ELECTRONIC ENGINEERING TECHNOLOGY PROGRAM (EET)

PROGRAM REVIEW REPORT
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# Table of Contents

Abstract .................................................................................................................. 1
Introduction and Program History/Philosophy ...................................................... 2
1 Program/Discipline Goals ................................................................................. 4
   1.1 Program Learning Outcomes ................................................................. 4
   1.2 Program Consistency with PCC’s Mission, Values and Goals ................. 6
2 Curriculum ......................................................................................................... 7
   2.1 Curriculum/Course Changes .................................................................... 7
   2.2 Assessment of Course Outcomes ............................................................. 8
   2.3 Consistency with PCC Core Outcomes .................................................... 8
   2.4 Distance Learning .................................................................................... 9
3 Needs of Students and the Community ............................................................. 10
   3.1 New Student Demographics ................................................................ 10
   3.2 Feedback for Curriculum Changes ......................................................... 10
   3.3 Enrollment Pattern ................................................................................ 10
   3.4 Strategies to Facilitate Access and Diversity .......................................... 11
4 Faculty ............................................................................................................... 11
   4.1 Faculty Composition ............................................................................... 11
      4.1.1 Rational for the size, distribution and composition of the faculty .... 11
      4.1.2 Quantity and quality of the faculty .................................................. 11
      4.1.3 Faculty turnover and changes anticipated in the future ................. 12
      4.1.4 Adjunct Faculty .............................................................................. 12
      4.1.5 Faculty Diversity ........................................................................... 12
   4.2 Instructor Qualifications .......................................................................... 13
   4.3 Faculty, Staff, and Advisor Profiles ........................................................ 14
   4.4 Professional Development ....................................................................... 15
5 Facilities and Support ....................................................................................... 17
   5.1 EET Laboratories ................................................................................... 17
   5.2 Use of Library Resources ...................................................................... 18
   5.3 Technical/Clerical/Tutorial/Administrative Support ................................. 18
      5.3.1 Technical Support ........................................................................... 18
      5.3.2 Clerical Support ............................................................................ 18
      5.3.3 Tutoring Support ........................................................................... 18
   5.4 Advising Support .................................................................................... 18
   5.5 Scheduling Patterns ............................................................................... 19
6 CTE Information ............................................................................................... 19
   6.1 Degree and Certificate Outcomes: ............................................................ 19
      6.1.2 Outcomes Assessment Strategies: ................................................... 19
   6.3 Improving Attainment of the Outcomes ..................................................... 20
   6.4 Job Placement Data ................................................................................ 20
   6.5 Future Employment Opportunities ........................................................ 21
   6.6 Challenges with Degree and Certificates Completion ............................ 21
7 Conclusions/Improvement Strategic Plan ........................................................ 22
   7.1 Strengths ............................................................................................... 22
      7.1.1 Faculty and Staff .............................................................................. 22
      7.1.2 EET Curriculum ............................................................................. 23
Abstract

The current report represents the 2010 review of the Electronic Engineering Technology (EET) program. The previous EET program review was conducted in 2004. Substantial changes took place since then to accommodate the new demands of the industry. EET is now offering four new specialty options and two certificates.

Our Program Review will address the development of the new EET options, Biomedical Engineering Technology, Mechatronics/Automation/Robotics, Renewable Energy Systems, Wireless and Data Communications and the two nine-month certificates, Electronic Engineering Technology and Renewable Energy Systems. One aspect of EET that we chose to highlight in our Program Review is EET’s role in supporting the college’s strategic initiative for sustainability. The EET program has historically emphasized engineering education in the industrial power area and has recently developed an EET option and a career pathway certificate in renewable energy systems.

PCC program review guidelines were used to create this report.
Introduction and Program History/Philosophy

The Electronic Engineering Technology (EET) Program at PCC has existed since the beginning of the college. Since then the program has seen considerable changes in enrollment and curriculum.

As outlined in the 2004 EET program review, the major concern of the department at the time was the continuous decrease in student enrollment due mainly to the massive shift of manufacturing jobs overseas. In 2005 the enrollment dropped to twelve students, approximately half that of the previous year. In the same time span many EET programs in the area closed down: Mount Hood CC, Columbia Gorge CC, Lane CC, and Tillamook Bay CC. After closing down the winter start due to low enrollment, the PCC administration urged us to develop a four-year growth plan for the EET program.

After extensive research and analysis of the existing job market and learning about the best practices of the other EET programs that had survived and/or showed success, we came up with the four-year EET growth plan. This plan included the development of specialized EET options, which share approximately 70% of its courses with the existing EET degree, and the increase of the marketing efforts. The old EET degree would not disappear but the new options will be built upon it.

Some of the benefits of the new EET option model are:

- Increase the hands on skills in the most popular electronics areas and address the needs of emerging industries such as renewable energy, mechatronics/robotics and biomedical engineering technology. These are new jobs for our graduates and they will remain local.

- Better assistance with the development of local workforce as well as maintaining the full credit transferability to Oregon Institute of Technology towards obtaining their BSEET degree.

- Make students more marketable by specializing in several areas, increasing the chances to find jobs in a competitive job market.

- Assist with low enrollment typical to normal industry cycles.

In the EET department students can earn the following:

- Associate of Applied Science in Electronics Engineering Technology
  - Students can complete the EET A.A.S. degree and/or the following EET options:
    - EET Option: Biomedical Engineering Technology
      Biomedical engineering technicians are responsible for manufacturing and servicing medical equipment and technology for hospitals and other health care facilities, manufacturers, and third-party service.
organizations. This is the only program of its kind in the State of Oregon.

- **EET Option: Renewable Energy Systems**
  PCC has the most comprehensive Renewable Energy Systems (RES) training in the State of Oregon. This is a growing industry nationwide. The RES option prepares manufacturing and servicing technicians for solar power, wind power, fuel cell and other renewable energy fields.

- **EET Option: Wireless and Data Communication Engineering Technology**
  Wireless and Data Communications Engineering Technology train technicians in the manufacturing and servicing fields of radio frequency, microwave, cellular, fiber optics, satellites, radar, commercial broadcast, wireless and data communications.

- **EET Option: Mechatronics/Automation/Robotics Engineering Technology**
  The Mechatronics/Automation/Robotics option is a new, interdisciplinary field that is changing at a dramatic rate, driven by new technology, innovation and global demand. It is one of the fastest growing careers in the world. PCC Sylvania’s Mechatronics program prepares technicians for manufacturing and servicing mechatronics/automation/robotics systems.

- **One-Year Certificate in Electronics Engineering Technology**
- **One-Year Certificate in Renewable Energy Systems**

The SACC feels strongly that the primary objective of the curriculum should be directed toward making the two-year associate degree student successful in the marketplace. The Secondary consideration should be the establishment of articulation with four-year institutions to facilitate the transfer of credits for students seeking BSEET and higher degrees. A follow up study shows that fifty percent of graduates are either pursuing or completed their bachelors. EET students have full transferability to the BSEET program at the Oregon Institute of Technology.

EET is concerned with the theory and practice of applied electronics engineering. Emphasis is placed on the practical application of engineering knowledge. Engineering applications require a thorough background in mathematics and sciences. Graduates of an associate degree program in EET are called electronic engineering technicians and find employment in circuits and system testing, product development, prototype construction and testing, circuit and systems modification, systems operation, and manufacturing.

Over the last several years graduates have been hired by companies such as Intel, Cascade Microtech, Triquint, Maxim, Tektronix and ESI.
The EET program is expected to remain in its current format for the next five years. All efforts will be focused on consolidation and strengthening weaker areas. However, new developments to better address future industry and community needs are not ruled out.

1 Program/Discipline Goals

1.1 Program Learning Outcomes

The EET Program and its options are designed to train the best engineering technicians in terms of overall technical competency. The curricula encompass a broad spectrum of specialty disciplines, each requiring a high level of expertise. Graduates of the program have the flexibility to succeed in a number of technical career fields. The EET faculty works with the EET industrial advisory committee and Oregon Institute of Technology faculty to ensure that the program curriculum and specific outcomes continue to be relevant to student and employer needs. Our program is offered at an institution accredited by the Northwest Association of Schools and Colleges Commission.

Each option has its own set of specific program outcomes as listed below. The old EET program outcomes are broadened to include specific skills for each area of study. New outcomes were added to address the emerging industries such as renewable energy and mechatronics/robotics. More electro-mechanical skills are emphasized in the mechatronics/automation/robotics, renewable energy systems and EET training options such as motors and generators, hydraulics/pneumatics, and PLC.

Following are the current program outcomes for EET and the EET options as well as for the offered certificates:

**AAS: Electronic Engineering Technology**
- Qualify for employment in the electrical and/or electronics field.
- Install, service and repair electrical and electronics systems, and perform technician work in the manufacturing area by applying knowledge of electrical, electronics, control systems, and programming concepts.
- Assist engineers with the design of electrical and electronics systems by applying knowledge of electrical, electronics, control systems, and programming concepts.
- Communicate effectively both at the individual level and within team settings.
- Apply ethical and professional practice within the field of electrical and electronics.
- Achieve success in continuing their education towards completion of a four-year degree in engineering technology or engineering.

**AAS: Electronic Engineering Technology: Biomedical Engineering Technology**
- Qualify for employment in the medical equipment field as technicians.
- Install, service, and repair medical equipment systems, and perform technician work in the manufacturing of medical equipment systems by applying knowledge of electrical, electronics, control systems, networking, and biomedical equipment concepts.
Apply knowledge of electrical, electronics, control systems, networking, biomedical equipment concepts working with engineers on the design of medical equipment systems.

