Computer Engineering Technology
2015-16 Assessment Report

I. Introduction

In 1965, OIT was invited to join a Technical Education consortium sponsored by a number of major computer manufacturers. In response, OIT developed an Electro-Mechanical Engineering Technology program. This program was based on a mix of existing EET, MET, Math and other support courses. The name of the program was changed to Computer Systems Engineering Technology in 1973 in order to better represent the course material and capabilities of graduates. Course offerings were expanded, refined and renumbered using CST prefixes to reflect their computer systems content. Since that time, the program has continued to evolve in order to track new developments in the field and keep graduates current. As of this time, the program is only offered on the Klamath Falls campus. Enrollment in the department continued to be flat or up slightly relative to previous years, but, the number of students selecting to pursue a degree in CET was up a little from the previous year. Three students graduated with BS degrees and 6 students were awarded AE degrees in the June 2015 commencement. The results of the 2014 graduate success survey showed a starting salary range of $63,500-66,500. During the academic year, one faculty member, Phong Nguyen, moved to take a position with OIT as CSET programs coordinator and as a professor in the Embedded Systems program on the Wilsonville campus. A new faculty member, Michael Healy was hired to replace him.

II. Summary of program mission, educational objectives and student learning outcomes

The program educational objectives and student learning outcomes are reviewed annually (each fall) by the program faculty and by our IAB. Also, the outcome assessment cycle for Outcome 9, which includes "a respect for diversity" was moved from the 15-16 assessment year to 16-17 in order to better align with OIT ESLO assessment cycle.

Mission

The mission of the Computer Engineering Technology (CET) Degree program in the Computer Systems Engineering Technology (CSET) Department at Oregon Institute of Technology is to provide an excellent education incorporating industry-relevant, applied laboratory based design and analysis to our students. The program is to serve a constituency consisting of its Alumni, employers in the high-technology industry, and the members of our IAB. Major components of the CET program's mission in the CSET Department are to:

I. educate computer engineering technology students to meet current and future industrial challenges,

II. promote a sense of scholarship, leadership, and professional service among our graduates,

III. enable our students to create, develop, and disseminate knowledge for the applied engineering environment,

IV. expose our students to cross-disciplinary educational programs, and provide high tech industry employers with graduates in the computer engineering technology profession, a profession which is increasingly being driven by advances in technology.

CET Program Educational Objectives

Program Educational Objectives are broad statements that describe what graduates are expected to attain within a few years of graduation.

Alumni of the Computer Engineering Technology (CET) Bachelor Degree program may be employed in a wide range of high tech industries from industrial manufacturing to consumer electronics where they will be involved in solving problems through the development of hardware, software and embedded applications. Alumni may be involved in product design, testing and qualification, application engineering, customer support, sales, or public relations.

A) Alumni will demonstrate technical competency through success in computer engineering technology positions and/or pursuit of engineering or engineering technology graduate studies if desired.

B) Alumni will demonstrate competencies in communication and teamwork skills by assuming increasing levels of responsibility and/or leadership or managerial roles.

C) Alumni will develop professionally, pursue continued learning and practice responsibly and ethically.

Alumni of the Computer Engineering Technology (CET) Associate Degree program may be employed as technicians or in support roles in a wide range of high tech industries from industrial manufacturing to consumer electronics. Alumni may be involved in product testing and qualification, customer support, sales, or public relations.

A) Alumni will demonstrate technical competence through success in computer engineering technician positions.

B) Alumni will demonstrate competencies in communication and teamwork skills through positive contributions to team based engineering projects.

C) Alumni will develop professionally, pursue continued learning and practice responsibly and ethically.

According to current statistics, one third of students who obtain the CET Associate degree also obtain a Bachelor degree in a related discipline, most often a Bachelor degree in Software. In this case, the Associate degree adds breadth to their education. Alumni in this category would be expected to perform at a level consistent with the Bachelor degree program educational objectives.

CET Bachelor of Science Program Student Learning Outcomes

Graduates of the CET Bachelor's degree program are expected to be able to demonstrate:

1. an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;

2. an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;

3. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;

4. an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives;

5. an ability to function effectively as a member or leader on a technical team;

6. an ability to identify, analyze, and solve broadly-defined engineering technology problems;

7. an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;

8. an understanding of the need for and an ability to engage in self-directed continuing professional development;

9. an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity;

10. a knowledge of the impact of engineering technology solutions in a societal and global context; and

11. a commitment to quality, timeliness, and continuous improvement.

