SUBJECT AREA TEMPLATE FOR CONDUCTING SELF-STUDY

SAC ELECTRONIC ENGINEERING TECHNOLOGY Contact Person Sid Antoch Email santoch@pcc.edu

1. The primary responsibilities of the Subject Area Committee are to determine what it is they want students to learn, to use appropriate teaching methods to facilitate the achievement of those outcomes by each student, to assess what the student has learned, and finally, to use those assessments to improve the delivery of the curriculum if necessary.

A. The first step in this process is to determine course, course sequence, and/or program learning outcomes.

- **For each course, discipline sequence, or professional technical education program, list the SAC-approved learning outcomes.**
- **Describe how these outcomes were determined. To what extent were the needs of transfer institutions, industry and the community – as well as any other internal or external stakeholders – taken into account in the process of establishing these outcomes?**
- **Describe how these outcomes are aligned with the PCC Core Outcomes. How do these outcomes support the mission and values of PCC?**

Response to Question 1A (Maniza Johnson)

Most of the generalized program learning outcomes listed below have been relevant to the EET program since it started. The EET faculty works with the EET industrial advisory committee to ensure that the program curriculum and specific outcomes continue to be relevant to student and employer needs. The program learning outcomes are also revised and adjusted for four-year transfer program requirements at the Oregon Institute of Technology.

Course Learning Outcomes:

Each course within the EET program has its learning outcomes which are presented in the Course Content Outcome Guides (CCOG). The CCOG for individual courses are developed by faculty members who teach the course. They are presented to the SACC for discussion and approval. Curriculum Mapping presented in the Program Review demonstrates how each course within the program was mapped both to the program outcomes and to PCC's Core Outcomes.

Upon satisfactory completion of the EET Program the student should be able to:

1. Read and understand electronic circuit schematic diagrams and identify electronic components and have a basic knowledge of their operating characteristics.

2. Use basic electronic instruments such as the digital multi-meter, oscilloscope, function generator, and spectrum analyzer to measure and analyze the performance of electronic circuits.

3. Use computer applications such as word processors, spreadsheets, circuit simulators, and data acquisition.

4. Use a scientific calculator to solve electronic circuit problems.

5. Apply basic electronic theory, math, and physics to measure and analyze the performance of electronic circuits. Be able to find and solve problems in electronic circuits.

6. Communicate effectively and work individually and as a team member.

7. Continue training on the job, at an educational institution, or engage in self-learning.

8. Obtain employment in the electronics industry.

9. Transfer to a 4-year BSEET program at schools such as the OIT.

Consistency with PCC Core Outcomes

The courses in the EET program interface with PCC Core Outcomes as follows:

Communication

Students majoring in Electronic Engineering Technology are required to take Writing 121 along with a second writing course, WR122 or 214 and WR 227 are recommended. SP 111 is recommended as one of the general education requirements since this course is required for BS degree at Oregon Institute of Technology. In addition, most courses require that written problem sets be submitted as an integral part of 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, provide students with the tools to analyze and make informed decisions regarding environmental ramifications of existing situations and proposals for future development.

1B. After the outcomes are established, the second step is to implement appropriate strategies to facilitate student achievement of the outcomes.

- **In teaching and facilitating student learning, describe the methodologies used by your SAC.**
- **How have these methods changed or evolved in the last five years, if at all?**

Response to Question 1B (Sid Antoch)

The following teaching methods are generally used in EET courses:

Lecture

In addition to traditional "blackboard" lectures, classroom presentations may be supplemented by PowerPoint presentations, overhead slides, visual aids, and student group work. Specific methods vary with instructor and course.

Students generally take several exams in the lecture course. These exams test the students' ability to apply concepts learned in the course and may include calculations, problem solving, and multiple choice type questions. In addition, some instructors give "take home" exams, term projects, outside the classroom team work, and research assignments.

Homework is typically assigned in every class. Typically this involves solving the textbook end of chapter problems. This encourages students to read their textbook and attempt to solve problems based on their reading. The homework helps the student to understand and master the concepts of the course.

Lab

Most EET courses involve a 3-hour per week laboratory session. Lab experiments reinforce the concepts that are presented in the class and textbook. Students also learn to use electronic test equipment to make measurements and analyze results. Students learn how to acquire data directly into the PC and to use a spreadsheet (MS Excel) as part of the analysis. Additional analysis is often done using a circuit "simulation" program (OrCad PSpice). This simulation program also enhances what the student learns in the lecture and laboratory. Students also learn to write lab reports using a word processor (MS Word).

Other

In order to facilitate the students' communication and learning, instructors maintain a class website that may include homework assignments, practice worksheets, keys for assignments and practice worksheets, practice exams, copies of the current term's exams, keys, and statistical information, links to interesting websites, and other relevant information. Instructors also hold office hours for individual consultations.