Qualify to train health care professionals on the use of medical equipment.

Communicate effectively both at the individual level and within team settings.

Apply ethical and professional practice within the field of medical equipment.

Achieve success in continuing their education towards completion of a four-year degree in engineering technology or engineering.


- Qualify for employment in the renewable energy field as technicians.
- Install, service, and repair renewable energy systems, and perform technician work in the manufacturing of renewable energy systems by applying knowledge of electrical, electronics, mechanical, control systems, and hydraulics/pneumatics concepts.
- Apply knowledge of electrical, electronics, mechanical, control systems, hydraulics/pneumatics concepts when assisting engineers with the design of renewable systems.
- Communicate effectively both at the individual level and within team settings.
- Understand the impact of renewable energy within the context of sustainability and apply sustainability concepts to their practice.
- Apply ethical and professional practice within the field of renewable energy.
- Achieve success in continuing their education towards completion of a four-year degree in engineering technology or engineering.

**AAS: Electronic Engineering Technology: Wireless and Data Communication**

- Qualify for employment in the wireless and data communications field as technicians.
- Install, service, and repair wireless and data communications systems, and perform technician work in the manufacturing area of wireless and data communications systems by applying knowledge of electrical, electronics, wireless and data communications concepts.
- Assist engineers in the design of wireless and data communications systems by applying knowledge of electrical, electronics, wireless and data communications concepts.
- Communicate effectively both at the individual level and within team settings.
- Apply ethical and professional practice within the field of wireless and data communications.
- Achieve success in continuing their education towards completion of a four-year degree in engineering technology or engineering.

**AAS: Electronic Engineering Technology: Mechatronics/Robotics/Automation**

- Qualify for employment in the Mechatronics/Automation/Robotics field as technicians.
- Install, service, and repair Mechatronics/Automation/Robotics systems.
- Perform technician work in the manufacturing area or assist engineers with the design of Mechatronics/automation/robotics systems by applying knowledge of electrical, electronics, mechanical, control systems, manufacturing processes, and programming concepts.
- Communicate effectively both at the individual level and within team settings.
• Apply ethical and professional practice within the field of Mechatronics/Automation/Robotics systems
• Achieve success in continuing their education towards completion of a four-year degree in engineering technology or engineering.

One-Year Certificate: Electronic Engineering Technology
• Qualify for employment in the electrical and/or electronics field as entry level operators.
• Assist technicians with installation, repair and servicing and manufacturing of the electrical and electronics by applying basic knowledge of electrical, electronics, and programming concepts.
• Communicate effectively both at the individual level and within team settings.
• Apply ethical and professional practice within the field of electrical and electronics engineering technology.
• Achieve success in continuing their education towards completion of an AAS degree in engineering technology.

Career Pathway Certificate: Renewable Energy Systems
• Qualify for employment in the renewable energy field as entry level operators.
• Assist technicians with Installation, repair and servicing and manufacturing of renewable energy systems by applying basic knowledge of electrical, electronics, mechanical, control systems, and hydraulics/pneumatics concepts.
• Communicate effectively both at the individual level and within team settings.
• Understand the impact of renewable energy within the context of sustainability and apply sustainability concepts to their practice.
• Apply ethical and professional practice within the field of renewable energy.
• Achieve success in continuing their education towards completion of an AAS degree in engineering technology.

In developing these learning outcomes we considered job skills required by industry. Recent graduates have found excellent employment with salaries ranging from $37,000 - $67,000. Some have gone on to obtain bachelor or master degrees. PCC’s EET Program has an articulation agreement with the BSEET of Oregon Institute of Technology (Appendix 1: OIT Transfer Agreement).

Discussions with officials at OIT-Portland confirm that PCC transfer students come in with a very good depth and breadth of educational background. Our graduates are well prepared for the junior and senior level EET courses and their graduation rate is excellent.

1.2 Program Consistency with PCC’s Mission, Values and Goals

The EET Program provides a “quality education in an atmosphere that encourages the full realization of each individual potential.” Students learn through various different teaching & learning modalities such as lecture, labs, group problem solving, individual research, and group projects. Students have access to campus-wide student services. EET students are of all ages, ethnicity, religion, and socioeconomic and educational levels. Dedicated teachers, staff, and Carl Perkins student services personnel assist all EET students in achieving their potentials. The program provides opportunities to
students who are unable to attend universities due to financial, employment, and family constraints.

PCC has a strong institutional commitment to sustainability. EET has made a great contribution at Sylvania campus through the development of the Renewable Energy Systems A.A.S. degree and the nine-month RES certificate. EET had the vision and acumen to design and implement these developments as early as 2005. EET served as inspiration for other local schools with their sustainable development initiatives.

2 Curriculum
2.1 Curriculum/Course Changes

In order to accommodate the development of EET options and the new RES certificate the EET department:

- Developed new courses such as EET 260 – Biomedical Equipment I and EET 261 – Biomedical Equipment II, EET 269 – Wind Mechanics, EET 110 – Introduction to renewable Energy, EET101 – Introduction to Electronic Technology, and EET 280C – BMET Practicum. A new course is under development, EET 272 – Motors and Generators.
- Incorporated existing courses from other departments such as:
  - Biomedical Engineering Technology option
    - MP 111 – Medical Terminology, BI 121/122 – Anatomy and Physiology I and II
  - Wireless and Data Communications
    - CIS 179/278 – Data Communications I and II and CIS 188/ – Wireless Network and Security
  - Renewable Energy Systems
  - Mechatronics/Automation/Robotics
    - ELT 125,126, 225 – Introduction/Intermediate/Advanced PLCs and other electives
    - CS 160 and 161
    - CMET 213 – Fluid Mechanics
    - DRF 270/126 or CMET 113
    - MCH 121 – MFG Processes
- Modified existing EET courses:
  - To better distribute the material of the digital systems sequence the EET 122 – Digital Systems II has been changed from three credits to four and EET 123 – Digital Systems III has been changed from five credits to four. The course outcomes did not change.
  - To better assist the mechatronics/automation/robotics option, robotics projects were added to the EET 242 – Microcontroller Systems (our credits). The outcomes did not change.
2.2 Assessment of Course Outcomes

The assessments of course outcomes are included in the CCOGs. They consist mainly of tests/exams, homework, group projects, laboratory and capstone projects. In order to improve attainment of course-level outcomes, instructors are constantly adapting their assessments. Decreasing the number of labs while increasing the depth of research required for the labs is a recent change that is being incorporated to improve development of critical thinking and general subject knowledge. Instructors are also considering adding self tests and increasing focus on hands on skills. Each course includes lecture and laboratory sessions.

2.3 Consistency with PCC Core Outcomes

The embedded academic content in the EET curriculum will serve our students throughout their lives. Students work together in groups to create a lab project. They learn and remember the academic content better because they are engaged by active participation in applying new concepts. They are learning teamwork and relationship skills as well. Understanding how to work well with others and maintaining good relations will help our students in their careers. Curriculum content in Electronics Engineering, Biomedical Engineering, Renewable Energy, Wireless and Data Communications, Mechatronics, Robotics and Automation is best delivered as an embedded curriculum. Analytical thinking and problem solving skills are embedded in the content. The following illustrates how embedded academic content of courses in the EET program interface with PCC Core Outcomes.

The Curriculum Outcomes Mapping (Appendix 2: Course Core Mapping Matrix) shows a breakdown on how EET courses focus on the College Core Outcomes.

Communication

Students majoring in Electronic Engineering Technology are required to take Writing 121. SP 111 is recommended as one of the general education requirements since this course is required for the BSEET degree at Oregon Institute of Technology. In addition, most courses require that written problem sets be submitted as an integral part of the engineering course description. Many of the EET courses require individual and team projects where students are required to make presentations and submit written reports. EET 254, the seminar course, requires students to conduct internet research on semiconductor industries and make power-point presentations, resumes and cover letters.

Community and Environmental Responsibility

Courses such as EET 188, Industrial Safety, and EET 254, Seminar provide students with the tools to analyze and make informed decisions regarding environmental ramifications...
of existing situations and proposals for future development. EET256, Capstone Project, allows students to complete their projects through Service Learning.

**Critical Thinking and Problem Solving**

The entire core curriculum of the EET program is a sequence of courses involved with developing the skills necessary to evaluate and analyze information using a scientific approach.

**Cultural Awareness**

The EET program has always made every effort to recruit students from diverse background, such as: Asians, Hispanics, Afro-American and Eastern Europeans. Student diversity statistics for the last five years are presented in Appendix 3: Student Diversity Data.

Instructors are sensitive to the fact that engineering continues to be a white/male dominated profession, and make every effort to create classroom environments that are safe and welcoming for under-represented groups.

We market our program in local ethnic newspapers.

**Professional Competence**

Graduates have been successful in obtaining excellent employment opportunities after completing an associate degree in the EET program and they have advanced to important positions in industry. The feedback from employers indicates a high degree of satisfaction with our EET graduates.

A recent survey conducted of EET Graduates indicated that 75% of the graduates who responded are employed full-time and 8% employed part-time in the electronics field (Appendix 5: Graduate Survey).

**Self-Reflection**

EET courses are designed to teach students to appraise their own skills and abilities, set well defined goals, and monitor their progress. Students are self motivated. The team projects teach students to work as a team member and understand oneself as part of a larger community. Work ethics are emphasized by our instructors.