CET Associate Degree Student Learning Outcomes

Graduates of the CET Associate degree program are expected to be able to demonstrate:

1. an ability to apply the knowledge, techniques, skills, and modern tools of the discipline to narrowly defined engineering technology activities;

2. an ability to apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require limited application of principles but extensive practical knowledge;

3. an ability to conduct standard tests and measurements, and to conduct, analyze, and interpret experiments;

4. an ability to function effectively as a member of a technical team;

5. an ability to identify, analyze, and solve narrowly defined engineering technology problems;

6. an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;

7. an understanding of the need for and an ability to engage in self-directed continuing professional development;

8. an understanding of and a commitment to address professional and ethical responsibilities, including a respect for diversity; and

9. a commitment to quality, timeliness, and continuous improvement.

III. Assessment Cycle

The assessment cycle appears below. For the BS program, four of the 12 student learning outcomes are assessed each year of a three year cycle. For the AE program, the outcomes that correspond to the BS program outcomes are assessed.

CET BS Program Assessment Plan

Learning Outcome:	15-16	16-17	17-18
1. an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities	•		
2. an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies			•
3. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes			•
4. an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives;	•		
5. an ability to function effectively as a member or leader on a technical team	•		
6. an ability to identify, analyze, and solve broadly-defined engineering technology problems			•
7. an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature		•	
8. an understanding of the need for and an ability to engage in self-directed continuing professional development		•	
9. an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity		•	
10. a knowledge of the impact of engineering technology solutions in a societal and global context		•	
11. a commitment to quality, timeliness, and continuous improvement	•		

CET AE Program Assessment Plan

Learning Outcome:	15-16	16-17	17-18
1. an ability to apply the knowledge, techniques, skills, and modern tools of the discipline to narrowly defined engineering technology activities	•		
2. an ability to apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require limited application of principles but extensive practical knowledge			•
3. an ability to conduct standard tests and measurements, and to conduct, analyze, and interpret experiments;			•
4. an ability to function effectively as a member of a technical team;	•		
5. an ability to identify, analyze, and solve narrowly defined engineering technology problems;			•
6. an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;		•	
7. an understanding of the need for and an ability to engage in self-directed continuing professional development		•	
8. an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity		•	
9. a commitment to quality, timeliness, and continuous improvement	•		

IV. Summary of 2014-15 Assessment Results

During the 2015-16 academic year, the program faculty assessed three student learning outcomes as summarized below.

Student Learning Outcome #1 (BS degree): an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities.

Student Learning Outcome #1 (AE degree): an ability to apply the knowledge, techniques, skills, and modern tools of the discipline to narrowly defined engineering technology activities.

Direct Assessment #1

This assessment focuses on the application of K-Map techniques to a logic minimization problem.

Data Collection Date: 12/09/15

Coordinator: Doug Lynn

Assessment Method: Assessments were based on a lab assignment given in CST 337 Fall 2015. Students were asked to implement a state-machine based interrupt service routine to manage reading and writing a block of data to/from an EEprom witih an SPI interface. This is a significantly difficult problem since commands written in instance k of the ISR will result in data returned in instance k+2. Students were also required to collect SPI setup and hold timing data for both the processor and the EEprom using a MSO.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Designed, debugged and demonstrated the interrupt driven EEprom system.	Successfully completed the assignment with minimal assistance	90%	100% (6/6)
Setup MSO and collected data	“	“	100% (6/6)

Evaluation: (12/9/15) All students were able to design debug and demonstrate the system as well as setup a MSO, collect and report timing data.

Actions: (10/10/2016) No changes need to be made as a result of this assessment.

Direct Assessment #2

This assessment focused on problem formulation.

