Section 1 – Program Mission and Educational Objectives

Oregon Tech Mission:

Oregon Institute of Technology, an Oregon public university, offers innovative and rigorous applied degree programs in the areas of engineering, engineering technologies, health technologies, management, and the arts and sciences. To foster student and graduate success, the university provides an intimate, hands-on learning environment, focusing on application of theory to practice. Oregon Tech offers statewide educational opportunities for the emerging needs of Oregonians and provides information and technical expertise to state, national and international constituents.

Core Theme 1: Applied Degree Programs

Oregon Tech offers innovative and rigorous applied degree programs. The teaching and learning model at Oregon Tech prepares students to apply the knowledge gained in the classroom to the workplace.

Core Theme 2: Student and Graduate Success

Oregon Tech fosters student and graduate success by providing an intimate, hands-on learning environment, which focuses on application of theory to practice. The teaching and support services facilitate students' personal and academic development.

Core Theme 3: Statewide Educational Opportunities

Oregon Tech offers statewide educational opportunities for the emerging needs of Oregon's citizens. To accomplish this, Oregon Tech provides innovative and rigorous applied degree programs to students across the state of Oregon, including high-school programs, online degree programs, and partnership agreements with community colleges and universities.

Core Theme 4: Public Service

Oregon Tech will share information and technical expertise to state, national, and international constituents.

Program Mission: The mission of the Embedded Systems Engineering Technology (ESET) bachelor's degree program within the Computer Systems Engineering Technology (CSET) Department at Oregon Institute of Technology is to prepare our students for productive careers in industry and government by providing an excellent education incorporating industry-relevant, applied laboratory-based instruction in both the theory and application of embedded systems engineering. Our focus is educating students to meet the growing workforce demand in Oregon and elsewhere for graduates prepared in both hardware and software aspects of embedded systems. Major components of the ESET program's mission in the CSET Department are:

- To educate a new generation of ESET students to meet current and future industrial challenges and emerging embedded systems engineering 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 embedded systems development environment.
- To expose our students to cross-disciplinary educational programs.
- To provide industry and government employers with graduates in embedded systems engineering and related professions.

Mission Alignment:

Our program is very hands-on and thus aligns with Core Theme 1. Our graduates are in high demand by the industries we support. This is evidence that we are aligned with Core Theme 2. The program features two years of project-based learning environment with junior project and senior project.

Section 2 – Program Description and History

Program History

The Embedded Systems Engineering Technology (ESET) program was proposed to OUS in spring of 2006 and approved in August, 2006. The curriculum for the ESET program is common with the hardware and software programs for the freshman year. The sophomore year of the ESET program has been constructed to mirror the track through both the Computer Engineering Technology (CET) and Software Engineering Technology (SET) programs, called the Concurrent Degree program. The ESET program junior year is when ESET students get instruction specific to topics of embedded systems engineering. These courses were taught for the first time in fall, 2008 on the Klamath Falls campus and soon after at the Wilsonville location. The full program is now offered to students at both locations.

Program Enrollment

As of Fall 2020, enrollment is growing in the Embedded Systems Engineering Technology program. The program is increased enrollment by 15% when compared with Fall 2016.

Oregon TECH

Computer Systems Eng Tech Headcount - Fall 4th Week
October 29, 2020

Student location is based on the primary campus assigned to each student; however students may enroll at other/multiple locations.
Majors with asterisk (*) have been phased out.
Dual Majors are reported under each separate major.

	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020
Computer Engineering Tech	63	62	61	56	39
Klamath Falls	**57**	**60**	**57**	**52**	**39**
Full-Time	51	50	48	48	36
Part-Time	6	10	9	4	3
Portland-Metro	**6**	**2**	**4**	**4**	
Full-Time	4			2	
Embedded Systems Eng Tech	57	57	69	80	68
Klamath Falls	**35**	**36**	**42**	**45**	**38**
Full-Time	31	29	36	40	36
Part-Time	4	7	6	5	2
Portland-Metro	**22**	**21**	**27**	**35**	**30**
Full-Time	11	10	14	16	14
Part-Time	11	11	13	19	16
Klamath Falls	**147**	**157**	**159**	**157**	**159**
Full-Time	124	126	133	135	133
Part-Time	23	31	26	22	26
Portland-Metro	**136**	**116**	**111**	**115**	**107**
Full-Time	62	51	51	59	56
Part-Time	74	65	60	56	51
Grand Total	**403**	**392**	**400**	**408**	**373**

Figure 1 CSET Headcount

Program Graduates

There has been a gradual and steady increase in the number of Embedded Systems graduates on both Portland Metro and Klamath Falls campus.

Oregon TECH

Computer Systems Eng Tech Degrees by Academic Year
October 29, 2020

Degree location is based on the primary campus assigned to each student at the time of graduation
Majors with asterisk (*) have been phased out.
Dual Majors are reported under each separate major.

