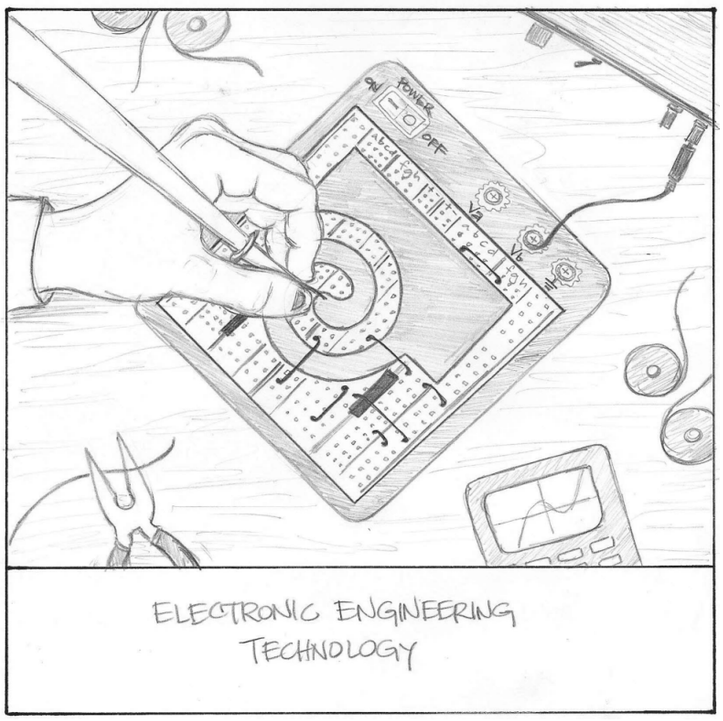
Electronic Engineering Technology Program Review Report

Issued October 2015



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About this Report

- This report was written to follow the format as described by the following document:
  https://www.pcc.edu/resources/academic/program-review/documents/Guidelinesfor2015_16PRs.docx
- The cover art was done for the EET department by Melissa Harder in 2012.
- The electronic version of this document contains links (colored blue) to assist in document navigation. For example, here is a link to the Table of Contents on the next page.

Table of Contents

1. Program/Discipline Overview

A.

What are the educational goals or objectives of this program/discipline? How do these compare with national or professional program/discipline trends or guidelines? Have they changed since the last review, or are they expected to change in the next five years?

The goals of the Electronic Engineering Technology (EET) program are to cultivate marketable skills in analog and digital circuit theory, troubleshooting, critical thinking, and the hands-on equipment-based experience to enable its students to obtain employment in the electronics technology industry. These have been the program's goals since its inception over 40 years ago. We do not anticipate change to these high-level goals in the next five years. Most of the program's students seek employment after obtaining a two-year Associate of Applied Science (AAS) degree, while some transfer to a four-year institutions to earn their Bachelor of Science in Electronic Engineering Technology (BSEET).

B.

Briefly describe changes that were made as a result of SAC recommendations and/or administrative responses from the last program review.

Equipment: "We request[ed] additional funds to bring the EET technology up to industry expectations." In response to the EET SAC request, new furniture and all the basic electronics equipment requested by SAC was purchased with campus margin dollars for the new (bond remodel) lab. Many replacement electronics were purchased for the two existing labs. Perkins funding, donations, and campus margin dollars were used to substantially upgrade the Biomedical Degree Option (Biomed) tech equipment and for EET 179 Fuel Cell Systems course developments. Equipment for EET 179 was purchased with a grant from Sylvania's Green Fund.

High School Connections: "We request[ed] $5,000 - $10,000 per year to promote STEM disciplines to high school students." Although only $2,500 per year has been allocated, efforts to this end have been coordinated across Engineering University Transfer (ENGR), EET, and Civil and Mechanical Engineering Technology (CMET). Substantial funding for outreach was provided through grants from Intel, Oregon Department of Education (ODE), and the Foundation. In addition, PCC has become formal partners with the two closest Oregon STEM Hubs. These hubs prioritize the transition from high school to college.

Recruiting More Women in the Program: "We request[ed] $5,000 per year to develop a committee of professionals with expertise in recruiting underrepresented

students in STEM programs and to recruit." Although funds were limited and the EET SAC did not submit the requested plan for this activity, the EET advisor Linda Browning participated in a grant-funded from the National Science Foundation (NSF) for a multi-week multi-discipline (CMET, Physics, Chemistry, Biology) "Retention and Recruitment" planning fellowship in 2015. The program, by design, focused on increasing women's participation in CMET; nevertheless, many project outcomes (best practices in website structure, for example) are easily scalable to additional STEM disciplines. An NSF grant has been proposed (funding pending) that will support rapid implementation of the plan and dissemination of the plan to disciplines that include EET.

Facilities: "We request[ed] the ST 308 room for additional EET laboratory space. We request[ed] EET laboratory space at the SE Center as well." EET received an additional lab classroom with the bond remodel and significant space at Sylvania was allocated in the HP building to support new, interdisciplinary "MakerSpace" activities, new equipment (eg., a new Baxter manufacturing robot), and new curriculum (eg., an emerging interdisciplinary "Creative Tech" class.) The MakerSpace supports interdisciplinary outreach efforts. A tour through the MakerSpace has been identified by Linda Browning as a "game-changing" part of new EET student recruitment. EET laboratory space at the SE Center was not developed, however, the physics laboratory was built large and with infrastructure to support electronics instruction. In addition, the SE Center recently opened an interdisciplinary STEM Center and this space has supported outreach, including the offering of the on-ramp ENGR 100 Exploring Engineering class. Students still need to attend Sylvania to complete EET courses.

Other Administration Recommendations: We were urged to work with our Division Dean to take full advantage of the recent bond remodelling of the ST building, which is now complete. The EET department is now very pleased to now have remodeled offices, remodeled labs, and, most importantly, one additional lab, as mentioned above.

It was also suggested that we better document the process of soliciting input from various sources. We have developed exit surveys (Appendix C) for alumni and have established a feedback path on the performance of EET graduates attending Oregon Institute of Technology (OIT). Also, we use Portland Community College (PCC)'s Graduation Requirements and Academic Decisions (GRAD) Plan to ensure they have a clear path to their degree.

Alternating day-only one year and evening-only the next year has been a good growth strategy, albeit with limitations. A suggestion from our previous review was to explore the possibility of offering a spring start and offering second-year classes more than once per year. EET has had fall and winter quarter start tracks in place. Adding a third track would be more demanding on faculty and would stretch our limited enrollment further than offering the second year classes multiple times per year. The multiple-times-per-year second-year class offerings are not a reality, however, concurrent day and evening classes for many of these courses is now in place. This is an improvement from our alternating offerings of day-only one year and evening-only the next.

Finally, the latest program review resulted in a suggestion to, "... determine ways

to facilitate the enrollment of Biomed students in [courses shared with other departments]." Through advising and close coordination with respective departments, we were able to accommodate student challenges with enrollment in MP 111, BI 121, and BI 122.

2. Outcomes and Assessment

Reflect on learning outcomes and assessment, teaching methodologies, and content in order to improve the quality of teaching, learning, and student success.

A. Course-Level Outcomes

The College has an expectation that course outcomes, as listed in the CCOG, are both assessable and assessed, with the intent that SACs will collaborate to develop a shared vision for course-level learning outcomes.

i.

What is the SAC process for review of course outcomes in your CCOGs to ensure they are assessable?

Any time a class or sequence is updated, the course outcomes are rewritten to be relevant and assessable. Electronics Engineering Technology is a field with ever-changing technology and industrial technological needs. The area faculty most frequently track is industrial standards. These faculty then bring updates for course content to the subject area committee (SAC) for review, and CCOGs are updated accordingly.

ii.

Identify and give examples of changes made in instruction to improve students' attainment of course outcomes, or outcomes of requisite course sequences (such as are found in in MTH, WR, ESOL, BI, CH, etc.) that were made as a result of assessment of student learning.

Most recently, the entire digital sequence (EET 121, 122, 123, 178, 241, 242) received a major overhaul. Some of the reorganization was done to incorporate new pedagogical standards, such as a larger focus on projects. Much of the effort addressed a need for better and more specific programming skills as a result of assessment of student learning.

It was observed that students in EET 241 and 242 did not have the basic programming skills needed to fully succeed in these classes. Programming used to be taught in a single class with a single application. The new approach distributes the programming skills to all of the 100-level classes in which students learn programming, as is applicable to outcomes of that particular course. This has guided our students to see broader applications of programming and this has become something students understand and appreciate more.

B. Addressing College Core Outcomes

i. Update the Core Outcomes Mapping Matrix

For each course, choose the appropriate Mapping Level Indicator (0-4) to match faculty expectations for the Core Outcomes for students who have successfully completed the course. (You can copy from the website and paste into either a Word or Excel document to do this update, and provide as an Appendix.)