Data Collection Date: 3/10/16

Coordinator: Kevin Pintong

Assessment Method: Assessments were based on a lab assignment given in CST 231 Fall 2015. Students were asked to wire an RGB led to the circuit board, and implement PWM in order to control a RGB LED utilizing an FPGA (Verilog) and Xilinx ISE 14.7. The red LED would be slowly brightened and dimmed. Then, the green LED would be slowly brightened and dimmed. Then, the blue LED would be slowly brightened and dimmed. In order to correctly wire the LED, students had to identify the anode and cathode. Since the LED was common cathode, the cathode was tied to ground and the R,G,B pins were tied to the FPGA through a resistor. Students had to calculate and place the correct resistor in between the FPGA and RGB led, as well as determine the correct method of wiring the LED.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results

Designed, debugged and demonstrated pulse width modulation by slowly dimming and increasing the brightness of each LED sequentially.	Successfully completed the assignment with minimal assistance	75%	90% (18/20)
Correctly wired LED to the FPGA. Correctly calculated and selected appropriate size resistor.	Successfully completed the assignment with minimal assistance	75%	90% (18/20)

Evaluation: (3/10/16) Assignments had to be turned in on time to be considered in the assessment. All 20 students turned in their work. 18 of 20 students were able to independently design, debug, and demonstrate using PWM to control an LED, and, were able to correctly wire the LED to the board with minimal assistance.

Actions: (10/12/2016) No changes need to be made as a result of this assessment.

Indirect Assessment #1
Data Collection Date: Spring 2016
Coordinator: Doug Lynn

8 of 8 CET seniors responding on the 2013-14, 2014-15 and 2015-16 senior exit survey questions related to this outcome judged that they were adequately prepared with an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities.

Actions (10/12/16): No changes need to be made as a result of this assessment

Student Learning Outcome #4 (BS degree): an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives.

Direct Assessment #1

Data Collection Date: 5/1/16

Coordinator: Phong Nguyen

Assessment Method: Assessments were based on team projects in the three term Junior Project sequence. There were two teams this term. The actual final devices and papers on Design, Build Prototype, Test for Deviation from Design, and Improvement were used for this assessment.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Design	1-4 according to rubric	70% at 3 or 4	100% (2/2)
Build Prototype	“	“	100% (2/2)
Test for Deviation from Design	“	“	100% (2/2)
Improvement	“	“	100% (2/2)

Evaluation: (5/9/16) The sample size this time is small -- just two projects. Perhaps because there was only two teams, the projects were overall successful, therefore every team was graded good (3) or excellent (4) on every criteria of this assessment. The projects were both well proposed, designed, fabricated, tested and improved.

Actions: (10/10/2016) No changes need to be made as a result of this assessment.

Direct Assessment #2

Data Collection Date: 5/1/16

Coordinator: Kevin Pintong

Assessment Method: Assessments were based on individual projects in the three term Senior Project sequence. A requirements development document, assurance plan (test document), the final report, and final submitted device were used for this assessment.

Performance Criteria	Measurement Scale	Minimum Acceptable	Results

		Performance	
Design	Pass/Fail	90% Pass	100% (6/6)
Requirements documentation or matrices were developed in accordance with SMART et. al. outlines.	Pass/Fail	90% Pass	100% (6/6)
Final documentation met content, organization, and writing quality standards set forth in the final report rubric	Pass/Fail	90% Pass	100% (6/6)
A test plan was developed for software and hardware functionality in the system.	Pass/Fail	90% Pass	100% (6/6)
The final submitted device functioned correctly during demonstration	Pass/Fail	90% Pass	100% (6/6)

Evaluation: (10/12/16) All senior project students carried out their project successfully. Each student was able to fulfill the performance criteria.

Actions: (10/12/2016) No changes need to be made as a result of this assessment.

Indirect Assessment #1
Data Collection Date: Spring 2016
Coordinator: Doug Lynn

8 of 8 CET seniors responding on the 2013-14, 2014-15 and 2015-16 senior exit survey questions related to this outcome judged that they were adequately prepared with an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives.

Actions (10/12/16): No changes need to be made as a result of this assessment.

Student Learning Outcome #5 (BS degree): an ability to function effectively as a member or leader on a technical team.

Student Learning Outcome #4 (AE degree): an ability to function effectively as a member of a technical team.

Direct Assessment #1

Data collection Date: 5/5/16

Coordinator: Phong Nguyen

Assessment Method: Assessments were based on 8 students divided evenly into two separate project team in the Junior Project sequence. It is a three quarter, 30 week class which students are teamed up to design a device that requires input, output, processor, memory and control. The embedded project also has an element of wireless. Both hardware and software aspects must be part of the project. Each team member was rotated into serving as team leader for periods of five to ten weeks of the 30 weeks.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Communication	1-4 according to rubric	70% at 3 or 4	87.5% (7/8)
Attitude toward team	“	“	100% (8/8)
Attitude toward professor	“	“	100% (8/8)
Workload	“	“	75% (6/8)
Reliability	“	“	100% (8/8)
Time management	“	“	75% (6/8)
Ability to adapt to team	“	“	100% (8/8)

Evaluation: (5/12/16) Performance exceeded the standard in all performance criteria. There was a major difference this year in communication upward, between students and the instructor. The instructor ran the class remotely from Wilsonville. Despite this, student team leaders stayed in constant communication with the instructor. Overall, the choice to offer the course via remote delivery did not hinder the success of the projects. Good teamwork and leadership resulted in success and success in turn resulted in better teamwork and leadership.