**2.4 Distance Learning**

Due to the embedded laboratory component in most of our courses, EET does not offer long distance classes, the only exception being EET 188 – Industrial Safety. Our team is exploring offering classes through Interactive Video. We piloted this in 2009/2010 with EET 121, 122 – Digital Systems I, II. We are still evaluating the results of this project.
3 Needs of Students and the Community

3.1 New Student Demographics

Our technology students are enormously diverse in terms of goals, needs, backgrounds, and life circumstances. Student ages range from eighteen to sixty-two. The development of new and more appealing EET job training options such as biomedical engineering technology, renewable energy systems and mechatronics/automation and robotics, coupled with the recent economic recession, prompted a different student population to join EET. Liberal arts and business graduates are motivated to enroll in the EET program for the better job prospects. Many of the current EET students are recipients of the Trade Act benefits due to recent layoffs in their employment situation. We have also noticed an increase in the number of military veterans with strong electronics backgrounds interested in the program.

This new demographic is bringing a larger range of skills into the classroom. Instructors have to adapt new strategies to relate to and engage the students in the classroom. Advisors are faced with trying to balance student and program scheduling with students’ financial limitations.

3.2 Feedback for Curriculum Changes

The Advisory Committee was instrumental in the development of the EET options. Members of the specific industries were invited to join the EET advisory board and provide feedback as well as approve the new EET options. Higher level institutions such as Oregon Institute of Technology and Portland State University were closely involved. We also collaborated with high schools’ First Robotics organizations. While classes of our RES options do not transfer to the REE of OIT, a new PCC engineering transfer option, REE, emerged from our collaboration. EET of PCC has a very strong transfer agreement in place with EET of OIT.

Not only did industry offer support with advice on curriculum, they helped with equipment and scholarships, donations and some funding for the department, facilitated co-op agreements, field trips, offered class presentations for our students, et cetera. EET graduates also provided feedback in revising the curriculum.

3.3 Enrollment Pattern

The enrollment grew from twelve students in 2005 to over 150 students. In the last two to three years both the fall and the winter classes started at full capacity and there were always approximately fifty to one hundred people waiting to get into the program. Advising sessions are held every week and there is a strong indication that the future enrollment will be as large as well. With the current resources we can only accommodate eighty students in the fall and forty in the winter.
3.4 Strategies to Facilitate Access and Diversity

The Perkins advisor for the EET program has developed a student need survey which is administered after the first exam (Appendix 4: Student Needs Survey Form). Based on the survey result, individual student needs are accommodated in many areas including academic and financial support.

There are plans in place to receive one more laboratory room at Sylvania and another at SE Center. To assist with student retention tutoring funds have been allocated. Recruiting efforts in the past have increased diversity by posting ads in the local ethnic periodicals, such as Hispanic, Asian, Russian, and Romanian newspapers. To increase female enrollment, we plan to highlight women presenters for the PCC math class presentations as well as the presentations to the local high schools.

4 Faculty

4.1 Faculty Composition

4.1.1 Rational for the size, distribution and composition of the faculty

In 2009/2010 we had over a hundred students start our program and about thirty students in the second-year courses. The 2010/2011 academic year will see us try and provide instruction for up to 150 students. Many of our part-time instructors are only available for night classes or can only teach one day a week. This forces us to find qualified instructors for every lab and lecture, of which there are many. It is very difficult to get continuity in the individual sections with so many instructors. Over the last three years, the EET department has expanded its program offerings as well. We now have five A.A.S. degree options and two certificates. This expansion has required us to revamp and review our curriculum in many classes and, at times, add or redesign classes. While all of our new options are approved on paper, we are still working full steam to get the actual classes ready. Full-time faculty with time and desire are needed to supervise and perform this development. It is an arduous task even for full-time faculty to develop the right level of depth and breadth of the highly technical subject matter we are teaching. It can be challenging for a part-time instructor or contractor who doesn’t fully understand our students.

4.1.2 Quantity and quality of the faculty

During the 2009/2010 academic year, the EET department consisted of three full-time faculty. One of these three faculty also split time with the ENGR department. Beyond these three faculty, the teaching responsibilities were divided among fifteen different part-time faculty. There was also a temporary full-time faculty position during the winter and spring terms. This position was renewed for the 2010/2011 school year. We are moving forward to make this a permanent position starting in the 2011/2012 academic year. Along with instructional faculty we also have a full-time lab manager and an advisor who is funded by Perkins Funds.
One of the difficult staffing tasks for this department is finding qualified instructors. In order to be considered for a full-time position an instructor must hold an MS in EE/Electronics or related field (Computer, etc.) and have three years of industry experience. The MS is required because the instructor needs to be able to teach in university level engineering transfer (ENGR) classes. Part-time instructors who will not be teaching in ENGR can be hired with a BS and four years experience. We also have a few specialty courses that can be taught by instructors without these degrees, as long as they completed industry training in that area. Some of our biomedical engineering technology instructors fall into this category. It is not these requirements that make it difficult for us to find qualified instructors but rather the pay rate. An MS EE working in industry will generally make a much higher salary than what they will make teaching full-time. This also affects our recruitment of part-time instructors. Finding someone who is qualified and willing to work for much less requires time.

4.1.3 Faculty turnover and changes anticipated in the future

At the end of 2010 Gary Hecht, our long time faculty member, will retire. The current one year temporary position held by Daniel Kruger will need to be replaced by a full-time EET position. Next year we need to hire two new faculty members. Based on our past experiences with hiring EET instructors, this will probably be a challenging task. The current Perkins advisor will be leaving us during the winter 2011 term. She was instrumental in obtaining curriculum grants and conduct intensive research, et cetera.

4.1.4 Adjunct Faculty

The number of adjunct faculty has increased to eighteen or more. Efforts are in place to build the EET part-time faculty pool. We are fortunate to have dedicated and qualified part-time instructors who are involved in program and course development in addition to teaching. The evening part-time faculty members have full-time jobs in the industry and they bring valuable industry experience to students. They also help with field trips, industry class presentations and co-op experience. The following part-time faculty brought great industry expertise and dedication to the students and the EET program: Chuck Fenning, Mindy Gonzales, George Knox, Sid Antoch (former EET department chair), Douglas Draper, Corneliu Boghean, Jumnit Hong, Jeff Kleck, Fran Pelinka, Vibha Nayyar, Joseph Fernandez, Gene Fifield, Allan Douglas, Trung Le, Ray Finch, Walter Lara, Ben Kouba, and Maniza Johnson.

4.1.5 Faculty Diversity

The EET department chair brings diversity to the program as a woman engineer and European ethnicity. The Perkins advisor also brings diversity to the program as a woman and foreign ethnicity. Trung Le, the lab manager and part-time faculty, is of Vietnamese heritage and a highly qualified engineer. Many of our part-time faculty come from different ethnic background such as Chinese, Romanian, Indian, Hispanic, et cetera. We are fortunate to have women faculty who are teaching as part-time instructors such as Fran Pelinka, Mindy Gonzales, and Vibha Nayyar.
4.2 Instructor Qualifications

During the 2009/2010 academic year the EET department revised the EET instructor qualifications. These qualifications have been approved by the college and are posted on the PCC website. These qualifications are explained below:

**Full-time EET Instructors** need to teach in both EET and ENGR programs, therefore, they must meet one of the following instructor qualifications categories:

- Master's degree in electrical/electronic engineering plus three years of full-time, industrial work experience in the electrical/electronic engineering field.

OR

- Master's degree in electrical/electronic engineering related areas including computer, electromechanical, and mechatronics/automation/robotics engineering, plus thirty quarter hours of credit in upper division coursework in the electrical/electronic engineering areas, plus three years of full time, industrial work experience in the electrical/electronic engineering or the above listed related fields.

**Part-time EET Instructors** must meet one of the following instructor qualifications categories:

- Master's degree in electrical/electronic engineering plus three years of full time, industrial work experience in electrical/electronic engineering field.

OR

- Master's degree in electrical/electronic engineering related areas including computer, electromechanical, and mechatronics/automation/robotics engineering plus thirty quarter hours of credit in upper division coursework in the electrical/electronic engineering areas, plus three years’ of full time, industrial work experience in electrical/electronic engineering or the above listed related fields.

OR

- Bachelor's degree in electrical/electronic engineering plus four years of full time industrial work experience in electrical/electronic engineering fields.

OR

- Bachelor's degree in electrical/electronic engineering related areas such as computer, electromechanical, mechatronics/automation/robotics engineering plus thirty quarter hours of upper division course work in the electrical/electronic engineering areas, plus four years of full time industrial work experience in electrical/electronic engineering or the above listed related fields.

OR

- AAS degree in electrical/electronic engineering technology or related areas including computer, electromechanical, mechatronics/automation/robotics, plus five years of full time, industrial work experience in electrical/electronic engineering technology or the above listed related areas.
o Demonstrated competency and/or qualifications set by licensing organization in the field of biomedical engineering technology. CBET certification will suffice for teaching the EET 260 and EET 261 courses. (Supportive documentation of SAC-determined requirements must be attached to this form).

OR

o Instructors teaching EET 254 must have demonstrated competency gained through a combination of study and/or teaching experience and/or professional performance.

Instructors shall have completed their education at institutions accredited by commissions associated with or similar to the Northwest Commission on Colleges and Universities.