Alignment of college core outcomes with course outcomes is shown in the Core Outcomes Mapping Matrix in Appendix E.

C. Degree and Certificate Outcomes

i.

Briefly describe the evidence you have that students are meeting your Degree and/or Certificate outcomes.

Over the last two years, we have reported the results of our Technical Skills Assessment (TSA) to the state reporting TSA results on 50 students. 47 of these students successfully passed the criteria defined by TSA assessment.

We assess the ODE-approved skills that align with our own degree outcomes with criteria that were developed in-house and make use of existing projects and tests from a variety of classes throughout the program. We developed the assessment using our advisory board committee's input. The process was subsequently approved by the entire board.

Only four of the six EET degree outcomes are assessed by the TSA assessment criteria. The other two outcomes are assessed each year as part of the PCC assessment process. Typically over 90% of the students assessed for these outcomes pass.

We have consistently heard good feedback from our advisory board members and other industry representatives that interact with and/or hire our students. They are pleased with our alumni's abilities, skills, and performance.

ii.

Reflecting on the last five years of assessment, provide a brief summary of one or two of your best assessment projects, highlighting efforts made to improve students' attainment of your Degree and Certificate outcomes.

Our best assessment project was likely the realization that our previous degree outcomes were not assessable in a realistic and meaningful way. We took the first year in

that process and rewrote our degree outcomes with the intention of assessability. We also wrote them with project ideas in mind. These projects include course final exams, lab final exams, and evaluation of written and oral reports.

The lab final exam for EET 242 is used to evaluate "Carry out instructions and automate highly repetitive or monotonous tasks by utilizing programming skills." During the 2011-12 assessment, it was determined that students needed improved programming skills, resulting in an overhaul of all of the first-year digital courses. All of these courses now include more embedded programming as a result. Reassessment of this outcome in 2013-14 showed an improvement in students' abilities in accordance with this outcome. In 2014, only one student of the forty-three assessed did not attain the desired performance.

"Communicate effectively both at the individual level and within team settings," is an outcome that has been continually assessed over the last five years. It was originally assessed in EET 256 Capstone Project and then in other classes where oral presentations were given. Assessment of this outcome has led to significant changes in our lab curriculum. More formal, written lab reports are now required in the first year. Classes in second year are requiring more projects that mandate reporting of results to the class. These reports come in the form of oral, written, and poster presentations. The net result is that we are seeing improvements in our students' abilities and desires to present data in a meaningful way.

iii.

Do you have evidence that the changes made were effective (by having reassessed the same outcome)? If so, please describe briefly.

All of our assessments have historically had a greater than 90% attainment rate. The goal of any changes are to improve the pedagogy of the class, make the class more relevant, and improve students' soft skills while not sacrificing achievement of the outcome.

Over the last three years, we have made many assessment-based changes (Appendix B). In all cases, that same outcome was reassessed the next year with no negative effect.

iv.

Evaluate your SAC's assessment cycle processes. What have you learned to improve your assessment practices and strategies?

Over the last five years, the SAC has continually assessed the degree outcomes for the EET option degree only. For much of this time, this involved TSA and PCC-based assessments. Recently, the PCC and TSA assessments have become aligned, resulting in a reduction of duplicate efforts. We will now start branching out and assessing outcomes in our other degree options.

The biggest hole in our assessment strategy has been incorporating results from our winter trailer cohort, which is taught at night primarily by part-time (PT) faculty. We need to find a better way to incorporate PT faculty and make sure they understand what is required for the assessment process. Lack of data from this cohort is a problem for both our PCC and TSA assessment.

Another problem we have with the winter cohort data is the timing. Many of our assessment are based on projects in the third term. For the winter cohort, this is summer term. The data is accumulated too late for inclusion on that year's report. It must be kept and evaluated the next year. To an extent, this means that this data could cloud the results of changes made based on the prior year's assessment.

v.

Are any of PCC's Core Outcomes difficult to align and assess within your program? If yes, please identify and explain.

Looking at the Core Outcomes Mapping Matrix in Appendix E, it can be seen that Cultural Awareness is a PCC Core Outcome that is difficult to align with our program. We recognize the importance of other skills that go beyond the technical world (the soft skills). We have tried to embed soft-skill training into classes wherever possible. The most concentrated exposure to soft-skills training occurs in EET 254 Seminar.

Integrating these skills into the other technical classes is a challenge. We have attempted to do this by assigning more reports and multi-week projects, which require better coordination and interaction between lab partners. Our hope that this will help students gain some understanding into cultural awareness via more demanding interaction with each other.

As a SAC, we feel that this is an improvement in helping students learn Cultural Awareness. However, we also realize that it is not currently assessed. Assistance is needed in assessing students' cultural awareness.

3. Other Curricular Issues

A.

Which of your courses are offered in a Distance Learning modality (online, hybrid, interactive television, etc.), and what is the proportion of on-campus and online? For courses offered both via DL and on-campus, are there differences in student success? (Contact the Office of Institutional Effectiveness, either Laura Massey or Rob Vergun, for course-level data). If so, how are you addressing or how will you address these differences? What significant revelations, concerns, or questions arise in the area of DL delivery?

Although instructors use many computer-based and web-based resources for instruction, currently only one EET class is taught in the distance modality: EET 188 Industrial Safety.

B.

Has the SAC made any curricular changes as a result of exploring/adopting educational initiatives (e.g., Community-Based Learning, Internationalization of the Curriculum, Inquiry-Based Learning, Honors, etc.)? If so, please describe.

Instructional style for the most of the EET courses is through the use of lecture, problem examples, demonstration and lab work. EET students use hands-on activities in lab and with projects.

One EET instructor has been using the flipped classroom model for approximately three years. Further integration of the model is being considered for additional courses.

Project-based lab assignments have increasingly been included into many of our courses. In one of course, students are required to find and solve a problem specified by a "customer," where the customer must be someone outside of the EET department (it cannot be an EET student or faculty member).

C.

Are there any courses in the program offered as Dual Credit at area high schools? If so, describe how the SAC develops and maintains relationships with the HS faculty in support of quality instruction.

The EET program does not currently have any classes that are offered as dual credit with area High Schools.

D.

Please describe the use of Course Evaluations by the SAC. Have you developed SAC-specific questions? Has the information you have received been of use at the course/program/discipline level?

Course evaluations take an important role in our improvement and development of courses. Although our goals are driven by our advisory board, student evaluations often provide detailed feedback on instructional implementation.

For example, in the first-year digital classes, EET 121, 122, and 123, the scheduling (as in day of the week) of a lab with respect to its corresponding lecture, and the weighting of grades have been adjusted based on student evaluations of the course. Fall term also marks the first time we began offering our courses starting on the half hour, reducing the chances a student would have lunch blocked out by multiple hours of class or lab. This addressed significant student feedback from last year.

The SAC has included SAC-specific questions into course evaluations. To date, the results from these questions has been useful at the course level.

E.

Identify and explain any other significant curricular changes that have been made since the last review.

All of our courses have gone through routine updating since our last program review. As with other high-tech fields, the electronics industry moves at a rapid pace and our courses are changed to keep in step.

We have split EET 255 into two courses (EET 272 and 273) to expand the electric motors curriculum. EET 178 Computing Environments has been entirely reworked to remain relevant to current computational platforms.

In response to student feedback, staff development grants were obtained to completely rewrite the lab assignments for EET111, 112, and 113. Separately, faculty re-evaluation of material for EET 111 and 112 has resulted in dropping some irrelevant material to intensify focus on core concepts.

4. Needs of Students and the Community

A.

Have there been any notable changes in instruction due to changes in the student populations served?

With a student population that has diverse challenges in meeting their educational goals, we have made many changes to enable them to succeed. We have created an environment of practical application through our hands-on lab experiments that help the students apply the theory they learn in class, maximizing exposure to the material in different context, helping students with various learning styles. We have also altered the lab experiments so there are fewer labs while maintaining substance. This lets students to reflect on their work, focusing on internalizing the concepts they are using, as opposed to rushing through with and achieving limited comprehension.

With the department now having an additional lab, students have more open lab time so that they can more easily fit out-of-class lab work into their busy schedules.

We have also addressed many opportunities in the lecture. Typically, we have at least two different instructors teaching each course. This allows for students to find an instructor that better matches their learning style. Our instructors are also developing new teaching methods.

To further address our commitment to our students' success, many instructors have made lecture materials available via PCC's online resources such as Desire2Learn (D2L) and the spot.pcc.edu web server so students can access information readily. We have also increased instructional resources outside of class by adding online tutoring and lecture recitations.

B.

What strategies are used within the program/discipline to facilitate success for students with disabilities? What does the SAC see as particularly challenging in serving these students?

The EET department makes it a top priority to enable student success. We work with Disabilities Services (DS) office to accommodate students' personal challenges effectively through use of the testing center, modified classroom and laboratory equipment (special chairs, desks, etc.), more visual aides, online lecture note availability, and even allowing students to record the lectures for personal use (publishing to the Internet is prohibited).

