</td>
<td>Engineering Manager</td>
<td>Memphis Light, Gas and Water</td>
</tr>
<tr>
<td>Phillip Hampton</td>
<td>Chief Engineer</td>
<td>ThyssenKrupp Elevator</td>
</tr>
<tr>
<td>James Wright</td>
<td>Associate Engineer</td>
<td>CN Railroad</td>
</tr>
<tr>
<td>Blanchard Winbush</td>
<td>Engineering Manager</td>
<td>Solectron</td>
</tr>
<tr>
<td>Craig Cates</td>
<td>Engineer</td>
<td>DuPont</td>
</tr>
</tbody>
</table>
Appendix 6 – Advisory Board Meeting Minutes

January 5, 2009
12:00 pm to 1:45 pm

The various Engineering Technologies programs met for lunch from 12:00 pm to 12:30 pm. Garry Spencer and Dean Stephens welcomed the program advisory council members and speakers. Brenda Williams reviewed the Career Services programs and asked advisory council members to complete employer surveys. She passed out tabulations of surveys completed last year (attached). She reminded employers of job listings that are made available to all current and former students. She also invited the council members to participate in our career fairs even if they don’t have current openings. It is good for them to be seen by our students and for them to tell our students the type of jobs they have and the skills they look for. Shayla Guy described the Federal Carl Perkins IV Grant that supports high skills programs in academia and outside of industry. She invited industry representatives to join her Perkins Grant newsletter mailing list.

A list of industry representatives attending and some employer surveys is attached. The individual program advisory councils broke out into separate meetings.

Advisory Council and Industry ELET Representatives:

Herman A Johnson – Johnson & Associates
Buz Ferguson - Automated Dynamics Corporation
Patrice Robinson – Memphis Light, Gas, & Water
Lisa Jones – Southwest Tennessee Community College
Mike Northern – Southwest Tennessee Community College

The Electrical Engineering Technology Industrial Advisory Council meeting agenda and handouts are attached. The council reviewed the program Educational Objectives and Program Outcomes. The objectives and outcomes were approved by the council members.

The council reviewed and approved the program description and course description catalog pages. The council was reminded that the Telecommunications concentration was going to be terminated this term. After explaining changes in the industry, low enrollments, and failure of the concentration to meet the number of graduate per year required by TBR, there were no sustained objections to the termination. Lisa Jones handed out assessments in TLET1010 (attached) and Mike Northern handed out an example frequency distribution (attached) of student abilities (on PO-3) including criteria ranges (for successful learning of the outcome) that match criteria ranges described in the recent TAC/ABET Self Study. Since the criteria ranges are used for assessment in SACS requirements and TBR Academic Audits of the program certificate, they asked the council to consider the meaning of the criteria ranges, namely, reasonable goals for program improvement. The goal of 75 (½ in the Meets/Exceeds standards and ½ in the Approaching standards categories) were considered reasonable.
Appendix 6 – Advisory Board Meeting Minutes, continued

The council approved the use of the assessments and criteria ranges. **The council approved the goal of achieving 75% of the questions relating to a criteria correct for the class.**

Mike Northern stated the importance of the council in TAC/ABET and continuous improvement processes. Herman Johnson described the importance of two year degrees in industry and stated that he had advised companies to hire AAS degree graduates to improve efficiency of company operations.

Herman Johnson and Buz Ferguson both brought up the importance of career advising and the faculty members explained how we accomplish that activity. They gave examples of elements of their university courses that were important including demonstrations given by industry professionals and research that they had to present to their classes. Mike Northern briefly described the case studies in the program and agreed to work on having professionals present to classes and also observe and endorse student presentations of research and case studies. Patrice Robinson described selection and placement procedures for employment at MLGW. She said that in addition to a written test, applicants had a skills test that was monitored and endorsed by a foreman. Mike Northern described hands-on laboratory exercises and the program’s progress in creating hands-on assessments that will measure individual student ability. Reference was made to program outcome four, experiments and measurements.

The council discussed industry updates extensively. During the luncheon, Herman Johnson who is familiar with the program’s PLC trainers suggested adding a DeviceNet Motor Controls Center to the trainers and/or a temperature module. He advised that the modules are used quite a bit in industry. Herman Johnson and Buz Ferguson described the importance of industrial networking. They advised the program to include training on setting up EtherNet/IP networks and putting PLCs, PCs, and Operator Interfaces online. Buz Ferguson added the importance of sub networks like PROFIBUS and DeviceNet to the mix. They stated that there is a shortage of qualified technicians that are familiar with sub networks, the vast array of instruments that run on sub networks, and protocol converts

The meeting adjourned at 1:45 pm.