4.3 Faculty, Staff, and Advisor Profiles

**Sanda N. Williams:** Sanda Williams received her MS and BS degrees in Electrotechnical Sciences from Craiova University, Romania (1988, 1987) and her M.B.A. from Marylhurst University, Oregon (2008). She has work experience as an electrical engineer in the industrial power areas such as hydro and nuclear power (1988-1991), retail business as the general manager of Bel-Ami Fine Arts (1993-2000) and as an electronics instructor (2000-2010). Sanda was hired as a full-time faculty by Clackamas Community College in 2000 and by Portland Community College, Oregon, in 2005. She also served as a program director (CCC) and EET department chair (PCC) and has extensive experience with electronics training program development/management leading the design/development/implementation of the Microelectronics Technology/Electronics Systems Technology programs at CCC and the EET options at PCC.

**Daniel Kruger:** Daniel Kruger received his MS in Electrical Engineering from George Washington University, Washington, DC in 2005. He received his BS EE from Michigan Technological University, Houghton, MI. His professional experience includes serving as a test engineer at Maxim Integrated Products (2007-2010) and as an electrical engineer for the U.S. Naval Research Laboratory (2001-2006).

**Mike Farrell:** Mike Farrell received his BS in Computer Engineering from Rose Hulman Institute of Technology in 1993. He then went on to earn a MS in Electrical Engineering from Washington State University in 1995. From 1995 to 2005 Mike was employed as an IC designer working in the Semiconductor Industry. He has designed memories, ALUs, and Clock Data Recovery circuits. Mike joined PCC in the fall of 2008 as a full-time instructor in the EET and ENGR programs. From 2005 until 2008 Mike traveled around the world.

**Sid Antoch (Retired):** Sid Antoch worked as an electronic technician and engineering aide at Boeing, and also owned several electronic repair businesses prior to receiving a BS degree in Science from Portland State University in 1971 (courses in Physics and Engineering). After doing graduate work at PSU in environmental science and physics, he became employed by Portland Community College in 1975. He took a professional leave of absence from PCC in 1988 to pursue an MS degree in electrical engineering at
PSU, which was awarded in 1989. Sid’s primary interest is teaching analog electronics courses in EET and GE programs. He has also served as the department chair of the EET program. His hobbies include electronics and music.

**Gary Hecht:** Gary Hecht received his BS in Electrical Engineering, with highest honors, from the University of Texas at Arlington in 1971. After graduation he worked at Unisys, a mainframe computer manufacturer, as a computer programmer and later as a logic designer. In 1978 Gary moved to Oregon and worked for five years at Tektronix Corporation, initially in the personnel department as a recruiter for technicians and engineers.

Later he worked in the printer division of Tektronix as an engineer. In 1982 Gary was hired by Portland Community College as a full time instructor for the Electronics Engineering Technology program. He enjoys very much teaching and preparing written materials for the students including a custom published laboratory manual – *Experiments in Digital Electronics* used in EET 121, 122, and 123.

**Maniza Johnson,** Academic Resource Specialist (Carl Perkins Position)
Maniza has a PhD in Business Education and Administration with concentration in Marketing, Management and Computer Applications from University of North Dakota. She also has two Masters degrees: one in Geography and the other in Education with a concentration in Business Education. She has extensive experience in teaching, grant writing, student advising and research. Maniza works in three engineering technology departments in various capacities. Her primary responsibility is to enhance student retention. She teaches EET 254, the seminar course for EET students. Through this course, students learn job search skills, research and presentation skills, and industry trends from professionals in the field.

**Trung Le:**
Trung graduated in 1994 with a BS degree in EET from Oregon Institute of Technology. He is a graduate of our EET program, graduating in 1984. He has extensive experience as a hardware technician and engineer at Intel Corporation, being employed at Intel from 1984 to 2006.

### 4.4 Professional Development

We have a budget and a formal professional development plan for the Engineering, Science and Technology divisions. The EET department's professional development plan focuses on instruction, program development and industry standards. The former division dean, John McKee, and the department chair, Sanda Williams have attended Mechatronics Skills Set Meetings at the state level and Summer Wind Institute. Sanda is also a Member of Oregon Solar Energy Industries Association, American Wind Energy Association and Internationalization Committee. Sanda Williams has also been involved with curriculum and course development. She recommended initial curriculums for all new EET options and certificates and continued revisions with the help of the SACC, advisory board, industry, etc. She developed the MT 70-Vacuum Technology course, the
EET 188- Industrial Safety on line course, and the EET 110-Introduction to Renewable Energy jointly with Chuck Fenning.

Chuck Fenning, part-time instructor, also developed the EET 269-Wind Mechanics. He also revised the biomedical laboratories initially developed by Mindy Gonzales, another part-time instructor. Mindy was instrumental in the development of the biomedical engineering technology option. She was a member and attended the monthly meetings of the Oregon Bioscience Association. Mindy recently relocated in a different state. Chuck Fenning and Ray Finch have replaced her.

Sanda Williams and Mike Farrell have each attended the Matec and HI-TEC conferences. HI-TEC is a national conference on advanced technical education where technical educators, counselors, industry professionals, and technicians can update their knowledge and skills. The participation in this conference includes community college & university faculty, high school teachers, Workforce Development Advocates counselors, industry professionals and technicians.

Mike Farrell has observed both EET and non-EET classrooms to help refine his teaching style and skills. He also worked with Jeff Kleck, part-time instructor, revising lab projects in EET 242, Microcontroller Systems.

Mindy Gonzales attended the national conferences of the Association for the Advancement of Medical Instrumentation.

In developing the new options of the EET program such as Biomedical Engineering Technology, Renewable Energy Systems, Mechatronics, Robotics and Automation technology, Maniza Johnson, the academic advisor, and Sanda Williams, the chair of the EET department, conducted extensive Internet research. They reviewed similar national and international programs. Maniza Johnson was successful in receiving curriculum development grants to pay for overload for program development activities. EET faculty, academic advisor, and the chair have all been involved in researching topics on various options of the program, and industry standards. The curriculum for the EET and its options are continuously updated to keep up with the advancement in technologies.

The former chair of the department, Sid Antoch, has been teaching as a part-time faculty. He has developed Electronic Engineering courses and Circuit Lab manuals. Electronic engineering technology students need to know how to use lab equipment and software to be ready for employment in just two years. The circuit lab manuals we’ve been using in the EET program do not cover all the software that the students need to use to write a lab report. Sid wrote a set of lab manuals for the EET circuits courses based on the engineering transfer lab manuals, but oriented toward the engineering technician. Sid is currently developing a new course, EET 272 – Motors and Generators, which will implement new projects using state-of-the-art Lab Volt equipment. This new class will be included in the curriculum of EET and two of its options, Renewable Energy Systems and Mechatronics/Automation/Robotics.

Gary Hecht has been teaching EET 178-PC Architecture for Technicians. Gary created a lecture manuals and lab manuals for EET 178, EET 241, EET121, EET122, and EET123.
Trung Le, lab manager and part-time instructor, has developed the EET 101, Introduction to Test Equipment. This course was designed to assist students with their preparation on specific tools used in the beginning classes: EET 111, Circuits Analysis and EET 121, Digital Systems I.

Maniza Johnson and George Knox developed the EET 254, Seminar which assists students with job search skills including developing technical resumes and cover letters. It also facilitates industry presentations, mock interview sessions and networking with industry representatives.

5 Facilities and Support

5.1 EET Laboratories

The EET program has two laboratories, ST313 and ST315, shared with the university transfer electrical engineering program. The labs are well maintained and are equipped with the standard complement of equipment including a power supply, digital multimeter, oscilloscope, function generator, and computer for automated data acquisition. Each lab can accommodate twenty-four students at twelve lab stations. ST315 and ST313 were designed to be Chemistry/Physics labs. They are not well suited for electronics.

Bond money has been allocated to remodel existing labs and to create another lab for the EET department. There are efforts in place to allocate another lab for the EET and the Microelectronics Technology programs at the SE campus. At this time plans have not been revealed as to what these remodels will entail. One key point is to reduce the number of students that a lab can accommodate from twenty down to between eighteen and twenty. This will allow for improved instruction and learning in the laboratory sections.

The electronics labs are generally open from 9AM until 5PM, Monday through Friday. During the week there is usually a lab section every night from 7PM until 10PM. If there is not a class scheduled in the lab at that time, it is considered open lab. Many students use this time to come in and work on experiments for their classes or to get together to work on homework. Until our third lab is ready, the amount of time that the rooms are available for this will be significantly reduced.

In 2009/2010 there was an increase in the number of lectures being held in our laboratory facilities. This was done for several reasons. Our enrollment was such that we sometimes had to add extra lecture sections. There was not always classroom space for another lecture so we held the lectures in our labs, cutting into free lab time. The other reason is that many of the classrooms do not have computers. We often use specialty software for demonstrations and teaching purposes. This is software that we expect our students to know. It is installed on the computers in our labs, but is not on the computers we can get from the Library.
Our laboratories are staffed with a full-time lab manager, Trung Le. Trung maintains lab equipment and lab supplies and provides instructor support with the equipment during the labs. In addition, Trung provides tutorial support and teaches as a part-time instructor.

5.2 Use of Library Resources

EET students use the library for study, Internet research, and journal article reviews. In the final term students develop a team capstone project which requires extensive research. Interactive Video Courses are stored as resources in the library as well.

Instructors place alternate or extra copies of textbooks on reserve at the library for student review.

5.3 Technical/Clerical/Tutorial/Administrative Support

5.3.1 Technical Support

Trung Le, lab manager, offers technical support to the students with the test instruments and computers in the lab. He also maintains and troubleshoots test instruments and computers.