Some of the challenges we face when working with students with disabilities is understanding how we can accommodate them without drawing unnecessary attention.

It is challenging to meet all requested accommodations in the lab environment. We are developing our relationship with DS so we are better prepared to meet students' needs.

C.

Has feedback from students, community groups, transfer institutions, business, industry or government been used to make curriculum or instructional changes? If so, please describe (if this has not been addressed elsewhere in this document).

Scheduling and capacity conflicts with the Machine Manufacturing Technology (MCH) department has resulted in the development of EET 199 Creative Technology, which is a work in progress. This could evolve into a course to help our Mechatronics and Renewable Energy Systems (RES) students.

Feedback obtained from co-op site visits has resulted in added networking and troubleshooting into our Biomed option's curriculum.

5. Faculty

Reflect on the composition, qualifications and development of the faculty. Provide information on:

A.

How the faculty composition reflects the diversity and cultural competency goals of the institution.

Despite the fact that engineering is a white, male-dominated field, the EET faculty body includes individuals with diverse backgrounds. Continuous efforts have been made to attract women in the EET department faculty and staff. There is one woman full-time faculty in the EET department who also serves as the EET department chair and one female faculty, who serves as the department's advisor.

We use the strengths of each instructor to the students' advantage, assigning the best instructor coverage for each class. Teaching in both EET and ENGR departments requires significant flexibility from instructors, as the two groups of students differ greatly in academic background and thus learning needs. One group may struggle with algebra and may have never seen a spreadsheet, while the other group is familiar with calculus and has already taken physics and chemistry.

The first-year EET classes require accommodating the needs of new students who, for instance, may have never seen a spreadsheet.

Evening students typically work during the day, often with little on-campus resources compared to the day students (no gym or cafeteria to relax and eat, no administrative assistants, no advisors and no lab manager). Many of the PT faculty also work during the day and have only one office hour per week to support the students. For these reasons, the full-time (FT) faculty have developed teaching materials to share with the PT faculty to facilitate course improvement and reduce preparation time for PT faculty.

Each term, a FT faculty is assigned as a course's lead (as in leader) who coordinates materials, lab assignments, and equipment to ensure consistency among multiple course sections. Despite all these challenges, our FT and PT faculty have harmonized well over the years, showing flexibility and genuine student-based motivations.

B.

Changes the SAC has made to instructor qualifications since the last review and the reason for the changes.

Our previous instructor qualifications can be found in Appendix F and current qualifications in Appendix G.

The development of the EET AAS degree options, which are specialized areas of EET, introduced the need for specialized faculty in these areas. Many instructors for biomedical engineering technology can be hired based on demonstrated competency, rather than usual EET instructor qualifications. Many of these faculty completed military training and have Certified Biomedical Engineering Technician (CBET) certifications in addition to many years of experience in the Biomed engineering field. The current instructor standards have specific qualifications for the ability to teach the Biomed engineering technology classes: EET 260 Biomedical Equipment I, EET 261 Biomedical Equipment II, and EET 280C Biomedical Engineering Technology Co-op.

Two of our EET options, RES and Mechatronics/Automation/Robotics, share more classes and involve more embedded electro-mechanical skills than other options. Therefore, it is common to have an instructor with a mechanical or electro-mechanical background teach some of the renewable energy classes. Specific qualifications were thus added to the demonstrated competency standards for EET 110 Introduction to Renewable Energy and EET 179 Fuel Cell Systems.

Specific standards were outlined for the EET 254 Seminar and EET 280A EET Co-op classes, which have an employment preparation orientation. Instructors for these courses need to meet instructor qualifications different from the rest of the EET faculty.

C.

How the professional development activities of the faculty contributed to the strength of the program/discipline? If such activities have resulted in instructional or curricular changes, please describe.

Two elective courses were developed in the renewable energy option: EET 269 Wind Mechanics and EET 179 Fuel Cell Systems as a result of our faculty's professional development activities. EET 269 was developed as a result of faculty attendence at American Wind Energy Association (AWEA)'s Education Working Group Perspective. EET 179 Fuel Cell Systems was developed after a field trip at ClearEdge Power company.

Faculty attendance at the 2013 STEMtech Conference influenced our layout and design of the EET labs, inspired incorporation of teaching techniques for non-native English speakers, and informed the purchasing of 3D printers for the MakerSpace and EET labs.

6. Facilities and Academic Support

A.

Describe how classroom space, classroom technology, laboratory space, and equipment impact student success.

The EET faculty are delighted to have a third, critically needed lab classroom. It has allowed us to teach programming classes in front of computers instead of on a white-board, which is a standard pedagogical approach for computer programming. It also allows for more EET face-to-face tutoring time and more open lab times for students to work on projects outside of their assigned class time, giving students more opportunities to internalize theory while applying it to hands-on experiences. Scheduling regularly-occurring introductions the program can now occur without imposing on any labs in session.

In addition to the bond remodeling, the department has obtained new equipment to keep our program modern and improve student engagement. Some examples include:

- 3-phase voltage installation and LabVolt motors and controls trainers
- fuel cell trainers for our RES option
- new programmable logic control trainers
- new lab benches and chairs
- soldering ventilation chutes
- upgraded some core bench equipment
- a variety of donated biomedical equipment.

In particular, student feedback and engagement with the use of the LabVolt equipment has been very positive. Students can see and control electric motors, generators, and actual fuel cell. The equipment also serves as a visual asset when giving our regular introductory presentation to perspective students.

EET faculty have taken leadership roles within the PCC MakerSpace area, where, among other equipment, 3D printers capture the interest of students. This commitment has been crucial to summer camp offerings and high school student outreach activities. Development for a course in wearable electronics is in the works with consideration for future course developments in areas such as audio electronics and photonics.

Working on these innovative projects strengthened the bond between the EET faculty, as it got many FT and PT faculty involved. Students enthusiasm has grown to a point where they formed an electronics club. The club is very well attended by EET students, as well as many from non-technical fields. This helped form interdisciplinary ties with many departments here at PCC and has brought students and faculty together to work on projects. The MakerSpace brought positive attention to PCC in the local, and even national arenas.

B.

Describe how students are using the library or other outside-the-classroom information resources.

The use of instructional Internet videos has become much more common in recent years. Library rooms are often used for student-coordinated study group sessions. The MakerSpace and the Science, Technology, Engineering, Art, and Mathematics (+STEAM) club are additional, recently added resources that cultivate student curiosity and learning. A course is being developed that will prepare students to use the equipment in the MakerSpace. Workshops were provided in the MakerSpace in collaboration with +STEAM where, for instance, a county sheriff was a guest speaker and demonstrated his department's police robots.

In addition to this, our RES and Biomed students participate in site visits of potential employers.

C.

Does the SAC have any insights on students' use of Advising, Counseling, Disability Services, Veterans Services, and other important supports for students? Please describe as appropriate.

Upon arrival at PCC, many students don't know whether engineering (transfer), engineering technology (EET/CMET/MT), or even STEM is right for them. Students benefit most from program-specific advising about EET degrees and degree options, and how the many required non-EET courses can best be scheduled into the EET two-year program. course-wise, the program is very full, so students benefit from early EET faculty and EET advisor support. General academic advisors have supported this and have even begun to attend some introductory program advising sessions, which are led by the EET advisor and EET faculty.

As the advisor for the EET program, Linda Browning regularly refers to campus services and works closely with the staff to ensure student completion. She is a keystone resource for the students and has made referrals to on-campus resources and to outside community resources for food, shelter, and counseling. Of the on-campus student services, the one probably most used by EET students is Disabilities Services.

7. For Career and Technical Education (CTE) Programs only

To ensure the curriculum keeps pace with changing employer needs and continues to successfully prepare students to enter a career field

A.

Evaluate the impact of the Advisory Committee on curriculum and instructional content methods, and/or outcomes. Please include minutes from the last three Advisory Committee meetings in the appendix.

Minutes from our last three advisory board meetings can be found in Appendices H , I, and J.

The membership of industry representatives from hospitals, wind companies, manufacturing companies including Intel, and government, direction from our advisory board has directly led to the following changes in course content and outcomes:

- EET 178 (previously known as PC Architecture) was revamped into Computing Environments with updated content.
- EET 178 Computing Environments for Technicians (previously known as PC Architecture) was revamped with more modern content.
- EET 179 Fuel Cell Systems was created for RES students.
- The first-year digital courses (EET 121, 122, and 123) were overhauled.
- EET 172 Motor and Motor Controls was refocussed from internal motor physics to practical motor control.
- Industry advisors guided our transition from digital controllers to analog controllers in EET 273 Electronic Control Systems.

B.

Describe current and projected demand and enrollment patterns. Include discussion of any impact this will have on the program.