Recorders: Mike Northern and Lisa Jones
Appendix 7 – Program Outcomes

Engineering Technology – Electrical/Electronic Fundamentals Certificate

Program Mission Statement

The mission of the Electrical/Electronic Fundamentals Certificate of the Engineering Technology department is to provide a quality-learning environment conducive to providing students with the skills and competencies necessary for entry level employment or career advancement as a technician in a broad range of fields that require basic electrical/electronic knowledge and skills. The education can be used to transfer to the two-year college level.

Program Outcomes

The graduating student will be able to:

PO-1. Use and understand technical vocabulary and symbols and read and prepare technical documents including charts, tables, and graphs in the electrical/electronic field.
   Assessment: Performance on final exams and laboratory work.

PO-2. Demonstrate information technology skills including word processing, spreadsheets, introduction to computer programming, and internet research.
   Assessment: Performance on final exams and laboratory work.

PO-3. Demonstrate the ability to use computer aided drawing (CAD) software to create and manage technical drawings and schematics in the electrical/electronic field.
   Assessment: Performance on final exams and laboratory work.

PO-4. Demonstrate the ability to solve technical problems in basic dc circuits using a scientific calculator.
   Assessment: Performance on final exams and laboratory work.

PO-5. Demonstrate the ability to measure electrical/electronic quantities using state-of-the-art instruments.
   Assessment: Performance on final exams and laboratory work.

PO-6. Demonstrate the ability to solve technical problems in basic electronic circuits.
   Assessment: Performance on exams and laboratory work.

Note: Faculty members will evaluate performance using a variety of assessment rubrics developed by the program’s assessment committee.
### Appendix 8 – Student Learning Outcomes for 2008-2009

<table>
<thead>
<tr>
<th>SLO</th>
<th>Unit/Program Indented Outcomes</th>
<th>Intended Method of Measurement and level of Performance</th>
<th>Assessment/Evaluation Results</th>
<th>Use of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PO-3 Problem Solving (A.A.S.). Students will be able to identify, analyze, and solve technical problems using correct theory, laws, formulas, including physics to electrical/electronic circuits.</td>
<td>Statistical measurement of student ability on PO-3 in ELET1110 70% of students will score 50 or higher on the program outcome - PO-3 section of the final exam.</td>
<td>Spring 2009  Final exam: 55.6% (10/18) Measurements of ability on PO-3 were less than the desired level.</td>
<td>The faculty changed the text. The new text that is more readable and understandable. The text was reviewed and endorsed by faculty and by two of our industrial advisors.</td>
</tr>
<tr>
<td>2</td>
<td>PO-4 Experiments (A.A.S.). Students will be able to assemble, test, maintain, troubleshoot, analyze, and interpret experiments relating to electrical/ electronic systems and measure electrical/electronic quantities using state-of-the-art instruments and tools in a safe manner.</td>
<td>Statistical measurement of student ability on PO-4 in ELET1110 70% of students will score 50 or higher on the program outcome - PO-4 section of the final exam.</td>
<td>Spring 2009  Final exam: 66.7% (12/18) Measurements of ability on PO-4 were less than the desired level.</td>
<td>The faculty changed the text. The new text more clearly distinguishes between theory and practice. The emphasis on practice makes the hands-on lab exercises more understandable. The text was reviewed and endorsed by faculty and by two of our industrial advisors.</td>
</tr>
<tr>
<td>3</td>
<td>PO-4. Applied Algebra (TCEF). Students will be able to solve technical problems in basic DC circuits using a calculator.</td>
<td>Statistical measurement of student ability on PO-4 in ENTC1124 60% of students will score 50 or higher on the PO-4 section of the final exam.</td>
<td>Spring 2007: 63.6% (7/11) Measurements of ability on PO-4 were on target.</td>
<td>No action required.</td>
</tr>
<tr>
<td>4</td>
<td>PO-4. Problem Solving (TCEF). Students will be able to solve technical problems in basic DC circuits using a calculator.</td>
<td>Statistical measurement of student ability on PO-4 in ENTC1124 60% of students will score 50 or higher on the PO-4 section of the final exam.</td>
<td>Spring 2007: 45.5% (5/11) Measurements of ability on PO-4 were less than the desired level.</td>
<td>The faculty developed an online pilot project that will provide students with immediate feedback on homework problems and an effective way for the teacher to track homework assignments. The pilot project is underway this semester.</td>
</tr>
</tbody>
</table>