2017-2018 Assessment Report
Software Engineering Technology

1 Program Mission

The mission of the Software Engineering Technology (SET) Bachelor's Degree Program within Computer Systems Engineering Technology (CSET) Department at Oregon Institute of Technology is to prepare our students for productive careers by providing an excellent education incorporating industry-relevant, applied laboratory-based instruction in both the theory and application of software engineering.

Major components of the SET Program's mission in the CSET Department are:

- To educate a new generation of Software Engineering Technology students to meet current and future industrial challenges and emerging software trends.
- To promote a sense of scholarship, leadership, and professional service among our graduates.
- To enable our students to create, develop, apply, and disseminate knowledge within the field of software engineering.
- To expose our students to cross-disciplinary educational programs.
- To provide employers with graduates in software engineering and related professions.

2 Program Educational Objectives

The Program Educational Objectives of Oregon Tech's Software Engineering Technology Program are to produce graduates that:

- Use their knowledge of engineering to creatively and innovatively solve difficult computer systems problems.
- Regularly engage in exploring, learning and applying state-of-the-art hardware and software technologies to the solution of computer systems problems.
- Will be an effective team member that contributes to innovative software design solutions to the resolution of computer systems problems.
- Will communicate effectively, both as an individual and within multi-disciplinary teams.

3 Program Description and History

The Software Engineering Technology (SET) program was implemented in Klamath Falls in 1984 and was initially accredited by ETAC of ABET in 1991. The Portland program was established in Fall 1996 under the same accreditation and is currently located on the Wilsonville campus. The Associate degree was accredited by ETAC of ABET in 2009. The program has continuously evolved as industrial changes have warranted.

3.1 Enrollment

Location	Freshmen	Sophomore	Junior	Senior	Postbac	Total
Klamath Falls	44	26	29	57	0	157
Wilsonville	10	22	19	59	6	116

3.2 Program Graduates

Degree	2013-14	2014-15	2015-16	2016-17	2017-18
Associate's	2	9	2	2	1
Bachelor's	31	35	47	42	43

3.3 Employment Rates and Salaries

93% of our graduates from 2015-2017 are currently employed, and their median salary is $65,000. Of the not-currently-employed, 5% are seeking and 2% are not currently seeking employment.

3.4 Industrial Advisory Board

We have an industrial advisory board consisting in individuals in industry. Many of our IAB members are former CSET students, so they know our programs well. We meet twice a year to discuss the mission of the program, student learning outcomes, and specific details of our programs and courses within the programs.

4 Program Student Learning Outcomes

Software Engineering Technology baccalaureate graduates will have demonstrated:

A. an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;
B. 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;
C. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;
D. an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives;
E. an ability to function effectively as a member or leader on a technical team;
F. an ability to identify, analyze, and solve broadly-defined engineering technology problems;
G. 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;
H. an understanding of the need for and an ability to engage in self-directed continuing professional development;
I. an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity;

J. a knowledge of the impact of engineering technology solutions in a societal and global context; and
K. a commitment to quality, timeliness, and continuous improvement.

5 Curriculum Map

Course	Title	ESLO										
		A	B	C	D	E	F	G	H	I	J	K
ANTH 452	Globalization									X	X	
BUS 304	Engineering Management										X	
CST 116	C++ Programming I	X										
CST 120	Embedded C	X										
CST 126	C++ Programming II	X										
CST 130	Computer Organization	X										
CST 131	Computer Architecture	X										
CST 136	Object-Oriented Programming with C++	X										
CST 162	Digital Logic I	X										
CST 211	Data Structures	X		X								
CST 223	Concepts of Programming Languages	X										
CST 229	Introduction to Grammars		X									
CST 236	Engineering for Quality Software	X		X	X							
CST 238	Graphical User Interface programming	X										
CST 240	Linux Programming	X							X			
CST 250	Computer Assembly Language	X										
CST 276	Software Design Patterns	X										
CST 316	Junior Team-Based Project Development I	X				X	X	X	X	X		X
CST 320	Compiler Methods	X										
CST 324	Database Systems and Design	X										
CST 326	Junior Team-Based Project Development II	X				X	X	X	X	X		X
CST 334	Project Proposal				X		X	X	X			X
CST 336	Junior Team-Based Project Development III	X				X	X	X	X	X		X
CST 352	Operating Systems	X										
CST 412	Senior Development Project	X					X	X	X			X

CST 415	Computer Networks	X										
CST 422	Senior Development Project						X	X	X			X
CST 432	Senior Development Project						X	X	X			X
Humanities elective												
Humanities elective												
Humanities Elective												
MATH 111	College Algebra		X									
MATH 112	Trigonometry		X									
MATH 251	Differential Calculus		X									
MATH 252	Integral Calculus		X									
MATH 254N	Vector Calculus I		X									
MATH 327	Discrete Mathematics		X									
MATH 465	Mathematical Statistics		X									
MGT 345	Engineering Economy											
PHY 221	General Physics with Calculus		X									
PHY 222	General Physics with Calculus		X									
PHY 223	General Physics with Calculus		X									
PSY 201	General Psychology											
Social Science elective												
Social Science elective												
SPE 111	Public Speaking					X		X				
SPE 321	Small Group and Team Communication					X		X				
Technical Elective												
Technical Elective												
Technical Elective												
Total 187												
WRI 121	English Composition							X				
WRI 122	Argumentative Writing							X				
WRI 227	Technical Report Writing							X				
WRI350	Documentation Development							X				

6 Assessment Cycle

Table 6-1 Assessment plan for the new Student Learning Outcomes

#	**Learning Outcome**	**2017-2018**	**2018-2019**	**2019-2020**
a	an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities		X	
b	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			X
c	an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes	X		
d	an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives		X	
e	an ability to function effectively as a member or leader on a technical team			X
f	an ability to identify, analyze, and solve broadly-defined engineering technology problems	X		
g	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			X
h	an understanding of the need for and an ability to engage in self-directed continuing professional development			X
i	an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity		X	
j	a knowledge of the impact of engineering technology solutions in a societal and global context	X		
k	a commitment to quality, timeliness, and continuous improvement		X	

7 Methods for Assessment

ABET C: an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes

240 Profiling

It was our intent to have students in CST 240 perform a profiling experiment to determine where inefficiencies in their code were. Unfortunately, the data for this experiment was not collected.