Current demand for electronics technicians is steadily rising as the baby boomer generation retires and the food processing, manufacturing, and health care industries are already experiencing technician shortages. Employers are now regularly contacting the EET advisor with job openings they need to fill.

Currently, this demand corresponds to an increasing number of EET program applicants, particularly in our Biomed and Mechatronics options.

C.

Explain how students are selected and/or prepared (e.g., prerequisites) for program entry.

Students applying for the EET program must meet the minimum prerequisites of readiness to take Math 111 College Algebra and completion of WR 121 English Composition.

Biomed students are encouraged to volunteer in a hospital to ensure the working environment is suitable because exposure to unpleasant smells, blood, loud noises, and gravely sick patients is a given in this type of job. Students need to what lies ahead.

D.

Review job placement data for students over the last five years, including salary information where available. Forecast future employment opportunities for students, including national or state forecasts if appropriate.

We currently do not have complete data on job placement for our students (Appendix C), although have new exit surveys that will inform us in the future. We plan to distribute exit surveys each summer and entry surveys during the fall and winter terms.

As stated in section B, the employment outlook is positive. Intel, Tektronix, Biotronic, and the local hospital systems Providence, the VA Hospital, and Legacy are predicting significant demand over the next three to five years.

E.

Please present data on the number of students completing Degree(s)/Certificate(s) in your program. Analyze any barriers to degree or certificate completion that your students face, and identify common reasons that students may leave before completion.

Completion numbers for the last five years can be found in Appendix K.

There seem to be three categories in to which barriers to completion fall:

1. academic challenges
2. financial need
3. and personal life challenges

Regarding academic challenges, some students are unable to meet the demands of the program. They may lack appropriate study skills or time management skills.

Some students are unable to go to school without also working, leading some to drop out due to insufficient time to study or work in labs. Child care expense can also create an overwhelming financial burden.

Personal life challenges such as divorce, children, caring for older parents, death of a family member. Time management can be an issue, especially when a student is working or has family obligations. Housing insecurity (homelessness or frequent moves), food insecurity, and health challenges have also impeded some of our students in the earning of a degree.

F.

Describe opportunities that exist or are in development for graduates of this program to continue their education in this career area or profession.

Graduates of the EET program can transfer to OIT for a BSEET and they can transfer to other BSEET programs in the United States.

8. Recommendations

A.

What is the SAC planning to do to improve teaching and learning, student success, and degree or certificate completion?

We review and debate the breadth versus depth of topics that are required for our degrees and certificates. This involves coordinating degree projects to balance student work loads, thus optimizing student learning efficiency.

We use entry and exit student surveys (Appendicies D and C) to guide program direction and we continue to develop more hands-on oriented projects.

In order to increase the chances of completion into our program which, of course, has finite enrollment, we began holding regular introductory presentations for perspective students in which the level of rigor required to graduate is emphasized. We have anecdotally found this to reduce dropouts in program entry courses.

B.

What support do you need from the administration in order to carry out your planned improvements? For recommendations asking for financial resources, please present them in priority order. Understand that resources are limited and asking is not an assurance of immediate forthcoming support, but making the administration aware of your needs may help them look for outside resources or alternative strategies for support.

- One new FT faculty is needed to maintain the EET program's quality of instruction.
- Science and Engineering grant-based tutoring funds recently ended. Permanent funding and dedicated tutoring space is critically needed for student retention and success at Sylvania Campus.
- Financial support to add a total of 12 additional computers for the EET labs (1 for ST 313, 5 for ST 315, and 6 for ST 316). This is would allow us to teach programming classes in these three rooms with sections with up to 20 to 25 students, with each student having their own computer. Currently, EET programming classes require that students share computers, which is not the standard way to teach programming.

A. Abbreviations and Acronyms

AAS Associate of Applied Science

AWEA American Wind Energy Association

Biomed Biomedical Degree Option

BSEET Bachelor of Science in Electronic Engineering Technology

CBET Certified Biomedical Engineering Technician

CMET Civil and Mechanical Engineering Technology

DS Disabilities Services

EET Electronic Engineering Technology

ENGR Engineering University Transfer

FT full-time

GRAD Graduation Requirements and Academic Decisions

MCH Machine Manufacturing Technology

NSF National Science Foundation

ODE Oregon Department of Education

OIT Oregon Institute of Technology

PCC Portland Community College

PT part-time

RES Renewable Energy Systems

SAC subject area committee

+STEAM Science, Technology, Engineering, Art, and Mathematics

TSA Technical Skills Assessment

B. Program Changes Influenced by Assessment

- Added formal lab reports to EET 221
- Added oral presentations to labs
- Added more project-based labs
- Added more troubleshooting to labs
- Programming is now integrated into the entire first year, instead of a single first-year course.
- Removed node-voltage analysis and mesh-current analysis techniques from EET 111 and 112 (the change was also motivated by Advisory Board feedback)

C. EET Student Exit Survey

EET Exit Student Survey

1. Are you looking for employment?

Yes

No

2. If you found work, who is your employer?

3. If you found work, how many months did it take to find your job?

Less than one month
1-6 months
6-12 months
More than 1 year

4. If you are employed, what is your hourly wage? Please select one:

$8.80 - $10.00 ($18,304 - $20,800 annual salary)
$10.01 - $15.00 ($20,820 - $31,200 annual salary)
$15.01 - $20.00 ($31,220 - $41,600 annual salary)
$20.01 - $25.00 ($41,620 - $52,000 annual salary)
$25.01 - $30.00 ($52,020 - $62,400 annual salary)
$30.01 - $35.00 ($62,420 - $72,800 annual salary)
$35.01 - $40.00 ($72,820 - $83,200 annual salary)
$40.01 - $50.00 ($83,220 - $104,000 annual salary)
> $50.01 ($104,020 and greater annual salary)

5. Will you be continuing your education towards an advanced degree at a four-year college university?

Yes

No

6. If yes, which four-year college or university will you be attending and which program?

7. In your opinion how would you rate your overall preparation as an EET technician or field related to EET?

2011
Very good. I feel well prepared.
Strong. I feel prepared.
Neutral. While I may feel prepared, there is room for improvement.
Poor. I do not feel prepared for employment.

8. In which year did you graduate?

2011
2012
2013
2014
2015
Other

9. Which EET degree/options and/or certificate did you complete?

Electronic Engineering Technology (EET)
EET: Biomedical Engineering Technology
EET: Mechatronics/ Automation/Robotics
EET: Renewable Energy Systems
EET: Wireless and Data Communications
EET Certificate
RES Certificate

10. How could the EET department improve how it prepares students for employment in the EET field?

1

D. EET Student Entry Survey

EET Program Entry Survey

In which EET degree/certificate are you enrolled *

- ○ EET degree
- ○ EET:Biomedical Engineering Technology
- ○ EET: Renewable Energy Systems
- ○ EET: Mechatronics/Automation/Robotics
- ○ EET: Wireless and Data Communications
- ○ EET Certificate
- ○ RES Certificate

Are you a Full Time or Part Time Student? *

- ○ Full Time
- ○ Part Time

How many hours per week do you work?

- ○ none
- ○ 0-5
- ○ 5-10
- ○ 10-15
- ○ 15-20
- ○ 20-25
- ○ 25-30
- ○ 30-35
- ○ 35 - 40
- ○ more than 40
- ○ Other:

1

How many hours per week are to devoted non-school obligations? (Don't include working hours.)

- ☐ 0-5
- ☐ 5-10
- ☐ 10-15
- ☐ 15-20
- ☐ 20-25
- ☐ 25-30
- ☐ 30-35
- ☐ 35-40
- ☐ more than 40
- ☐ Other:

How many credits are you taking this term?

- ◯ less than 12
- ◯ 12
- ◯ between 12-15
- ◯ between 15-19
- ◯ more than 19
- ◯ Other:

Are you satisfied with your class performance/test scores? If not, what kind of help do you need?

- ☐ Tutoring in academic program area courses
- ☐ Tutoring in general education area courses
- ☐ Help with tiime management skills and/or study skills
- ☐ Meeting with EET advisor regularly
- ☐ Other:

Do you need accommodations to help you succeed?