Changes/Evolution in the Last 5 Years

Changes in the program are usually due to changes in the technology in industry. The EET program's industrial advisory committee is regularly consulted to ensure that the programs' courses and laboratories prepare the student for employment. The major changes in the last five years have been mostly in laboratory equipment. In particular, there is more emphasis on data acquisition and the use of a spreadsheet (MS Excel) for data analysis.

1C. The third step is to assess what the student has learned.

- **How does your program/discipline assess student learning of your stated outcomes?**
- **What evidence do you have, direct and indirect, that your students are achieving these objectives (other than simply completing your courses)?**
- **In order to provide more and better evidence of student learning in the future, what additional methods might your program/ discipline explore that aren't currently being utilized—or what methods are being under-utilized?**
- **What types of resources—human, physical, financial—would be necessary to facilitate this?**

Response to Question 1C (Fran Pelinka)

- Locally (faculty) developed tests
- Student work samples
- Course imbedded assessment
- Observations of student behavior
- Review of student projects
- Internally/externally reviewed internships
- Lab reports & notebook

Direct

- Exam & quiz scores
- Homework
- Completion of class projects
- Lab reports & notebooks

Indirect

- Exit interviews with graduates
- Job placement statistics
- Retention and transfer studies
- Alumni, employer and/or student surveys
- Focus groups
- Percentage of students who transfer to 4-year schools

- Student projects & oral reports that encourage students to make practical application of what they've learned
- Web-based or Distance Learning for the lecture portion of selected courses
- Better, more complete methods of tracking students after graduation
- Ability to keep the lab facilities and lab equipment (ie: oscilloscopes, function generators, power supplies, digital multimeters) modern and up-to-date
- Scholarships to be able to attract students who otherwise wouldn't be able to enroll

- TIME: We badly need at least 1 more full-time instructor. Our instructors are too overloaded to be able to keep up with things like developing Distance Learning, upgrading lab manuals, developing additional tools, and keeping up with all the requires paperwork…CCOG's, Program Reviews, Self-study Assessments, etc.

- FINANCES: for curriculum development, conducting surveys, offering scholarships, developing recruitment strategies, and more modern labs – our current labs were designed for physics/chemistry labs and are inappropriate & inefficient for electronics labs.

- Better pool of part time faculty. We would love to have part timers who could be counted on for more than just one or 2 terms at a time. This seems to be a more difficult proposition for the engineering discipline than many of the other disciplines.

- More financial involvement of our industry advisory members to support our program. Tektronix has been great in donating over a dozen oscilloscopes. Intel has helped us with computers. We would like to see other high tech companies get in involved with their resources in supporting us.

1D The final step is to use the results from above to improve the curriculum, if necessary.

- **Describe how has the SAC has used student assessments to improve teaching and learning.**
- **What other activities has the SAC engaged in to improve teaching and learning?**

Response to Question 1D (Fran Pelinka)

- We have made improvements in the lab equipment. We were able to purchase additional oscilloscopes and, added to the donation from Tektronix, were able to furnish 22 lab stations with new scopes.

- Using the new Tektronix oscilloscopes and Tek-provided software, we have been able to interface them with the computer and students are able to directly download their data from the scope into an Excel spreadsheet.

- We have speakers from industry address the students as to what they can expect in the job market, what would be required in order for them to be hired by their company and to conduct mock interviews for the students.

- We have on-going input from our Industry Advisory Committee as to the direction of the industry, their projected future needs for Engineering Technicians, and what they expect our students to know when they hire them.

2. In order to assess and provide evidence of the extent to which your program/discipline is cohesively designed and implemented, please address each of the following:

- **The process by which degree/certificate/discipline objectives and requirements are determined, and once established, where/how this information is made available to students.**
- **The role of faculty in your program/discipline with regard to advising students.**
- **The extent to which students are enrolling in courses with the basic skills necessary to succeed in the course/program; that is, are appropriate prerequisites required in order to maximize student success?**
- **Appropriate breadth, depth, and sequencing of courses.**
- **Intellectual skills, creative capabilities, and methods of inquiry to be acquired.**
- **If applicable, specific career preparation competencies to be mastered.**
- **How library and information resources are integrated into the learning process.**
- **How course scheduling maximizes accessibility for students.**

Response to Question 2 (Gary Hecht)

- **The process by which degree objectives and requirements are determined and made available to students:**

The EET SAC members all have experience in the electronics industry and use their industrial background combined with the active participation of the EET Industry Advisory Committee (whose members are primarily from the electronics industry) to determine degree objectives and requirements. Also, the EET SAC has periodic conversations with the EET faculty of OIT (Oregon Institute of Technology) to discuss general trends and specific needs for articulating PCC's EET program with OIT's first two years of their BSEET program.

This information is made available to students through the EET program's term-by-term course sequencing outline, PCC schedule of classes, course syllabi, CCOGs, and the PCC catalog.