	2015-16	2016-17	2017-18	2018-19	2019-20
Computer Engineering Tech	9	9	4	9	8
Assoc of Engineering					
Klamath Falls	5	3	1	1	2
Portland-Metro	1			1	
Bachelor of Science					
Klamath Falls	3	6	3	6	4
Portland-Metro				1	2
Embedded Systems Eng Tech	3	6	4	10	10
Bachelor of Science					
Klamath Falls	3	5	2	6	4
Portland-Metro		1	2	4	6
Software Engineering Tech	45	44	44	51	41
Assoc of Engineering					
Klamath Falls	2	1	1	3	
Portland-Metro		1		1	2
Bachelor of Science					
Klamath Falls	24	15	16	22	17
Portland-Metro	23	27	27	25	22
Grand Total	61	59	52	70	59

Figure 2 CSET Degrees

Employment Rates and Salaries

Institutional data indicates that graduates of the Embedded Systems Engineering Technology program are successful in finding employment. Some recent employers include Intel, Aristocrat, Mentor Graphics, LO3 Energy, Ravensclaw, Intel, Ravensclaw and Mentor Graphics. Some graduates are also pursuing graduate degrees in a related field.

Oregon Tech Graduate Outcome Data												
a=2015 / 2016 / 2017 combined	% Employed		% Continuing Ed		% Seeking		% Not Seeking		Success Rate		Median Salary	
b=2016 / 2017 / 2018 combined	a	b	a	b	a	b	a	b	a	b	a	b
% among those reporting outcomes	**90.0**	**89.9**	**6.7**	**7.0**	**2.8**	**2.5**	**0.5**	**0.5**	**97.2**	**97.5**	$ 58,000	$ 60,00
Computer Engineering Technology	100	93	0	7	0	0	0	0	100		$ 64,000	$ 65,50
Embedded Systems Engineering Technology	88	75	13	13	0	13	0	0	100	87	$ 60,000	$ 60,00
Software Engineering Technology	93	89	0	1	5	8	2	2	95	92	$ 65,000	$ 67,00

Figure 3 Employment Data

Showcase Learning Experiences

- During the week of February 9th, 2020 Kevin Pintong took students to the Annual IPC Expo to participate in teaching a soldering workshop as well as explore the Expo.
- On October 7th, Larry Landis from Intel PSG gave a presentation on getting hired in Tech Talk, as well as ran a workshop on Intel FPGA High Speed I/O.
- On June 5th 2020, Junior project students participated in the campus wide virtual project symposium to showcase their projects. Industry Advisory Board members were also invited to attend.

Program Changes

Pramod Govindan left at the end of June 2020. A search for his replacement is ongoing.

Program Improvement Discussions

The mission statement for Computer Engineering Technology was reviewed. The following changes were made.

No changes were made.

The mission statement for Embedded Systems Engineering Technology was reviewed. The following changes were made.

No changes were made.

The Program Educational Objectives for Computer Engineering Technology were reviewed. The following changes were approved.

PSLO 1 indicated ‘well-defined’ instead of the correct ‘broadly-defined’.

The Program Educational Objectives for Embedded Systems Engineering Technology were reviewed. The following changes were approved.

PSLO 1 indicated ‘well-defined’ instead of the correct ‘broadly-defined’.

Faculty discussed implementation of staggered courses for freshman year for CST 162, CST 130, CST 131. Frequently student would fail or come in Winter or Spring term. We discussed offering trailers for each class, but also discussed purposefully holding back part of the class to make sure we had sufficient number of students in each trailer. Typically, trailer classes have difficulty with enrollment numbers and may not run. Faculty were ok with this idea since it meant students would get the course earlier if needed.

Industry Advisory Board Meeting

In the January 1, 2020 Industry Advisory Board meeting, we discussed the following questions. Meeting minutes are available as well.

1. Engineering Technology to Engineering changes
2. Changing from A-K to 1-5 for ABET assessment
    a. Members commented that some removed outcomes were necessary in the workplace such as professional development, ethics, and professional development.
3. How do members feel about changing the junior project from 3 terms to two terms.

    Todd stated this was done in the past and did not result in adequate training.
    - One member stated that going to 2 terms might just make projects less in-depth. Another stated that there would not be averse affect if hardware, software or embedded had different junior project lengths.
    - Todd stated that currently, junior project consists of:

        1st & 2nd term- development, testing

        3rd term- polish and preparing for Symposium
    - Consensus was that reducing to two terms may not have a severe negative impact.

    Phil asked if members thought it was important that we can currently state "two year-long projects.
    - Members did not think this would have much impact in the marketplace.
    - It was commented that by the 3rd term, interpersonal relations often start to fail and this can be a good teamwork learning situation.

4. In freshman year, sometimes the students may fail or come in out of sequence. Right now we only offer CST 162 Fall, CST 130 Winter, CST 131 Spring. Should we start offering these classes every term? This would mean we would have to stagger students, and the 'common first year' is somewhat broken up.
    - Member input was that if a student gets out of sequence, they need to take other classes and take the class next time it is offered. Part of this is based on the lack of faculty time to continually offer every class and minimal class size.
    - Phong stated they always have about 10 students for trailers. Portland Metro offer trailers in the summer so that students do not lose a year. Several members stressed that if the class is offered, it cannot be cut by the department.
    - Todd stated the number of winter starts has steadily decreased, thus the offering(s) have been hard to offer.
    - CST162 also is required for EE, so students can be picked up from that department.