5.3.2 Clerical Support

EET department faculty, advisor and chair are covering most of the departmental clerical needs. The department chair has done departmental handouts, websites, brochures and fliers revisions. The dean’s assistant, Kathleen Harriman, is assigned to give support to the engineering departments as well. Shaun Majors used to help with clerical jobs in our departments when she was assigned to our area.

5.3.3 Tutoring Support

The department attempts to provide at least one tutor for the EET students each term. Historically these tutors have been paid through funds secured by our advisor, STEM, or NSF grants. Recently, the PCC administration allocated continuing tutoring funds in support to the growth of the EET program. We also received funds from the industry for tutoring support. The EET advisor facilitates math and writing tutoring through campus wide resources.

5.4 Advising Support

EET department is fortunate to have a Perkins advisor who provides quality student services support. Dr. Maniza Johnson wrote successful tutoring grants as well as staff development grant proposals. She has conducted extensive research for the curriculum development of some of the EET options such as Biomedical Engineering Technology, Renewable Energy Systems and Mechatronics/Automation/Robotics.

Advising duties are shared between Maniza Johnson and Sanda Williams. Due to the sheer volume of students wishing to enter the EET program, initial advising is done
mostly in a group setting. These advising sessions are held every week. Additionally new students are assisted with freshman orientation sessions.

The EET advisor is active helping current students gain access to campus-wide student service resources and financial aid/scholarships. Students who need additional basic study skills are assisted and advised on how and where to get continued help.

5.5 Scheduling Patterns

We currently have two starting cohorts a year. In the fall we start a set of students taking day classes. In the winter there is another start with students taking night classes. For the second year the two cohorts are traditionally combined. They now take a combination of day and night classes. Traditionally, the EET classes are scheduled on two days a week. Second year classes are offered at night and alternated each year so that all students can be accommodated. The night classes tend to have 1 three-hour lecture one night and a single hour of lecture followed by three hours of lab. The day classes often have their lectures split over two days with a lab on one of those days. In 2010/2011 our second-year class sizes are large enough that we are offering two lectures and four labs per class. We are attempting to keep a night and day option open to all students. However, as we get into winter term we will likely run out of night laboratory and class space available. This may require course offerings during the weekends.

6 CTE Information

6.1 Degree and Certificate Outcomes:

To better accommodate the current demands of the industry, the EET program added specialty options to the existing EET degree for the most popular job market segments such as biomedical engineering, renewable energy systems, mechatronics/automation/robotics, and wireless and data communications. Therefore, each option has its own set of specific program outcomes as listed above; however, they all fit under the general description of the original EET program’s outcome. We only decided to cover in more detail the specific areas that were already addressed by the old EET program. The new renewable energy area is a new segment of the industrial power already covered by EET. More electro-mechanical training is emphasized in mechatronics/automation/robotics, renewable energy systems and EET such as motors and generators, hydraulics and pneumatics, and PLCs.

6.1.2 Outcomes Assessment Strategies:

The EET coursework utilizes relevant technology to increase student academic and technical skills. Most courses also have laboratory sections which provide students with much needed hands on experience. The laboratories also provide students with training in the use of computers to generate and organize data pertinent to the EET field. The labs are designed with open ended problems to promote critical thinking and problem solving activities.
Capstone Project is a course offered in the final term. One of the requirements of this course is to develop an innovative team project which brings together skills learned in classes attended at PCC. Students develop, design, and present projects in the area of renewable energy, robotics, and electronics communications. Some of the additional skills emphasized include presentation skills, team work skills, writing and critical thinking skills.

Past Capstone Projects have included a home windmill, a robot that is controlled by sound, and a system to use a bicycle to generate an AC signal for the home, to name a few. Students have also restored to working condition varies pieces of electronic equipment. This includes fixing a broken stereo amplifier and working with wafer handling robots.

6.3 Improving Attainment of the Outcomes

New EET classes have been developed to strengthen the academic and CTE skills of students. EET101 was added to provide students with a better introduction to the equipment that they are expected to use throughout this program and in their careers. This class also serves as an introduction to soldering. Advisory board recommended the inclusion of soldering skills in the EET curriculum.

The program is continuously revising to meet the industry demands and needs. Classroom and laboratory focus is evaluated internally in an effort to insure that the skills being taught are the correct ones. Our advisory committee provides input in developing and revising the curriculum of each option of the EET program.

6.4 Job Placement Data

EET department conducted a follow up survey for the EET/BMET graduates in May and July of 2010 and for the EET/BMET current students (as of the previous academic year) conducted May and June of 2010 (Appendix 5: Graduate Survey).

The response rate for the graduates was 55%, which is substantially above the typical response rate for graduate surveys. This was achieved through email and phone call follow-up.

Forty two percent of the graduates indicated that the education and training greatly improved their employability. Seventy-five percent of the graduates are employed full-time and eight percent of the graduates are employed part-time. Seventy five percent indicated that the PCC program provided training that is related to their employment. Eighty eight percent indicate that they are happy with the instruction, ninety two percent are happy with the class availability, and 100% highlighted satisfaction with the class size.

In 2010 (through September), thirty-six recruitments were processed, some with multiple job openings (forty-four recruitments in 2009; fifty-seven recruitments in 2008). These included engineering technician positions in manufacturing, renewable energy, and biomedical engineering. These positions were primarily local and entry-level. Posted
wages ranged from $12.99- $32.29/hr. (approx. $27K – $67K annually). Recruiting employers included Intel Corp., Triquint Semiconductor, Rockwell Collins, Solar World, Siemens Energy, Vestas, Bonneville Power Administration, Adventist Medical Center, the VA Hospital, and others.

Our graduates generally work in a high wage jobs with an Associate of Applied Science degree. They also can further their education at the Oregon Institute of Technology and earn a BS degree in the field.

6.5 Future Employment Opportunities

RES program prepares technicians for high demand occupations. According to Climate Solutions and Clean Edge (October 2008), "More than 41,000 jobs in Washington and Oregon by 2025 from the following five sectors:

- Solar PV Manufacturing
- Green Building Design Services
- Wind Power Development
- Sustainable Bioenergy
- Smart Grid Technologies

and in an accelerated growth scenario, more than 63,000 jobs in the region by 2025.” These estimates are only focused on the five priority sectors targeted in this report. The potential for green job creation in the region is even larger.

According to Oregon Careers 2009, "Occupations of Tomorrow" cited many jobs in related electronic technology areas. Following are some of the occupations:

- Advanced Digital Manufacturing Technicians
- Composite Technicians
- Computer and Digital Forensic Technicians
- Convergence Technology Specialists/Technicians
- Electronics Commerce Specialists
- Global Positioning Systems Technicians
- Micro-electromechanical Systems Technicians
- Nano Technology Technicians
- Robotics Technicians

Electronics Technicians maintain all equipment that has electronics. Beginning salary for an AAS degree in EET ranges from $38,000 to $47,500 and with experience it can be $60,000+. In some exceptional cases it can be in six figures.

6.6 Challenges with Degree and Certificates Completion

Because of open enrollment policies a large numbers of non-traditional students are enrolled in the program. Retention rates for non-traditional students tend to be lower than that of traditional students. A relatively high level of “at-risk” students, such as students from some minority groups, students with disabilities, students from low-income
families or first generation students, and students who are older are enrolled in the program. These students are often academically under-prepared, financially disadvantaged, and have extensive family obligations.

Retention is a work in progress and one of the major challenges of the EET department.

A significant number of students drop during the first year. However, by checking with similar programs in the area it looks like this is common to EET programs.

Measures are already in place to assist this situation: STEM grant to help students who drop come back to school, scholarships from the industry and from a STEM grant for youth and laid off, permanent tutoring in the department, more FT faculties and the increase of a dedicated pool of PT instructors who know the program, increase of co-op and On The Job training sites. Thanks also to the efforts of Todd Sanders; we have a $596,214 NSF grant to provide scholarships to engineering technology students. The scholarships will be available to all engineering technology students, and are targeted at under-represented groups. This grant has also paid for some of the above-mentioned tutoring.

Due to the large number of students entering the program, marketing efforts have been scaled down. However, we developed new fliers for all EET options and a poster (Appendix 6: EET Poster). More efforts will go into finalizing and updating the EET website. In the future we plan to continue our math class presentations, post ads in the newspapers, and maybe give presentations to high schools to educate our community about the training opportunities offered in the EET department.

7 Conclusions/Improvement Strategic Plan

7.1 Strengths

Major strengths for the EET program include its dedicated faculty and staff. The EET program also has a very strong curriculum. The specialty options, degree and certificates offerings, and transferability make the program very attractive for both students and industry.

7.1.1 Faculty and Staff

One of the major strengths of the EET program is its dedicated faculty and staff. Each one of the faculty is dedicated to students and the program. Collectively, they work on continuous improvement of the program. They have technical skills, teaching ability, and industry experience.

The EET academic support specialist for the program serves as a one-stop resource person for students. She facilitates tutoring in electronic subjects for EET students, and helps students personally with their study skills techniques and term papers, helps students with financial and scholarship applications, job search processes including resume preparation and mock interviews.
The program has a competent lab manager. He relates well with students and help students with lab projects.

7.1.2 EET Curriculum

In addressing the ever changing industry and community needs, we added several specialty options to the EET program. These options share 70% of the EET core classes. Students can easily specialize in one or more options to become more marketable in the today’s demanding job market. The Electronic Engineering Technology program at PCC has a well-balanced curriculum with courses in digital electronics, analog electronics, communications and programming. Students can attend day or night, part or fulltime.