- **The role of faculty in advising:**

Each faculty member has advising duties by contract. These advising times are known to the Engineering Office support staff who schedule prospective EET students for counseling with EET faculty members. For the last several years there has been one EET faculty member who has been available for advising during the summer term.

- **Appropriate course prerequisites:**

During the last year the EET SAC has reviewed, and in a few cases changed, the prerequisites for its courses. In particular, the EET SAC has spent a great deal of time over the last several years discussing the appropriate mathematics course prerequisite for the beginning electronics circuit analysis sequence that begins in the first term of the program. The difficulty is that a relatively high math prerequisite reduces the number of students entering our program but a relatively low math prerequisite does not properly prepare students for the technical problem solving skills that they need in the beginning circuit analysis course.

- **Appropriate breadth, depth, and sequencing of classes:**

Again, the EET SAC members all have experience in the electronics industry and use their industrial background combined with the active participation of the EET Industry Advisory Committee (whose members are primarily from the electronics industry) to determine the breadth, depth, and sequencing of classes.

- **Intellectual skills, creative capabilities, and methods of inquiry to be acquired.**

The EET department has not independently assessed how the intellectual skills, creative capabilities and methods of inquiry are to be acquired by students taking courses in its program. It is the expectation that the successful teaching and learning of the electronics technology subject matter will implicitly assess these important components of learning, as they are so intertwined with being successful in a technological field of study.

- **Career competencies:**

The EET SAC members all have experience in the electronics industry and use their industrial background combined with the active participation of the EET Industry Advisory Committee (whose members are primarily from the electronics industry) to determine the career competencies required for a successful career in the electronics technology field.

- **How library and information resources are integrated into the process.**

We are continuing to expand the use of faculty web sites for delivering information to our students.

In addition, some of our courses require the use of the library, and/or the Internet, to gather information for reports and/or projects.

- **Scheduling:**

We have worked hard to provide class schedules that accommodate as many students as possible while minimizing the use of resources. Each fall term we have a starting group that is scheduled for day classes. Each winter term we have a “trailer” starting group that is scheduled for night classes. During summer term, the trailer group takes their third-term classes so that we have just one group for the second-year classes. Second-year classes are usually scheduled for the late afternoon and evening.

We have tried scheduling classes to accommodate people working a “compressed workweek” schedule. However, we did not find it to be productive due to various reasons including the fact that companies do not all use the same compressed workweek schedule.

3. If applicable:

- **Are graduates of your program required to pass state or national credentialing exams in order to gain employment in their field?**
- **What are the most recent pass rates for students in your program?**

Response to Question 3: NOT APPLICABLE.

4. One of the SAC’s responsibilities is to determine its recommendations for instructor qualifications.

- **Has the SAC identified specific requirements for faculty - full-time and part-time - to teach in this program/discipline? If not, why not? If so, what are they?**
- **Do these criteria apply to both full-time and part-time faculty? If not, why not?**
- **Do the current requirements facilitate the recruitment and hiring of excellent faculty? If not, why not? How could this process be improved?**

Response to Question 4 (Robert Hickey)

The educational requirements and instructional qualifications for teaching each class are approved and enforced by the Engineering SAC. To teach a GE or EET course at PCC as either a part-time or full-time instructor, the individual must meet the following qualifications:

1. Bachelor's degree in Electrical, Electronic, or Computer Engineering required from an accredited college or university
2. Master's degree in Electrical, Electronic, or Computer Engineering from an accredited college or university preferred.
3. Experience: The successful candidate will have a minimum of three years industry experience and the ability to teach a broad range of electrical engineering and electronic engineering technology courses. The successful candidate will have the ability to work with a diverse student population and to integrate technology into the classroom. The successful candidate will be actively participating in academic, professional, and/or community organizations, will have a dedication to the community college mission, show enthusiasm for teaching, and demonstrate a commitment to continuous quality improvement in the classroom. Experience in a multi-cultural environment is required.

There is no distinction in instructor qualifications between full-time and part-time instructors.

The current requirements facilitate the recruitment and hiring of excellent faculty. However, the lack of adequate wages and benefits for part-time instructors inhibits our ability to employ adjunct instructors for relatively long periods of time, which affects the continuity of teaching quality in the program.