Actions: (10/10/16) No changes need to be made as a result of this assessment.

Indirect Assessment #1
Data Collection Date: Spring 2016
Coordinator: Doug Lynn

8 of 8 CET seniors responding on the 2013-14, 2014-15 and 2015-16 senior exit survey questions related to this outcome judged that they were adequately prepared with an ability to function effectively as a member or leader on a technical team.

Actions (10/12/16): No changes need to be made as a result of this assessment.

Student Learning Outcome #11 (BS degree): a commitment to quality, timeliness, and continuous improvement.

Student Learning Outcome #9 (AE degree): a commitment to quality, timeliness, and continuous improvement.

Direct Assessment #1

Data collection Date: 5/16/16

Coordinator: Kevin Pintong

Assessment Method: This assessment was conducted by having students prepare an Assurance Plan document in CST 461. The assurance plan document is a document that assures a customer that the student's project has:

1) Met all requirements stated in requirements matrix and report

2) Developed a test plan to assure hardware and software requirements were met and are functioning as intended.

3) Ensured that the system can be upgraded and modified in the future (continuous improvement)

4) Disclosed all areas of concern such as code or a design that does not function correctly.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Disclosed all areas of concern and notated areas of project which were not functional or could be improved (Quality)	1-4 as measured by the attached rubric	70% at 3 or above	100% (6/6)
Identified hardware and tools used so that project can be modified in the future (Continuous Improvement)	"	"	100% (6/6)
Implemented tests for both hardware and software components of the project (Quality)	"	"	100% (6/6)
Assurance plan document submitted on time (Timeliness)	"	"	100% (6/6)

Evaluation: (5/16/16) Each student was able to meet all performance criteria on this assessment.

Actions: (10/12/16) No further action required.

Direct Assessment #2

Data collection Date: 6/11/16
Coordinator: Phong Nguyen

Assessment Method: This assessment was conduction by having teams in the Junior Project sequence write a paper that covers aspects of quality management: understanding of quality management, validation testing, etc.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Understanding/definition of testing in improving project	1-4 according to rubric	70% at 3 or 4	100% (2/2)
Identify/understand quality management in order improve quality of project	“	“	100% (2/2)
Understand quality in improvement of project	“	“	50% (1/2)
Improvement of one aspect of project	“	“	100% (2/2)

Evaluation: (6/11/16) Evaluation of the papers showed that quality management needs to be further emphasized. Students do understand that testing for quality is important and are able to make improvements in their projects; however, little effort is put into the operative word: quality. This problem is ongoing because implementing the basic functionality of the project still uses up over 2/3 of the third quarter, leaving little time to address quality and improvement.

Actions: (10/12/16) We will add further emphasis on quality throughout the entire JP sequence.

Indirect Assessment #1
Data Collection Date: Spring 2016
Coordinator: Doug Lynn

8 of 8 CET seniors responding on the 2013-14, 2014-15 and 2015-16 senior exit survey questions related to this outcome judged that they were adequately prepared with a commitment to quality, timeliness, and continuous improvement.

Actions (10/12/16): No changes need to be made as a result of this assessment.

V. Summary of Student Learning

This year, student performance in all assessed objectives exceeded expectations in all performance criteria except one. In this one case, direct assessment #2 for outcome #9, students did not demonstrate their ability to implement quality improvements in their junior projects. In order to address this, the professor responsible for Junior project sequence will add further emphasis on quality throughout the entire JP sequence.

VI. Changes Resulting from Assessment

Compared with the previous 2012-13 assessment cycle, students in both Junior and Senior projects demonstrated an improved ability to complete their projects, however, in the case of the junior project this still did not leave enough time to demonstrate improvements in quality. Last time this was assessed, not all projects were completed, so some improvement has been achieved, though perhaps not enough. Increased emphasis on managing the scope of projects and on completion has helped. However, it appears that a bit more emphasis is still needed.