JP Stress Testing

In the spring of the year, the groups in junior project were asked to stress test their projects. Stress testing consists of flooding the project with a large number of requests to verify that the project is well behaved under load. The following rubric was used:

CSET Conducting Standardized Tests Rubric

ABET C: an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes

Performance Criteria	High Proficiency (4)	Proficiency (3)	Developing Proficiency (2)	Limited/No Proficiency (1)
Analysis	Organizes and synthesizes evidence to reveal insightful patterns, differences, or similarities related to focus.	Organizes evidence to reveal important patterns, differences, or similarities related to focus.	Organizes evidence, but the organization is not effective in revealing important patterns, differences, or similarities.	Lists evidence, but it is not organized and/ or is unrelated to focus.
Interpretation	States a conclusion that is a logical extrapolation from the inquiry findings.	States a conclusion focused solely on the inquiry findings. The conclusion arises specifically from and responds specifically to the inquiry findings.	States a general conclusion that, because it is so general, also applies beyond the scope of the inquiry findings.	States an ambiguous, illogical, or unsupportable conclusion from inquiry findings.
Application	Student is able to easily go from the data to a solution to improve the system.	Student was able to go from the data to a solution, but their solution did not maximize positive impact on the system	The student made changes to the system based on the data, but the changes did not improve the system in significant ways.	Student was unable to correlate the data to changes that should improve the system

Results:

For the first two categories, all students scored a 3 or better. For the third category, 77% of students scored a 3 or better.

ABET F: an ability to identify, analyze, and solve broadly-defined engineering technology problems

For both Junior Project and Senior Project, various artifacts were examined to determine the students' skills in this area. The rubric that was used is as follows:

CSET Designing a System, Component or Process Rubric

ETAC F: an ability to identify, analyze, and solve broadly-defined engineering technology problems

Performance Criteria	**High Proficiency (4)**	**Proficiency (3)**	**Developing Proficiency (2)**	**Limited/No Proficiency (1)**
Identify critical elements of the design	Identified at least 85% of the critical design elements.	Identified at least 75% of the critical design elements.	Identified at least 60% of the critical design elements.	Identified less than 60% of the critical design elements.
Create a detailed design specification addressing each of the identified critical design elements	The document is sufficiently complete and clear so that another developer could pick it up and complete the project.	Some aspects of the document need additional clarification.	Major portions of the design are not sufficiently documented.	The design is poorly documented.
Generate a implementable solution for each of the identified critical design elements	Student has a reasonable chance of implementing the entire design within the project timeline with minimal changes to the design.	There are some aspects of the design that may need to be reworked or re-scoped for the project to be completed.	Project design requires significant rework in order to be implementable.	Project can't be implemented as designed.

Senior Project

For the first category, 77% of students scored a 3 or better. For the second category, 92% of students scored a 3 or better. For the third category, 88% of students scored a 3 or better.

ABET J: a knowledge of the impact of engineering technology solutions in a societal and global context

CST 238 Graphical User Interfaces includes material on the human factors in UI design. The material includes a heavy emphasis on trying to see the UI from the user's perspective instead of the developer's perspective. This change in perspective addresses criteria J.

For this assessment year, several approaches to measuring compliance with this criterion were tried with the hope of doing data collection next year. As a result, no data is being reported in this year.

Inquiry and Analysis

The university's Inquiry and Analysis rubric was used to assess this ESLO. The rubric is available at https://www.oit.edu/docs/default-source/academic-excellence/rubrics/2016-17-inquiry-amp-analysis-rubric.pdf?sfvrsn=4.

The assessment was based on students work in senior project proposal.

The following list presents the results:

1. Identify: 62% of students met the standard
2. Investigate: 79% of students met the standard
3. Support: 79% of students met the standard
4. Evaluate: 79% of students met the standard
5. Conclude: 79% of students met the standard

8 Evidence of Improvement in Student Learning

9 Data-driven Action Plans: Changes Resulting from Assessment

Most of the PSLOs we measured this year showed our students were making satisfactory progress. To put another way, they did not show any glaring holes in our program.

The following initiatives will be undertaken in the 2018-2019 year:

1. Collect data on PSLO J based on this year's preparatory work.
2. Teach some sections of CST 116 using the Linux development environment instead of Visual Studio to determine if Visual Studio does too much hand-holding for beginning students. This could potentially impact Criterion C to the extent that it addresses the debugging process (which is a non-standardized testing process). This will also potentially impact inquiry and analysis because that is the essence of the debugging process.
3. Teach some sections of CST 116 using C style I/O instead of C++ style I/O. This could potentially impact retention because it starts students out using a different mechanism for doing I/O. Our sense is that this might be a "softer" introduction and it might therefore reduce drop-out rates between our first two intro classes.