5. Consider faculty workloads as well as opportunities for professional growth and development.

- **How do they reflect the mission and goals of PCC, as well as the talents and competencies of the faculty?**
- **To what extent is sufficient time/support available for professional growth and renewal? Comment on conferences and training – both on and off campus, instructional technology training, TLC events, sabbaticals, etc.**
- **To what extent do faculty utilize the opportunities available to them?**
- **List the professional development activities of faculty over the last three years and describe any instructional or curricular changes made as a result of those activities.**
- **If opportunities are under-utilized, why is that the case?**
- **How do opportunities for full-time and part-time faculty compare?**
- **In what ways might professional development opportunities for faculty in your discipline be improved?**

Response to Question 5 (ALL)

There is an over all feeling in the EET department that the workloads are excessive. It is hard to find time to prepare for lass and lab, keep the curriculum up to date, respond to administrative questions, program reviews, program assessments, let alone to find time for professional growth. Part of this is due to having only 3 full time faculty to teach and maintain the EET program and the electrical part of the GE program. The only way professional development opportunities could improve is to have more time be made available. Some suggestions:

1. Labs should be considered the same weight as lectures.
2. Paperwork needs to be reduced. For example, why do a program review and a program self assessment? Why not do one to serve both needs.
3. Provide so release time once a year to faculty for professional development and program improvement activities.
   (some of this is available through competitive application processes, but it should be considered a necessary part of the job).

6. The faculty, through the structure of the SAC, are asked to make recommendations and provide oversight regarding any issue which would have a college-wide impact on instructional programs. With that in mind, address each of the following:

- **Comment on the consistencies/ inconsistencies of your program/discipline throughout the district. Do students have equal opportunities to learn and achieve program/discipline and course outcomes anywhere your courses are offered in the district? If not, why not?**
- **To what extent do all faculty in your SAC participate in academic planning, curriculum development and review, academic advising and institutional governance? Provide specific examples.**
- **Are instructor qualifications and hiring processes consistent across the district?**
- **On what basis are class sizes determined? Are enrollment caps consistent across the district?**

- **To what extent do faculty assume responsibility for and exercise oversight over distance learning courses, certificates and degree programs?**
- **How does the use of part-time faculty impact your program or discipline?**

Response to Question 6 (Sid Antoch)

PCC's EET program is offered at the Sylvania campus and at Columbia Gorge Community College. The program at CGCC is administered by CGCC. PCC and CGCC have their own relatively independent SACs. PCC and CGCC faculty and administrators meet at least once a year, in addition to regular email contact.

Everything is consistent between the two schools.

Part time faculty is a problem. It's hard to find good part time faculty, especially for day classes. Part time faculty add additional work for full time faculty because of the need of the full time faculty to help the part timers with syllabi, share curriculum material, and in many cases, help their students because part timers usually don't have office hours.

7. Describe efforts made by your SAC to increase student retention and minimize attrition.

Response to Question 7 (Maniza Johnson)

7. Describe efforts made by your SAC to increase student retention and minimize attrition.

Response to Question 7

The overall retention rate for all technology programs for 1999–2000 and 2000–2001 was 43%. It is difficult for technology students to complete their degree programs without adequate financial resources. Two major reasons for student not completing their education are academic, and financial

Engineering and Technology student demographics at the Portland Community College are quite unique. The average age for the group is 34, and the range is between 21 to 52 years old. A majority of these students are married with children. Currently, there are a few women students who are single mothers. For most of these students it is a career change. They came from all walks of life, barber, truck drivers, cooks, accountants and small business owners.

8. In all colleges there are things that both facilitate the teaching and learning process <u>and</u> act as barriers to the optimal teaching and learning environment.

- **What has your SAC experienced in the last five years that has supported teaching and learning?**
- **What barriers has the SAC experienced in the same period of time?**

- How have the organizational structure, regulations, or other factors beyond the SAC's control affected teaching and student learning? Response to Question 8

Response to Question 8 (Gary Hecht)

- **What has your SAC experienced in the last five years that has supported teaching and learning?**

One highlight has been the support from Tektronix for our EET program. A generous contribution from Tektronix allowed PCC to acquire 24 current technology oscilloscopes along with software (Open Choice) that allows students to make electrical measurements with the oscilloscope and transfer the results directly to a PC where the results can be easily imported into Microsoft Office application programs (e.g., Excel).

Intel has provided support in the form of donated computers that have been used in the laboratory portion of our EET 178 (PC Architecture for Technicians) course as "tear down" computers.

Also, last year Intel provided funds that were directed for tutoring of EET students. The funds were used to provide approximately two hours of faculty release time per week for two terms where the faculty member held scheduled tutoring sessions for EET students.

- **What barriers has the SAC experienced in the same period of time?**

It is the opinion of our SAC members that we spend too much time in SAC meetings trying to determine approaches/responses to administration directed activities (e.g., Program Review and Self Survey) which leaves us with little or no time to discuss core content of courses and discuss new instructional methods. As such, our SAC meetings are often used to deal with administrative issues rather than discussing instructional matter.

- **How have the organizational structure, regulations, or other factors beyond the SAC's control affected teaching and student learning?**

In summary it should be noted that the entire faculty of our SAC is proud to be a part of the PCC community. We feel that our students receive a strong technical education that will provide them with the basis of a rewarding career in the electronics field.