- ◯ Yes
- ◯ No

2

E. Course Core Outcomes Mapping

Mapping Level Indicators:	
0	Not Applicable
1	Limited demonstration or application of knowledge and skills.
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

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

Course #	Course Name	CO1	CO2	CO3	CO4	CO5	CO6
EET 101	Introduction to Electronic Technology	2	2	3	1	2	2
EET 110	Introduction to Renewable Energy	4	4	2	1	2	2
EET 111	Electrical Circuit Analysis I	3	2	4	1	3	2
EET 112	Electrical Circuit Analysis II	3	2	4	1	3	2
EET 113	Electrical Circuit Analysis III	3	2	4	1	3	2
EET 121	Digital Fundamentals I	3	2	4	1	3	2
EET 122	Digital Fundamentals II	3	2	4	1	3	2
EET 123	Digital Systems III	3	2	4	1	3	2
EET 178	PC Architecture for Technicians	4	2	4	1	2	2
EET 188	Industrial Safety	4	4	3	1	4	2
EET 221	Semiconductor Devices and Circuits	4	2	4	1	3	3
EET 222	Operational Amplifiers	4	2	4	1	3	3
EET 223	RF Communications Circuits	4	2	4	1	3	3
EET 241	Microcomputer Systems I	4	2	4	1	3	3
EET 242	Microcontroller Systems	4	2	4	1	3	3
EET 254	EET Seminar	4	3	3	3	4	4
EET 255	Industrial Control Systems	4	2	4	1	3	3
EET 256	Capstone Project	4	4	4	1	4	4
EET 260	Biomedical Equipment I	3	2	4	2	4	2
EET 261	Biomedical Equipment II	3	2	4	2	4	2
EET 269	Wind Power	3	2	4	2	4	2
EET 280	Cooperative Education	4	2	3	4	4	4

F. EET Instructor Qualifications Pre-2012

EET Instructor Qualifications prior to November 2012

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 3 years of full-time, industrial work experience in the electrical/electronic engineering field.

OR

- Master's degree in areas related to electrical/electronic engineering, including computer engineering, electromechanical engineering, and mechatronics/automation/robotics engineering or other related areas, plus 30 quarter hours credit in upper-division coursework in the electrical/electronic engineering, plus 3 years' of full-time, industrial work experience in the electrical/electronic engineering or the above listed related fields.

Note: for Full Time Faculty positions, MS or higher is required. The FT Instructor will teach many different program courses, and have significant, if not primary, responsibility for the curriculum, laboratory facilities and other departmental operations.

Part Time EET Instructors must meet one of the above, or one of the following instructor qualifications categories:

- Bachelor's degree in electrical/electronic engineering plus 4 years of full-time industrial work experience in the electrical/electronic engineering fields.

OR

- Bachelor's degree in areas related to electrical/electronic engineering, including computer engineering, electromechanical engineering, and mechatronics/automation/robotics engineering or other related areas, plus 30 quarter hours credit in upper-division coursework in the electrical/electronic engineering or other related areas, plus 4 years of full-time industrial work experience in the electrical/electronic engineering or the above listed related fields.

OR

- AAS degree in electrical/electronic engineering technology or related areas including computer engineering, electromechanical engineering, mechatronics/automation/robotics engineering or other related areas, plus 5 years full-time, industrial work experience in the electrical/electronic engineering technology or the above listed related areas.

OR

- Instructors teaching EET 260/261 and EET 280/C meet instructor qualifications by demonstrating competency through one of the following:
  - CBET certification

    - Documented completion of industrial/military training in biomedical technology
    - A minimum of 5 years of experience as a biomedical technician in a hospital
- Instructors teaching EET 280A meet instructor qualifications by demonstrating competency through one of the following:
    - Qualifications set by licensing/certification organizations in the field of electrical/electronic engineering/engineering technology such as Professional Engineer license, NOCTI, etc.
    - A minimum of 5 years of experience as an electrical/electronic engineer/technician in the industry
    - A minimum of 5 years of experience working with electrical/electronic engineers/technicians in support areas of technical training, technical writing, and/or technical recruiting with some project management experience.
- Instructors teaching EET 254 meet instructor qualifications by demonstrating competency through one of the following:
    - A minimum of 5 years of experience as an electrical/electronic engineer/technician in the industry
    - A minimum of 5 years of experience working with electrical/electronic, engineers/technicians in support areas of technical training, technical writing, and/or technical recruiting with some project management experience.
- Instructors teaching EET 110 meet instructor qualifications by demonstrating competency through one of the following:
    - Bachelor's degree in science, or applied science, or business administration, and a minimum of 4 years experience in the renewable energy area
    - Master's degree or higher in science, or applied science, or business administration and a minimum of 3 years experieince in the renewable energy area.

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

Approved: August 2011
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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 3 years of full-time, industrial work experience in the electrical/electronic engineering field.

OR

- Master's degree in areas related to electrical/electronic engineering, including computer engineering, electromechanical engineering, and mechatronics/automation/robotics engineering or other related areas, plus 30 quarter

hours credit in upper-division coursework in the electrical/electronic engineering, plus 3 years' of full-time, industrial work experience in the electrical/electronic engineering or the above listed related fields.

Note: for Full Time Faculty positions, MS or higher is required. The FT Instructor will teach many different program courses, and have significant, if not primary, responsibility for the curriculum, laboratory facilities and other departmental operations.

Part Time EET Instructors must meet one of the above, or one of the following instructor qualifications categories:

- Bachelor's degree in electrical/electronic engineering plus 4 years of full-time industrial work experience in the electrical/electronic engineering fields.

OR

- Bachelor's degree in areas related to electrical/electronic engineering, including computer engineering, electromechanical engineering, and mechatronics/automation/robotics engineering or other related areas, plus 30 quarter hours credit in upper-division coursework in the electrical/electronic engineering or other related areas, plus 4 years of full-time industrial work experience in the electrical/electronic engineering or the above listed related fields.

OR

- AAS degree in electrical/electronic engineering technology or related areas including computer engineering, electromechanical engineering, mechatronics/automation/robotics engineering or other related areas, plus 5 years full-time, industrial work experience in the electrical/electronic engineering technology or the above listed related areas.

OR

- Instructors teaching EET 260/261 and EET 280/C meet instructor qualifications by demonstrating competency through one of the following:
  - CBET certification
  - Documented completion of industrial/military training in biomedical technology
  - A minimum of 5 years of experience as a biomedical technician in a hospital
- Instructors teaching EET 280A meet instructor qualifications by demonstrating competency through one of the following:
  - Qualifications set by licensing/certification organizations in the field of electrical/electronic engineering/engineering technology such as Professional Engineer license, NOCTI, etc.
  - A minimum of 5 years of experience as an electrical/electronic engineer/technician in the industry
  - A minimum of 5 years of experience working with electrical/electronic engineers/technicians in support areas of technical training, technical writing, and/or technical recruiting with some project management experience.

- Instructors teaching EET 254 meet instructor qualifications by demonstrating competency through one of the following:
    - A minimum of 5 years of experience as an electrical/electronic engineer/technician in the industry
    - A minimum of 5 years of experience working with electrical/electronic, engineers/technicians in support areas of technical training, technical writing, and/or technical recruiting with some project management experience.

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

Approved: January 2011

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- Master's degree in electrical/electronic engineering plus 3 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 30 quarter hours credit in upper division coursework in the electrical/electronic engineering areas, plus 3 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 3 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 30 quarter hours credit in upper division coursework in the electrical/electronic engineering areas plus 3 years' of full-time, industrial work experience in the electrical/electronic engineering or the above listed related fields.

OR

- Bachelor's degree in electrical/electronic engineering plus 4 years of full-time industrial work experience in the electrical/electronic engineering fields.

OR

- Bachelor's degree in electrical/electronic engineering related areas such as computer, electromechanical, mechatronics/automation/robotics engineering plus 30 quarter hours upper division course work in the electrical/electronic engineering areas plus 4 years of full-time industrial work experience in the 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 5 years full-time, industrial work experience in the electrical/electronic engineering technology or the above listed related areas.

OR

- Demonstrated competency and/or qualifications set by licensing organization in the field of biomedical engineering technology. CBET certification will suffice for teaching EET 260, EET 261 courses. (Supportive documentation of SAC-determined requirements must be attached to this form).

OR

- Instructors teaching EET 254 must have demonstrable 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.

Approved: June 2010

G. Current EET Instructor Qualifications

EET Instructor Qualifications prior to November 2012

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 3 years of full-time, industrial work experience in the electrical/electronic engineering field.

OR

- Master's degree in areas related to electrical/electronic engineering, including computer engineering, electromechanical engineering, and mechatronics/automation/robotics engineering or other related areas, plus 30 quarter hours credit in upper-division coursework in the electrical/electronic engineering, plus 3 years' of full-time, industrial work experience in the electrical/electronic engineering or the above listed related fields.

Note: for Full Time Faculty positions, MS or higher is required. The FT Instructor will teach many different program courses, and have significant, if not primary, responsibility for the curriculum, laboratory facilities and other departmental operations.

Part Time EET Instructors must meet one of the above, or one of the following instructor qualifications categories:

- Bachelor's degree in electrical/electronic engineering plus 4 years of full-time industrial work experience in the electrical/electronic engineering fields.

OR

- Bachelor's degree in areas related to electrical/electronic engineering, including computer engineering, electromechanical engineering, and mechatronics/automation/robotics engineering or other related areas, plus 30 quarter hours credit in upper-division coursework in the electrical/electronic engineering or other related areas, plus 4 years of full-time industrial work experience in the electrical/electronic engineering or the above listed related fields.