7.1.3 EET Options

Our specialty options prepare students to be employed locally, nationally, and internationally. Biomedical Engineering Technology is the only training program of its type available in the state of Oregon. The Renewable Energy Systems option has been developed to address the needs of the emerging renewable energy industry. Mechatronics/Automation/Robotics and Wireless and Data Communications engineering technicians are also growing professions.

7.1.4 Advisory Board

The EET advisory board is comprehensive including members from each industry sector related to the EET options. They provide input in curriculum development, student co-op experience, field trips, scholarships and employment of our graduates. To meet the changing needs of our students and community, new members of the advisory board have been recruited.

7.1.5 Transferability

The most commonly chosen career path is to complete the two-year EET program and receive an AAS degree, then go on to work in the engineering field. Another career path available for our students is to continue their education in engineering technology and work toward a Bachelor or higher degree. EET students can transfer into any BSEET degree. We have a specific transfer agreement with Oregon Institute of Technology in which students completing the A.A.S. EET degree or any of its options can enter the third year of their BSEET degree upon completion of a few additional classes.

7.1.6 Tutoring

Our department was allocated permanent funding to assist the EET growth with academic tutoring services. Campus-wide tutoring services in mathematics and writing are also available to the EET students.

7.1.7 Facilities

EET program is housed at PCC Sylvania campus. A free shuttle service between other campuses is available to students throughout the Portland area. This campus is also
served by public transportation. The buildings are accessible to students with disabilities. There is a plan to remodel the Science and Technology building, including our EET labs and there are opportunities for additional lab space.

7.1.8 Student Access

The existence of the winter start in addition to the fall start is a major strength of the program. The lag class represents program strength for at least two reasons. The lag class provides a “safety net” for the students who start in fall term. If a student does not have time or the necessary focus to complete all the first-term classes during fall term, the existence of the lag class means that all first-term classes will be repeated winter term, and either missing or not completing a required class will not force the student to wait a full year for the next offering of the class.

The winter cohort is traditionally a night cohort. This provides more students with access to our classes and opportunities to get a degree.

To increase the flexibility with class offering, the second year classes are scheduled as two sections - during the day and in the evening.

7.2 Weaknesses

7.2.1 Class Schedule

Second year classes are offered only once a year. This makes it difficult for some of our students who miss a term to complete the degree in two years.

7.2.2 Facilities

The interest in the EET program exceeds the capacity of its facilities, the most restricting of which are our laboratories. If we want to better address the needs of the community we need additional lab space. The two lab rooms are currently shared with the ENGR program and due to lab room limitations we see more and more our EET labs pushed toward Fridays and Saturdays.

7.2.3 Retention

EET students’ retention rate is a concern for us. It is not significantly different than the nation-wide electronics engineering technology retention rate, however it can be improved.

Several steps have been taken to help improve retention. The securing of permanent funds to provide outside tutoring is the biggest step. Also the math requirement has been raised from placement in MTH 95 to placement in MTH 111. It is believed that this will provide students with a better mathematical background at the critical start of the program.
7.2.4 Faculty

In recent years, the EET program has grown dramatically, yet there are only three full-time and seventeen part-time faculty members. Part-time faculty work during the day and they are not available for student office hours, or daytime lectures/labs. Moreover, it is difficult to find qualified and dedicated part-time instructors mainly due to the low pay rate. If we decide to accommodate more students, we will need to hire additional full-time instructors.

7.2.5 Equipment

We do not have enough adequate lab equipment for our new options. If we have new laboratory rooms we will need to equip them as well.

7.2.6 Clerical Help

We only have one person assigned for clerical support who is also the dean’s assistant. She tries to help some with the clerical support of three engineering and engineering technology programs. The EET department chair, the faculty and the Perkins advisor could spend more time with students if more clerical support were available to them.

7.2.7 High Schools Connections

Currently we do not have much collaboration and transfer agreements in place with local high school electronics programs and, in particular, with high schools having robotics programs.

7.2.8 Recruiting Women into the Program

One of the weaknesses of student enrollment is the low number of women students in the program.

7.3 Strategic Improvement Plan

7.3.1 Class Schedule

Explore the possibility of a spring start for EET program and its options. Second year classes need to be offered more than once a year. This is contingent on increases in facilities and staff.

Classes shared with other departments need to ensure enrollment for our students. Some of the students could not enroll in the anatomy and physiology classes, prerequisites of the biomedical program. This delayed the completion of the degree by one year. We are working with other departments on critical scheduling.

7.3.2 Facilities

We request the ST 308 room for additional EET laboratory space. We request EET laboratory space at the SE Center as well.
7.3.3 Retention

Several steps have been taken to help improve retention. The securing of permanent funds to provide outside tutoring is the biggest step. Weekly or by-weekly class evaluation along with a student needs survey are used to accommodate appropriate services.

We request physical space to accommodate tutoring for our EET students.

The math requirement has been raised from placement in MTH 95 to placement in MTH 111. It is believed that this will provide students with a better mathematical background at the critical start of the program. They will not fall behind in the first classes trying to understand the math and can focus on comprehending the electrical theory and practicality.

7.3.4 Faculty

With all the new added specialty options and the increase in enrollment and demand, additional full-time faculty will greatly benefit the EET program.

EET has experienced issues of recruitment and retention created by the labor market conditions. Therefore, we request that all newly hired part time and full time EET faculty start their salary at Step 3.

7.3.5 Equipment

EET secured $350,000 for the EET program to update the equipment and lab projects through the FY 10 FIPSE Federal Appropriation. Major equipment purchases and lab development will take place in 2010/2011.

We request additional funds to bring the EET technology up to industry expectations.

7.3.6 Clerical Support

We request 25% FTE clerical support for the EET department to accommodate the increased enrollment from 12 students to approximately 150 since the last program review.

7.3.7 High Schools Connections

We request $5,000 - $10,000 per year to promote STEM disciplines to high school students.

7.3.8 Recruiting More Women in the EET Program

We request $5,000 per year to develop a committee of professionals with expertise in recruiting underrepresented students in STEM programs and to recruit.
Appendices

Appendix 1: OIT Transfer Agreement

Portland Community College Electronics Engineering Technology AAS to OIT’s Bachelor of Science in Electronics Engineering Technology 2007-2008 Catalog
Page 1 of 1

Portland Community College, Electronics Engineering Technology AAS degree to Oregon Institute of Technology’s Bachelor of Science in Electronics Engineering Technology 2007-2008 Catalog

It is agreed that students that have completed the Associate of Applied Science (AAS) degree in Electronics Engineering Technology from Portland Community College (PCC) transferring to Oregon Institute of Technology’s (OIT) Bachelor of Science degree in Electronics Engineering Technology will be given full credit for the OIT lower-division (100- and 200- level) Electronics Engineering Technology (EET) courses. In addition to the AAS degree requirements students must have completed Calculus I (MTH251) and Calculus II (MTH252) in order to enroll in upper-division courses, with the exception of courses in Digital Systems and Microcontrollers, at OIT. This agreement is based on the evaluation of the rigor and content of the general education and technical courses at both PCC-EET and OIT and is subject to a yearly reevaluation by both schools for continuance. This agreement is dated June 5, 2007.

This agreement only covers the program technical course requirements. PCC’s general education courses will normally transfer to OIT and normally will apply toward OIT’s general education requirements. Students should consult with their advisor for recommended courses. Students transferring to OIT must satisfactorily meet all of the OIT General Education requirements prior to earning a Bachelor’s degree from OIT.

Baccalaureate students at OIT must complete a minimum of 60 credits of upper-division work before a degree will be awarded. Upper-division is defined as 300 and 400-level classes at a bachelor’s degree-granting institution. Baccalaureate students at OIT must complete 45 credits from OIT before a degree will be awarded.

Transfer students may guarantee their OIT catalog of graduation by obtaining written approval from their OIT major department and the Registrar. The agreed upon catalog will be the one a student uses when he/she transfers to OIT. Students must enroll at OIT within three years of this approval to receive credit.

By Sanda Nedelcu
Chair, Electronics Engineering Technology
Portland Community College

By Christine Chairesel
Vice President, Academic and Student Affairs
Portland Community College

By Maria Edge
Registrar
Oregon Institute of Technology

By Andrew Sedlock
Electrical Engineering & Renewable Energy
Oregon Institute of Technology

[Stamp: Received JUN 13 2007]

EET Program Review 27 11/05/2010
Appendix 2: Course Core Mapping Matrix

CORE OUTCOMES MAPPING

Mapping Level Indicators:

0: Not Applicable.
1: Limited demonstration or application of knowledge and skill.
2: Basic demonstration and application of knowledge and skills.
3: Demonstrated comprehension and is able to apply essential knowledge and skills.
4: Demonstrates thorough, effective and/or sophisticated application of knowledge and skills.

SAC EET: Electronic Engineering Technology

Core Outcomes:

1: Communication.
2: Community and Environmental Responsibility.
3: Critical Thinking and Problem Solving.
4: Cultural Awareness.
5: Professional Competence.
6: Self-Reflection.