OR

- AAS degree in electrical/electronic engineering technology or related areas including computer engineering, electromechanical engineering, mechatronics/automation/robotics engineering or other related areas, plus 5 years full-time, industrial work experience in the electrical/electronic engineering technology or the above listed related areas.

OR

- Instructors teaching EET 260/261 and EET 280/C meet instructor qualifications by demonstrating competency through one of the following:
  - CBET certification

    - Documented completion of industrial/military training in biomedical technology
    - A minimum of 5 years of experience as a biomedical technician in a hospital
- Instructors teaching EET 280A meet instructor qualifications by demonstrating competency through one of the following:
    - Qualifications set by licensing/certification organizations in the field of electrical/electronic engineering/engineering technology such as Professional Engineer license, NOCTI, etc.
    - A minimum of 5 years of experience as an electrical/electronic engineer/technician in the industry
    - A minimum of 5 years of experience working with electrical/electronic engineers/technicians in support areas of technical training, technical writing, and/or technical recruiting with some project management experience.
- Instructors teaching EET 254 meet instructor qualifications by demonstrating competency through one of the following:
    - A minimum of 5 years of experience as an electrical/electronic engineer/technician in the industry
    - A minimum of 5 years of experience working with electrical/electronic, engineers/technicians in support areas of technical training, technical writing, and/or technical recruiting with some project management experience.
- Instructors teaching EET 110 meet instructor qualifications by demonstrating competency through one of the following:
    - Bachelor's degree in science, or applied science, or business administration, and a minimum of 4 years experience in the renewable energy area
    - Master's degree or higher in science, or applied science, or business administration and a minimum of 3 years experieince in the renewable energy area.

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

Approved: August 2011
****

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OR

- Master's degree in areas related to electrical/electronic engineering, including computer engineering, electromechanical engineering, and mechatronics/automation/robotics engineering or other related areas, plus 30 quarter

hours credit in upper-division coursework in the electrical/electronic engineering, plus 3 years' of full-time, industrial work experience in the electrical/electronic engineering or the above listed related fields.

Note: for Full Time Faculty positions, MS or higher is required. The FT Instructor will teach many different program courses, and have significant, if not primary, responsibility for the curriculum, laboratory facilities and other departmental operations.

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OR

- AAS degree in electrical/electronic engineering technology or related areas including computer engineering, electromechanical engineering, mechatronics/automation/robotics engineering or other related areas, plus 5 years full-time, industrial work experience in the electrical/electronic engineering technology or the above listed related areas.

OR

- Instructors teaching EET 260/261 and EET 280/C meet instructor qualifications by demonstrating competency through one of the following:
  - CBET certification
  - Documented completion of industrial/military training in biomedical technology
  - A minimum of 5 years of experience as a biomedical technician in a hospital
- Instructors teaching EET 280A meet instructor qualifications by demonstrating competency through one of the following:
  - Qualifications set by licensing/certification organizations in the field of electrical/electronic engineering/engineering technology such as Professional Engineer license, NOCTI, etc.
  - A minimum of 5 years of experience as an electrical/electronic engineer/technician in the industry
  - A minimum of 5 years of experience working with electrical/electronic engineers/technicians in support areas of technical training, technical writing, and/or technical recruiting with some project management experience.

- Instructors teaching EET 254 meet instructor qualifications by demonstrating competency through one of the following:
    - A minimum of 5 years of experience as an electrical/electronic engineer/technician in the industry
    - A minimum of 5 years of experience working with electrical/electronic, engineers/technicians in support areas of technical training, technical writing, and/or technical recruiting with some project management experience.

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

Approved: January 2011

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OR

- Master's degree in electrical/electronic engineering related areas including computer. electromechanical, and mechatronics/automation/robotics engineering, plus 30 quarter hours credit in upper division coursework in the electrical/electronic engineering areas, plus 3 years' of full-time, industrial work experience in the electrical/electronic engineering or the above listed related fields.

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- Master's degree in electrical/electronic engineering plus 3 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 30 quarter hours credit in upper division coursework in the electrical/electronic engineering areas plus 3 years' of full-time, industrial work experience in the electrical/electronic engineering or the above listed related fields.

OR

- Bachelor's degree in electrical/electronic engineering plus 4 years of full-time industrial work experience in the electrical/electronic engineering fields.

OR

- Bachelor's degree in electrical/electronic engineering related areas such as computer, electromechanical, mechatronics/automation/robotics engineering plus 30 quarter hours upper division course work in the electrical/electronic engineering areas plus 4 years of full-time industrial work experience in the 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 5 years full-time, industrial work experience in the electrical/electronic engineering technology or the above listed related areas.

OR

- Demonstrated competency and/or qualifications set by licensing organization in the field of biomedical engineering technology. CBET certification will suffice for teaching EET 260, EET 261 courses. (Supportive documentation of SAC-determined requirements must be attached to this form).

OR

- Instructors teaching EET 254 must have demonstrable 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.

Approved: June 2010

H. EET Advisory Board Meeting Minutes
5-2-2014

EET Advisory Board Meeting
May 2nd, 2014, 7:30-9:30am, Oak room, PCC, SY

Attendees:

- Sanda Williams
- Linda Browning
- David Goldman
- Chuck Fenning
- Karla Muth
- Tim Pfister
- Tom Prevish
- Kevin Foster
- Steve Ellithorpe
- Angela Baltz
- Jeff Johnson
- Peter Kazarinoff

Sanda: EET updates. focusing on consolidating program, and continue developments.
Curriculum changes to all options to align w/ industry:

- David G: swap programming for electronics and microcontrollers. Reorganized intro to programming, removed a CS class, add one credit to each 1st year digital class, which include incremental intro to programming. VHDL vs verilog? no preference expressed. new class, advanced microcontrollers.
- Sanda: should we add this to biomed option? David Smith of clinical eng: a tech in a hospital won't use it much, but maybe for manufacturing. Tim and Thomas: more networking instead.
- Sanda: decreasing some RES class offerings due to lowered enrollment in RES option.
- Sanda: trying to screen students, select students for biomed at end of 1st year. Interview hospitals, survey students, and pair. biomed student placement in hospital versus manufacturing?

filter students entering EET is desirable to increase completion rates:

- Linda: David G doing orientation sessions to give students an idea
- we have 80 applications now, we have 21 biomed applications and biomed slots
- we will prioritize admission by completion of math courses. extra points for medical terminology and anatomy.
- biomed has the lowest dropout, by far, of the EET programs
- Steve: list of competencies was put out for biomed. chuck has been using the list. Chuck will make more labs this summer to create exposure to a greater variety of equipment. Chuck really wants ESU units. Steve said possibility of loaning Chuck some. Chuck wants an IV pump analyzer. Steve may be able to send one along with a tech. Chuck has tried asking Fluke for test equipment without success. If a customer calls Fluke instead,

it may help. Steve to call Mick and Keith (at Fluke?) to encourage donation/loaning of equip to EET dept.

Sanda wants guest speakers/field trips/job shadow for biomed students to give them an idea of what the job is like. Linda: we recommend students volunteer/hang out at hospital. Steve: they created a volunteer position that is a permanent posting. ?? Thomas, possibility of creating job shadowing.

Sanda: developing wearable electronics to capture interest. David G: Last year, +STEAM club did the Intel (Hermanas project) at Rock Creek which was successful.

Carl: are any biomed interested in Intel? Intel looks for general skills, so biomed specialty would not hinder their chances. Sanda: all EET options have 70% the same course work.

Peter form N Seattle CC. Complemented this advisory board on high participation. Have 2 year training program for nanotech techs. They have a few nanotech classes. Students get jobs in microscopy, and other subfields of nanotech. 3 classes:

- Nano 101 is intro to nanotech, lab based, only pre-req is math 97 in WA (HS math completion).
- Nano fab class: photolithography, etching, deposition. They use a lab at a WA.
- Nanotech characterization class: use of electron microscopes, fixing systems involved.

2 quarters of internships, some at large companies, some at startups, some at medium sized companies, some w/ research groups at U of W. This year, graduating ~8 students. Jobs hard to locate, as many postings aren't labeled "nano tech", they have a full time employment specialist to help with this. Program running since 2008, recently won NSF grant to help program. There are industries other than micro electronics using nanotech. 1/3 students out of HS, 1/3 already have 4 year degrees, 1/3 adults changing careers. 2/3 students are mobile (relocate for job?). They have well vetted curriculum they can pass on (labs, lab materials support), have consortium of industry members who want to see what is available in Portland area. In their lab, they have ~$.25M of equipment. Much of that donated. Can use expensive tools without purchasing, many are mobile tools.

Jeff: He does control systems for electric util substations all across US. they have 50 people in Portland, 300 across US. Jeff found a lot of the coursework for EET's mechatronics. They may be able to get by without hiring engineers. (Dan Kruger leaving to teach class).