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<td>EET 223</td>
<td>RF Communications Circuits</td>
<td>4</td>
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<tr>
<td>EET 222</td>
<td>Operational Amplifiers</td>
<td>4</td>
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<tr>
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<td>4</td>
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<td>2</td>
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<td>2</td>
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### Appendix 3: Student Diversity Data

#### Electronic Engineering Technology

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<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
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#### Gender Distribution, Nonmissing/Reported Data Only

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<td>2007-2008</td>
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<td>2008-2009</td>
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#### Race/Ethnicity Distribution, Nonmissing/Reported Data Only

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<th>Asian/Pacific Islander</th>
<th>American Indian/Alaska Native</th>
<th>Hispanic</th>
<th>White Non-Hispanic</th>
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<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
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<tr>
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<td></td>
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<td>18.8</td>
<td>1.2</td>
<td>9.4</td>
<td>63.5</td>
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<td>1.8</td>
<td>2.7</td>
<td>72.3</td>
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<tr>
<td>2006-2007</td>
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<td>5.9</td>
<td>22.1</td>
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<td>7.4</td>
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<tr>
<td>2007-2008</td>
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<td>7.1</td>
<td>18.8</td>
<td>1.2</td>
<td>9.4</td>
<td>63.5</td>
</tr>
<tr>
<td>2008-2009</td>
<td>112</td>
<td>4.5</td>
<td>18.8</td>
<td>1.8</td>
<td>2.7</td>
<td>72.3</td>
</tr>
</tbody>
</table>

*Source: Banner End-of-Term Extracts*

Data gathered by PCC Institutional Effectiveness
Appendix 4: Student Needs Survey Form

Engineering and Technology Programs

Student Needs Survey

Engineering and Technology faculty and staff would like to help you succeed as a student. This questionnaire is designed to seek information on your needs: both academic and non-academic.

Name: _______________________________

Program Enrolled ______________________ Full-time ___ Part-time __________

Are you working? If yes, how many hours per week? __________________

Do you have other obligations? __________________

Spouse/Partner________________________

Family with children___________________

Other ______________________________

How many courses are you taking this term? Please list:

1. __________________
2. __________________
3. __________________
4. __________________
5. __________________
6. __________________

Are you satisfied with your class performance/test scores? __________________

If not, how can we help you improve your performance?

Tutoring in academic program area courses____________
Tutoring in general education area courses
Help with Time Management Skills_______________
Help with Study Skills Techniques_______________
Help with English language_______________________
Other__________________________

Do you need any accommodations to help you succeed? __________________

______________________________________________
Do you need assistance in locating financial aid, scholarships, part-time jobs?______________

Do you need child care assistance?______________________

Are you satisfied with your experience at PCC?

Admissions office ______________________________________
Campus Bookstore_______________________________________
Campus Library________________________________________
Financial Aid Office____________________________________
Child Care_____________________________________________
Counseling and Advisement_______________________________
Other__________________________________________________

Comments/Concerns________________________________________
________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________
Appendix 5: Graduate Survey

Survey of PCC Graduates of the Electrical Engineering (EET) and Biomedical Engineering Technology (BMET) Programs

Conducted May-July 2010 by the PCC Office of Institutional Effectiveness (sample size=48 ; survey response rate=55%)

Section I. Background Information

1. What was your PRIMARY reason for attending PCC? (choose one)
   - Prepare for a new career 28 (58%)
   - Upgrade skills 12 (25%)
   - Transfer to a 4-year institutional 8 (17%)
   - Other: 0 (0%)
   - no answer 0 (0%)

2. What was your MAJOR field of study at PCC?
   - Electronics Engineering Technology 20 (42%)
   - Biomedical Engineering Technology 24 (50%)
   - Renewable Energy Systems 0 (0%)
   - Mechatronics, Robotics, and Automation Technology 1 (2%)
   - Wireless and Data Communication Engineering Technology 1 (2%)
   - Other: 2 (4%)
   - no answer 0 (0%)

3. What motivated you the MOST to pursue your education in the above field of study? (choose one)
   - Job prospects 16 (33%)
   - Interest in the electronics area 20 (42%)
   - Will receive a "Trade Act" benefit 4 (8%)
   - Lost my job and need additional training 4 (8%)
   - Other: 4 (8%)
   - no answer 0 (0%)
4. In what year did you complete your degree and/or certificate? (If you completed more than one degree/certificate, select the most recent).

<table>
<thead>
<tr>
<th>Year</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>8</td>
<td>17%</td>
</tr>
<tr>
<td>2006</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>2007</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>2008</td>
<td>16</td>
<td>33%</td>
</tr>
<tr>
<td>2009</td>
<td>20</td>
<td>42%</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Other:</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>no answer</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

5. To what extent did your PCC experience improve your employment situation?

<table>
<thead>
<tr>
<th>Extent of Improvement</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>It greatly improved my employment situation</td>
<td>20</td>
<td>42%</td>
</tr>
<tr>
<td>It moderately improved my employment situation</td>
<td>8</td>
<td>17%</td>
</tr>
<tr>
<td>It slightly improved my employment situation</td>
<td>16</td>
<td>33%</td>
</tr>
<tr>
<td>It did not improve my employment situation at all</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td>Not applicable (for example, I am not working by choice)</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>no answer</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

6. Which BEST describes your current employment status?

<table>
<thead>
<tr>
<th>Employment Status</th>
<th>Count</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Employed Full-time</td>
<td>36</td>
<td>75%</td>
</tr>
<tr>
<td>Employed Part-time, but looking for Full-time employment</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td>Employed Part-time, and NOT looking for Full-time employment</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Full-time Military</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Unemployed and looking for a job</td>
<td>8</td>
<td>17%</td>
</tr>
<tr>
<td>Unemployed and have given up looking for a job</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Not employed and not looking for a job, by choice</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>no answer</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

7. Is your current job related to your PCC program of study? (If you currently have more than one job, consider the job in which you typically work the MOST hours per week.)

<table>
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<tr>
<th>Related Status</th>
<th>Count</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Closely Related</td>
<td>16</td>
<td>33%</td>
</tr>
<tr>
<td>Somewhat Related</td>
<td>20</td>
<td>42%</td>
</tr>
<tr>
<td>Not Related</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Not Applicable (For example, not currently employed)</td>
<td>12</td>
<td>25%</td>
</tr>
<tr>
<td>no answer</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>
Section II. Employment that is Related to your PCC Field of Study

8. If your job is CLOSELY or SOMEWHAT RELATED to you PCC program of study, what is your current job title?

Validation Technician
Controls Engineer
biomedical engineer
Quality control analyst
Software Quality Assurance Tech
biomedical Engineering Technologist
Wafer operator
Engineer/Analyst Level 2
Customer Engineer (Field Service Engineer)
Biomedical equipment support specialist
Biomedical Engineer

9. If your job is CLOSELY or SOMEWHAT RELATED to you PCC program of study, how long did it take to get your current job?

I was already working in my field prior to graduation 4 (8%)
Less than 4 Months 12 (25%)
4 to 6 Months 0 (0%)
7 to 9 Months 4 (8%)
10 to 12 Months 4 (8%)
Longer than 12 Months (specify the number of months): 8 (17%)
no answer 16 (33%)

10. If your job is CLOSELY or SOMEWHAT RELATED to you PCC program of study, what is your gross annual salary?

Less than $18,000 0 (0%)
$18,001 to $27,000 4 (8%)
$27,001 to $36,000  8 (17%)
$36,001 to $45,000  4 ( 8%)
$45,001 to $54,000  4 ( 8%)
$54,001 or more  16 (33%)
no answer  12 (25%)

11. If your job is CLOSELY or SOMEWHAT RELATED to your PCC program of study, do you receive benefits (such as medical, dental, etc.)?
Yes  32 (75%)
No  0 ( 0%)
no answer  12 (25%)

Section III. Satisfaction with Our Program

Thinking about your PCC experience with either the Electronics Engineering Technology (EET) or the Biomedical Engineering Technology (BMET) programs, please rate your level of satisfaction with the following:

12a. Satisfaction with EET/BMET: Instruction
Very Satisfied  24 (50%)
Somewhat Satisfied  16 (33%)
Neutral  4 ( 8%)
Somewhat Dissatisfied  4 ( 8%)
Very Dissatisfied  0 ( 0%)
no answer  0 ( 0%)

12b. Satisfaction with EET/BMET: Availability of classes when needed
Very Satisfied  24 (50%)
Somewhat Satisfied  20 (42%)
Neutral  4 ( 8%)
Somewhat Dissatisfied  0 ( 0%)
Very Dissatisfied  0 ( 0%)
no answer  0 ( 0%)

12c. Satisfaction with EET/BMET: Class size
Very Satisfied  28 (58%)
Somewhat Satisfied  20 (42%)
Neutral  0 ( 0%)
Somewhat Dissatisfied  0 ( 0%)
Very Dissatisfied  0 ( 0%)
no answer 0 (0%)  

### 12d. Satisfaction with EET/BMET: Range of subject matter available

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</tr>
<tr>
<td>Somewhat Satisfied</td>
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<td>(8%)</td>
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<td>(0%)</td>
</tr>
<tr>
<td>no answer</td>
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<td>(0%)</td>
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### 12e. Satisfaction with EET/BMET: Availability of faculty outside class

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<td>(25%)</td>
</tr>
<tr>
<td>Somewhat Satisfied</td>
<td>24</td>
<td>(50%)</td>
</tr>
<tr>
<td>Neutral</td>
<td>8</td>
<td>(17%)</td>
</tr>
<tr>
<td>Somewhat Dissatisfied</td>
<td>2</td>
<td>(4%)</td>
</tr>
<tr>
<td>Very Dissatisfied</td>
<td>2</td>
<td>(4%)</td>
</tr>
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<td>(0%)</td>
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<td>no answer</td>
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### 12f. Satisfaction with EET/BMET: Availability of equipment

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<td>(42%)</td>
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<tr>
<td>Neutral</td>
<td>4</td>
<td>(8%)</td>
</tr>
<tr>
<td>Somewhat Dissatisfied</td>
<td>8</td>
<td>(17%)</td>
</tr>
<tr>
<td>Very Dissatisfied</td>
<td>4</td>
<td>(8%)</td>
</tr>
<tr>
<td>Not Applicable</td>
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<td>(0%)</td>
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<tr>
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### 12g. Satisfaction with EET/BMET: Quality of equipment

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<tr>
<td>Somewhat Satisfied</td>
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<td>(25%)</td>
</tr>
<tr>
<td>Neutral</td>
<td>8</td>
<td>(17%)</td>
</tr>
<tr>
<td>Somewhat Dissatisfied</td>
<td>4</td>
<td>(8%)</td>
</tr>
<tr>
<td>Very Dissatisfied</td>
<td>4</td>
<td>(8%)</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>0</td>
<td>(0%)</td>
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<tr>
<td>no answer</td>
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<td>(0%)</td>
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### 12h. Satisfaction with EET/BMET: Counseling/Advising

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<th>Percentage</th>
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<tbody>
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<td>12</td>
<td>(25%)</td>
</tr>
</tbody>
</table>
12i. Satisfaction with EET/BMET: Career Planning

- Very Satisfied: 8 (17%)
- Somewhat Satisfied: 32 (33%)
- Neutral: 12 (25%)
- Somewhat Dissatisfied: 2 (4%)
- Very Dissatisfied: 2 (4%)
- Not Applicable: 16 (33%)
- no answer: 0 (0%)

12j. Satisfaction with EET/BMET: Cooperative Work Experience programs

- Very Satisfied: 8 (17%)
- Somewhat Satisfied: 12 (25%)
- Neutral: 8 (17%)
- Somewhat Dissatisfied: 2 (4%)
- Very Dissatisfied: 2 (4%)
- Not Applicable: 12 (25%)
- no answer: 0 (0%)

12k. Satisfaction with EET/BMET: Job Placement Services

- Very Satisfied: 2 (4%)
- Somewhat Satisfied: 18 (38%)
- Neutral: 12 (25%)
- Somewhat Dissatisfied: 2 (4%)
- Very Dissatisfied: 2 (4%)
- Not Applicable: 12 (25%)
- no answer: 0 (0%)

Section IV. Overall Satisfaction with PCC

Thinking about your overall PCC experience (including coursework in other fields of study at PCC), please rate your level of satisfaction with the following:
### 13a. Overall PCC Satisfaction: Instruction

<table>
<thead>
<tr>
<th>Satisfaction Level</th>
<th>Number of Responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Satisfied</td>
<td>24</td>
<td>50%</td>
</tr>
<tr>
<td>Somewhat Satisfied</td>
<td>20</td>
<td>42%</td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
<td>0%</td>
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<tr>
<td>Somewhat Dissatisfied</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Very Dissatisfied</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>No Answer</td>
<td>4</td>
<td>8%</td>
</tr>
</tbody>
</table>

### 13b. Overall PCC Satisfaction: Availability of classes when needed

<table>
<thead>
<tr>
<th>Satisfaction Level</th>
<th>Number of Responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Satisfied</td>
<td>16</td>
<td>33%</td>
</tr>
<tr>
<td>Somewhat Satisfied</td>
<td>32</td>
<td>67%</td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Somewhat Dissatisfied</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Very Dissatisfied</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>No Answer</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

### 13c. Overall PCC Satisfaction: Class size

<table>
<thead>
<tr>
<th>Satisfaction Level</th>
<th>Number of Responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Satisfied</td>
<td>24</td>
<td>50%</td>
</tr>
<tr>
<td>Somewhat Satisfied</td>
<td>24</td>
<td>50%</td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Somewhat Dissatisfied</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Very Dissatisfied</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>No Answer</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

### 13d. Overall PCC Satisfaction: Range of subject matter available

<table>
<thead>
<tr>
<th>Satisfaction Level</th>
<th>Number of Responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Satisfied</td>
<td>12</td>
<td>25%</td>
</tr>
<tr>
<td>Somewhat Satisfied</td>
<td>32</td>
<td>67%</td>
</tr>
<tr>
<td>Neutral</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td>Somewhat Dissatisfied</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Very Dissatisfied</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>No Answer</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

### 13e. Overall PCC Satisfaction: Availability of faculty outside class

<table>
<thead>
<tr>
<th>Satisfaction Level</th>
<th>Number of Responses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Satisfied</td>
<td>12</td>
<td>25%</td>
</tr>
<tr>
<td>Somewhat Satisfied</td>
<td>28</td>
<td>58%</td>
</tr>
<tr>
<td>Neutral</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td>Somewhat Dissatisfied</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>Very Dissatisfied</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>No Answer</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>
13f. Overall PCC Satisfaction: Availability of equipment
Very Satisfied  8  (17%)
Somewhat Satisfied  28  (58%)
Neutral  4  (8%)
Somewhat Dissatisfied  4  (8%)
Very Dissatisfied  4  (8%)
Not Applicable  0  (0%)
no answer  0  (0%)

13g. Overall PCC Satisfaction: Quality of equipment
Very Satisfied  16  (33%)
Somewhat Satisfied  20  (42%)
Neutral  4  (8%)
Somewhat Dissatisfied  4  (8%)
Very Dissatisfied  4  (8%)
Not Applicable  0  (0%)
no answer  0  (0%)

13h. Overall PCC Satisfaction: Counseling/Advising
Very Satisfied  8  (17%)
Somewhat Satisfied  12  (25%)
Neutral  8  (17%)
Somewhat Dissatisfied  4  (8%)
Very Dissatisfied  4  (8%)
Not Applicable  8  (17%)
no answer  4  (8%)

13i. Overall PCC Satisfaction: Career Planning
Very Satisfied  4  (8%)
Somewhat Satisfied  20  (42%)
Neutral  8  (17%)
Somewhat Dissatisfied  2  (4%)
Very Dissatisfied  2  (4%)
Not Applicable  12  (25%)
no answer  0  (0%)

13j. Overall PCC Satisfaction: Cooperative Work Experience programs
Very Satisfied  12  (25%)
Somewhat Satisfied 12 (25%)
Neutral 4 (8%)
Somewhat Dissatisfied 0 (0%)
Very Dissatisfied 4 (8%)
Not Applicable 16 (33%)
no answer 0 (0%)

13k. Overall PCC Satisfaction: Job Placement Services
Very Satisfied 8 (17%)
Somewhat Satisfied 32 (33%)
Neutral 8 (17%)
Somewhat Dissatisfied 0 (0%)
Very Dissatisfied 4 (8%)
Not Applicable 12 (25%)
no answer 0 (0%)

13l. Overall PCC Satisfaction: Availability of tutors
Very Satisfied 8 (17%)
Somewhat Satisfied 20 (42%)
Neutral 4 (8%)
Somewhat Dissatisfied 4 (8%)
Very Dissatisfied 0 (0%)
Not Applicable 12 (25%)
no answer 0 (0%)

14. What suggestions do you have for improving PCC college services or the EET/BMET programs?

I wish that PCC have medical equipment so we can practice and learn before our internship. OR A class to prepare us for troubleshooting medical equipment. i saw only 2~3 equipment in one year that our instructor had borrowed from her hospital "job".

Upgrade lab computers and equipment
Increase lab hours
Focus on hands-on hardware e.g. soldering, circuit board fabrication

Longer cooperative work experience.
Out dated equipment... although the equipment served its purpose the electronic industry is ever growing and using outdated technologies is not very helpful when you get out into the field (eg oscilisopes, computers, and old defibs)

[Deleted instructor name] [The instructor’s] idea of teaching is reading the material out of the book!!

More Biomed test equipment instruction

Cooperative work experience needs to be longer. 330 hours is not quite enough to give the student enough experience to directly enter the field. I interned for an additional 1000 hours after the cooperative work experience before I was hired.

The learning curve in this field is very steep, and receiving as much experience as you can prior to graduation is very helpful in improving your chances of becoming employed in this field.

Having more cooperative work experience.
Appendix 6: EET Poster

Electronic Engineering Technology

- Research and Development Laboratories
- Electronic Equipment Manufacturers
- Public Utilities
- Higher Education
- Government Agencies
- Medical Laboratories and Hospitals
- Semi-conductor Manufacturers

What do these industries have in common? They represent a sample that employ Electronic Engineering Technicians – highly skilled staff whose responsibilities range from circuits and system testing, to product development, to prototype construction and testing, to systems operation and manufacturing. In the ever-developing field of engineering technology, their expertise is valued, respected and in demand.

Learn how to become an electronic engineering technician at PCC Sylvania through its ELECTRONIC ENGINEERING TECHNOLOGY program that offers:

Two-Year Associate of Applied Science degree in Electronic Engineering Technology, with the following specialty options:
- Biomedical Engineering Technology
- Renewable Energy Systems
- Wireless and Data Communications
- Mechatronics / Automation / Robotics

Nine-month Certificates:
- Electronic Engineering Technology
- Renewable Energy Systems

For more information, contact Sanda Williams, department chair, Electronic Engineering Technology

503-977-4527
or sanda.williams@pcc.edu
www.pcc.edu
http://www.pcc.edu/programs/electronic-engineering/
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