Minutes by Sanda Williams:
Jeff recommended transforming the RES option into “Power Electronics.” Tom supported the idea and recommended we focus on advanced batteries storage and power electronics. George recommended we keep RE in the title so we can still address the RES needs – ex. “Power and Renewable Energy Systems”

Tom believes that the fuel cell area is still going to reach the goal of being “more than just a demo thing” by 2015. Still a lot of potential in transportation. Clear Edge has great products. Jeff

said that fuel cell services are in more demand in Southern California and East Coast- tax credit and incentives are better.

George said that jobs slowed down a bit in the MFG and Health areas. There is a small increase in control and project management as well as wireless areas (field engineer/Comcast tech type). BPA has some openings occasionally. Flattening or decreasing of wages. Lots of temporary positions rather than FT positions. Mock interviews - 50 CMET/EET students. Recruitment companies – Intel, Solar City. Biomed no mock interviews – set-up co-op interviews. George keeps the list with all graduates and send them jobs lists. There were some on campus internships – we would like to see more off campus internships.

Steve provided some feedback about our students: eager to learn, very professional, prompt, arriving on time. Internal experts help them with troubleshooting and soldering as well as other skill sets. They hired one of our graduates and there are two non entry level positions open.

Comments were made on the line of having more options for veterans in the future due to new GI Bill. Jeff reported success with employing veterans and commented on their great skills. George said that we need to have a better veteran data track system at PCC level and that PCC is working on it. There is a new PCC Veterans Task Force.

It was recommended we coordinate the schedule of the Microelectronics/CMET/EET advisory board to better accommodate the industry members since many serve on all three advisory boards.

The next meeting was scheduled on November 7th, 2014 between 7:30-9:30am.

Adjourn

I. EET Advisory Board Meeting Minutes 11-7-2014

EET Advisory Committee Meeting
7 November 2014

EET Advisory Members			PCC Staff
*Angela Baltz	*Mark Lewis	*Leonor Rubio	*Linda Browning
*Todd Brogna	Tom Lieurance	Aaron Scher	Mike Farrell
*Anthony Carr	*Russ Magoon	David L. Smith	David Goldman
Cristina Crespo	*Dave McBride	Eric Thomas	Kathleen Harriman
Steve Ellithorpe	*David McGiverin		Reg Holmes
Chuck Fenning	Sharon McLeod		George Knox
Kevin Foster	*Shaun Melander		Dan Kruger
Joseph Gregoire	Derek Miller		*Trung Le
*Steve Grote	*Dennis Minsent		*Dieterich Steinmetz
*Kyle Gunsul	Karla Muth		*Sanda Williams
*Amy Hankins	*Bart Onoday		
*Keith Harper	*Tim Pfister		
*Todd Haynes	*Mike Philpott		
*Holden Hughart	Tom Prevish		
Jeff Johnson	*Jim Pytel		
*Bruce Kaylor	Frank Rytkonen	** Not Present*	

Next Meeting: Thursday,
April 30, 2015
7:30 a.m. Oak Room

Introduction
David Goldman welcomed the members and asked them to introduce themselves.

EET Program Review
David informed the group that the program review for EET will be in October 2015. Program reviews are done every five years and examine the statistics, challenges, what is going well, and what the accomplishments are of a program. David invited members to attend.

Employment Projections
George Knox reported that there were nine postings for BMET, five of which were local. EET had 23 postings while wind had three postings, and wireless one posting. He will refer grads to Kevin Foster at Intel. George will contact employers about mock interviews. He talks to around 100 employers and about 40 respond.

Curriculum

David asked the group about adding PLCs to the EET degree as well to the Mechatronics and Renewable Energy Systems degrees. And whether EET 243, should be advanced programming versus PLC classes. Tom Previsch said that microcontrollers might be more useful as often PLCs are more product-based. Jeff Johnson pointed out that PLCVs are more utilized in operating a piece of equipment. Frank Rytkonen said microcontrollers are custom programmed by experts. George noted that requests for PLC experience happen more often in job postings that he sees. Frank replied that there are four different programming languages; two are text and two are graphical for PLCs. Joseph Gregoire said that field technicians need to be acquainted with PLCs as there is not that much programming for the wind turbines.

David asked how important it is to add to a program where everyone has to take it. Jeff said that if you program it, then you can maintain tool sets. Reg Holmes said that he was hearing that PLCs were crucial and asked what sort of exposure students should have. Steve Ellithorpe recommended a 3-credit full term class. Eric Thomas said that BMET doesn't deal with PLCs at all and that it was manufacturing and field service that deals with PLCs. Reg added that students use Arduinos. Tom Lieurance felt EET should offer both PLC and programming. Aaron Scher noted that OIT has an advanced microcontroller course and Cristina Crespo added that OIT does not require PLCs for EET transfers.

Mike Farrell moved on to questions about Physics 203. He said that most degrees require the full sequence, PHY 201, 202, and 203; Mechanics / Fluids/ Electricity and Magnetism respectively. If they add PHY 203 to Renewable Energy Systems, which is currently at 107 credits, then the 2-credit Capstone class would need to be cut. PHY 203 would be background for controls unit. David pointed out that multi-week projects are embedded in classes already. Joseph said that the more technicians know about motors and generators, the better able they are to diagnose the turbine. Wind techs need the foundation. Frank added that OIT has added PHY 203 as a prerequisite for the motors class. Tom noted that technicians need a good basis for electromagnetism. George reminded the group that they want to ensure students include their presentation in the portfolio they show to employers. Dan Kruger said that the third term of the first year circuits class covers transformers. Aaron asked if the department had considered an applied physics course. Derek Miller told the group that he took PHY 211 at PCC and 212 and 213 at OIT and found that much of the information was covered in EET classes. Reg suggested increasing the section on magnetics in EET courses. Tom Lieurance suggested offering both PLC and programming.

Joseph remarked that if additional instruction does not help technicians fix the problem, then it has no value. He asked are you getting so broad that it is too general. There are 8 to 9 motors in a turbine system and it uses a PLC to turn on/off. The system either works or it doesn't. Technicians do not rewire the motors.

Mike suggested expanding the credits in the motors class rather than adding Physics. Cristina asked if he had seen a difference between students who had completed PHY 203 versus those who had not. Mike replied that he had seen a difference in student success when they had taken PHY 203 but he only had anecdotal evidence, not statistical.

BMET Program Prerequisites

David asked if having students complete Anatomy and Physiology (A & P) before entering the program was useful. George noted that other health professions require A & P. Chuck Fenning added that when he is teaching the biomedical equipment class he assumes that students know about the physiology for pace makers. David Smith said that A & P is essential for a biomedical technician. Bruce Kaylor noted that technicians and health professionals need a common language. Steve said that A & P needs to be integrated and that it acts as a determiner. Dan Kruger explained that A & P and medical terminology are necessary for entry into the BMET program. Reg asked if spots in these two classes could be guaranteed. George replied

that lots of programs need these classes. Frank Rytkonen told the group that OIT offers A & P. Eric Thomas remarked that PCC is turning out students that are doing fine and why mess with something that is working well. Chuck added that technicians have to talk to the patient and know what is going on. Reg asked if a condensed class would go forward. Chuck replied that for technicians to pass CBET certification students need both terms. Derek suggested interviewing students and telling them they have one year to complete the prerequisites.

Industry Feedback

Jeff Johnson discussed Pro Steps, a program that pays $6,500 for the first six months for on the job training. Kim Davis at the Work Force Development Center is the contact.

Davis, Kim C Workforce Development -Wi 971-722-2602
Coord/Employment Spec WC 101 kim.davis1@pcc.edu

The funds help employers absorb the cost of bringing employees up to speed.

Steve announced that there will be a large group of staff retiring at Providence. Frank noted that the power industry is growing and will also experience a large retirement. Eric said there is a 30% vacancy in BMET at OHSU. Kevin Foster said that Intel will be holding a hiring event in February at the Rock Creek campus.

Joseph reported that the wind industry is at 5-10% of its former status. The service part is where the industry makes its money. There is always turnover. Most of the managers do not have degrees but experience alone. George said that three recruitments, were maintenance, not installation and one of the recruitments did not require a degree.

Tom Previsch discussed the interest in micro grids and smart grids. Battery storage for electric vehicles is another area. He recommended students receive more exposure to different batters as in 2015; fuel cell cars could become commercially available.

Frank informed the group of a competency model developed by the Department of Energy. He recommended seeing how closely the program aligns with the Renewable Energy competency guide and the automation competence guide.

David Smith noted that over ten years, there has been an increase of embedded medical apps in I-phones.

Mike closed the meeting and thanked the members for coming.

The next meeting will be on Thursday, April 30, 2015 at 7:30 a.m. in the Oak Room.

J. EET Advisory Board Meeting Minutes 4-30-2015

EET Advisory Committee Meeting
30 April 2015

EET Advisory Members			PCC Staff
Angela Baltz	Tom Lieurance	Aaron Scher	Linda Browning
*Todd Brogna	*Russ Magoon	David L. Smith	*Mike Farrell
*Anthony Carr	*Amos Martin	Eric Thomas	David Goldman
*Cristina Crespo	*Dave McBride		Kathleen Harriman
Chuck Fenning	*David McGiverin		*Reg Holmes
Kevin Foster	Sharon McLeod		*George Knox
*Joseph Gregoire	*Shaun Melander		*Dan Kruger
*Steve Grote	*Derek Miller		*Trung Le
*Kyle Gunsul	Karla Muth		Dieterich Steinmetz
*Amy Hankins	*Bart Onoday		Sanda Williams
*Keith Harper	*Tim Pfister		
*Todd Haynes	*Mike Philpott		
Holden Hughart	*Tom Previsch		
Jeff Johnson	*Jim Pytel		
Bruce Kaylor	*Frank Rytkonen		
*Mark Lewis	*Leonor Rubio		** Not Present*

Next Meeting Friday
Nov. 6, 2015
7:30 a.m. Oak Room

Introduction
Sanda Williams welcomed the members and asked them to introduce themselves.

Division Updates
Dieterich Steinmetz told the member about accreditation report (140 pages) submitted by PCC to the Northwest Commission on Colleges and Universities. The accreditation team arrived at 7:00 a.m. Monday, April 20th and left on Wednesday evening. The commission gave PCC nine commendations for success and three recommendations that are related to infrastructure and facilities. The next report will be in one year to respond to the college's progress on their recommendations. The Career Technical Education (CTE) programs received a commendation. The incoming Sylvania campus president, Lisa Avery is a strong supporter of CTE and is a data –driven decision maker which matches the CTE profile.

Dieterich announced Kathleen Harriman's retirement in June.

The Engineering department received a grant from the Oregon Department of Education to further develop ENGR 100, Exploring Engineering, and a survey class that introduces high school students to what engineers actually do. The class looks at different types of engineering and design thinking. ENGR 100 is a dual credit class that can be taught by physics or math teachers with industry experience. Enrollment in the class has increased from 25 to 135 with the inclusion of high school students. Hands-on activities are being incorporated in the course. The Beaverton High School has an integrated engineering and math program with 3,000 students.

EET Program Updates

Every four years, there is a program review. The EET review is scheduled for October 2015 and the department would appreciate it any of the board members could be present. Sanda said the department is making a video for the review.

David Goldman said they have continued updating digital in six different classes. They are looking at when a concept is introduced and should two concepts be introduced at the same time. Students will buy boards to populate with components and the focus will be on problem solving methodology. A new class is being developed, Creative Technology. The course grew out of a summer workshop offered for Latina girls who learned how to embed electronics in fabric; http://news.pcc.edu/2014/09/wearable-tech-2/
Both art and EET students will take the two-week class and learn how to use the equipment in the Maker Space: 3D printers, laser cutters, vinyl cutters, etc.

Sand announced work beginning next week on a new option, audio electronics and PLCs or microcontrollers. She will meet with Oregon Institute of Technology re electronic communications.

The annual state level assessment of the engineering technology programs is required by the Perkins Fund which funds the advisor position held by Linda Browning.

Chuck Fenning has 22 students in the BMET co-op which is an important part of their training. Students are introduced to equipment from an operator view and do function testing on basic devises. Co-op is the introduction to the BMET world. Chuck tells his students that the evaluation from co-op is like a real job – it is not just a grade. Chuck thanked the members for their support of co-op opportunities.

Linda reported 25 applicants so far for Fall 2015. Veterans are interested in applying to the program. She holds advising sessions in an EET Lab and typically 7-15 students attend. David is a co-presenter and shows projects, boards, robot, and homework. Knowing more specifics before beginning the program makes a difference in retention. Dieterich said he is grateful for the effort to solve the “what was I thinking?” problem for students who really have no idea about the work involved. Nationally, CTE programs require a job shadow experience which has had a huge success in a short period of time.

EET Graduates

Linda reported on the June grads:

9 in BMET with a further 11 who are doing their co-ops in the summer term
10 in EET
5 in Mechatronics and Robotics
4 in Renewable Energy Systems
5 in Wireless and Data Communications

Hiring
Intel interviewed and made 10 offers to our students. Intel also sent their manager of engineering who gave a presentation about the future of Intel. Intel will be returning in June and will be giving students a second chance that interviewed but did not receive an offer. Tektronix came on campus and interviewed 8 students.

Recruiting
Dieterich said that through a National Science Foundation grant, a team of five faculty members completed an 8-week training course on how to better recruit more women into STEM (Science, Technology, Engineering, and Mathematics) disciplines. They learned the importance of making presentations that make engineering relevant; making a difference, helping the community, and being part of a team. Dieterich said the course offered 4-step plans for recruitment and for retention. Institutional Research has pulled the names of students who have taken STEM classes and the division will send e-mail once a month. Students can opt in for more frequent e-mails. The web team will work to improve the web site. This will offer a high return on a small investment.

Retention
Sanda said that EET numbers are stable with many students transferring to OIT. BMET enrollment is capped to 20 students per year. Mechatronics is a growing area as is the Wireless option as students in BMET are enrolling for both options. Due to a lack of jobs, enrollment in Renewable energy is down. The Wind Mechanics and Fuel Cell options are now offered every other year. The Introduction to Renewable Energy class, EET 110, is now required but this may change to an elective. The Civil/Mechanical tech students also take this class. The department may look for other electives in sustainability. Fall usually starts with 80 students and winter term with 24 as there are now three labs, these numbers may change. Sanda said the program needs day time instructors and asked anyone interested to contact her directly or apply on-line for the EET faculty part-time pool.

Industry Feedback
Valdez Bravo asked if EET did exit interviews re strengths, weaknesses, experience with the program, jobs, etc. Sanda replied they had done so in the past. Todd Sanders developed a survey for engineering students. Linda added that instructors are evaluated on-line every term. Linda collects this data if the students choose to share. Valdez suggested doing the survey 90 days after graduation and asked if there was way to reach students. Linda replied that students keep their PCC e-mail address for two years after graduation. Aaron Scher noted that at OIT they are able to see who was hired by Intel. Jeff Johnson suggested hiring a work-study student to track grads. Linda gets student e-mails before they leave.

Jeff said that EET students need exposure to CAD for design. David Goldman replied that they are adding more TCAD to coursework so students see designs on screen. He added that one of the students is using 3D printing to repair a broken part. David Smith said that Biomed technicians require CAD for a floor plan layout. Eric Thomas said that his department tried to use a 3D Printer for repairs but it is not cost effective at this time. Dieterich said that students engage with this technology very rapidly. The 3D visualization can be measured. This is especially engaging to young women in digital design.

Aaron reported that enrollment is up at OIT with the articulation agreement with PCC, in two years student can get their BSEET. OIT is working on two new programs: cyber security and patents.

Jeff said that Power Engineers has limited space for more hires. They have a lot of work out of state as the infrastructure has been neglected for a long time.

Dieterich said the department appreciates specific suggestions for success in their first year on the job. Angela Baltz suggested that students do more writing for a non-technical audience. Students should create a trouble shooting guide with clear instructions and photos, then revise their draft and test it on someone to check for clarity. Technicians need to document what they have done so emphasizing the writing component is important. She added that repetition in revising the document really helps. Eric said the technician needs to read the manual and then translate it into a "cheat sheet" to make the job easier for a new person. Angela agreed that this was critical for emergency procedures for nurses and doctors who cannot understand the technical jargon.

Valdez recommended that students teach each other as you become an expert when you teach; you really have to know the material and improve your oral skills.

Sanda said that the Capstone project instructor (EET 256) invited Intel and AutoDesk to give feedback on student projects. Chuck noted that his BMET students give a presentation and receive evaluations from each of their classmates. He will now add creating a document for their work on how to function test the equipment they are reporting on.

Dieterich closed the meeting and thanked the members for coming.

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K. EET Completion Numbers 2010-11 to 2014-15

28-Sep-2015 10:30 Portland Community College Page 1
SWRGR5Y Five Years of Completions, from Live Data

Major	Award	2010-11	2011-12	2012-13	2013-14	2014-15	Change
BMET EET: Biomed Engineering Techno	AAS	14	23	16	21	21	+ 50%
EET Electronic Engineering Techno	AAS	17	13	12	14	19	+ 12%
EET Electronic Engineering Techno	ACERT1	11	16	11	30	34	+ 209%
EETM EET: Mechatronics/Auto/Robotic	AAS	0	1	3	1	6	+ 600%
EETR EET: Renewable Energy Systems	AAS	5	12	12	7	5	0%
EETW EET: Wireless & Data Comm Tech	AAS	1	1	1	3	5	+ 400%
RNEW EET: Renewable Energy Systems	ACERTP	4	3	4	7	6	+ 50%
TOTALS:		52	69	59	83	96	