5. The focus on the program is heavy on architecture. From a qualitative data from engineers in the field Kevin has spoken to, all job postings, industry is looking for digital systems people with DSP experience, moving from architecture focus. What do members think of changing the focus to digital logic/DSP?
    - One member stated his company is not doing a lot of DSP. He thinks applied filter to a clock and used a spectrum analyzer. Also, architecture is important, understating the peripherals and how they are used.
    - Currently, there is no DSP. Would it be worth taking something out to add DSP? Or signals and systems. Basically, how to do the math. Again, understating the architecture is valuable.

The only change that was rolled into action was the addition of trailer classes. Due to COVID, everything else was placed on hold.

Core Program Faculty

Douglas Lynn, Professor (KF)

Michael Healy, Assistant Professor (KF)

Phong Nguyen, Assistant Professor (PM)

Kevin Pintong, Interim Program Director Computer Engineering Technology, Associate Professor (KF)

George Drouant, Instructor (KF)

Pramod Govindan, Instructor (PM)

Troy Scevers, Program Director Embedded Systems Engineering Technology, Associate Professor (KF)

Section 3 – Program Student Learning Outcomes

Graduates 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. Graduates may be involved in product design, testing and qualification, application engineering, customer support, sales, or public relations.

Program Educational Objectives

The Program Educational Objectives reflect those attributes a student of the CET program will practice in professional endeavors.

- Demonstrate technical competency through success in computer engineering technology positions and/or pursuit of engineering or engineering technology graduate studies if desired.
- Demonstrate competencies in communication and teamwork skills by assuming increasing levels of responsibility and leadership or managerial roles.
- Develop professionally, pursue continued learning, and practice computer engineering technology in a responsible and ethical manner.

Program Student Learning Outcomes

(1) an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly defined engineering problems appropriate to the discipline.

(2) an ability to design solutions for broadly-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline.

(3) an ability to apply written, oral, and graphical communication in well-defined technical and non-technical environments; and an ability to identify and use technical literature

(4) an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results.

(5) an ability to function effectively as a member of a technical team.

Program Student Learning Outcomes Update

On September 18, 2020, the ESET and CET faculty met to review the mission statement, and program student learning outcomes. Faculty also met to discuss PSLO responsibilities for the 2020-2021 cycle, as well as outcomes for 2019-2020 cycle.

External validation

External validation of PSLO are achieved through the following:

1) Industry Advisory Board discussions
2) Graduate job placement and continuing education rates
3) ABET ETAC accreditation process

Section 4 – Curriculum Map

Program Student Learning Outcomes

Course	Major	Title	PSLO				
			1	2	3	4	5
CST 162		Digital Logic I	X				
CST 130		Computer Organisation	X				
CST 120		Embedded C	X				
CST 131		Computer Architecture	X				
CST 133		Digital Logic II	X	x			
CST 134		Instrumentation	X			X	
CST 250		Computer Assembly Language	X	x			
CST 204		Introduction to Microcontrollers	X	x	x		
CST 231		Digital Systems Design I	X		X		
CST 337		Embedded System Architecture	X	X	x	X	
CST 315		Embedded Sensor Interfacing & I/O	X			X	
CST 374		Embedded Project Proposal	X		X		
CST 371		Embedded Systems Development 1 (Junior Project)	X		X	X	X
CST 372		Embedded Systems Development 2 (Junior Project)	X		X		X
CST 373		Embedded Systems Development 3 (Junior Project)	X		X		X
CST 471		Embedded Senior Project 1	X		X		
CST 472		Embedded Senior Project 2	X		X		
CST 473		Embedded Senior Project 3	X		X		
CST 331	CpE	Microprocessor Peripheral Interfacing	X	X	x	X	
CST 418	CpE	Data Comm & Networks	X				
CST 351	CpE	Digital System Design II	X		x		
CST 344	CpE	Intermediate Computer Architecture	X				
CST 442	CpE	Advanced Computer Architecture	X				
CST 455	ES	System on a Chip Design	X				
CST 456	ES	Embedded System Testing	X				
CST 466	ES	Embedded System Security	X		X	x	
CST 417	ES	Embedded Networking	X				
CST 347	ES	Real Time Embedded Operating Systems	X				

X = Major component, x = minor component

The curriculum map was updated and approved on October 4, 2019.

Essential Student Learning Outcomes

Essential student learning outcomes are given in the table below at the introduction, practice, and capstone levels.

ISLO/ESLO Three Year Academic Assessment Cycle (Student Success)

Year 1 ISLO/ESLO's 2020-2021	Year 2 ISLO/ESLO's 2021-2022	Year 3 ISLO/ESLO's 2022-2023
Plan **Communication, Teamwork, Ethical Reasoning** Upcoming assignments & assessments; Reflect and Evaluate	**Plan** **Diverse Perspectives including Cultural Sensitivity & Global Awareness** Upcoming assignments & assessments; Reflect and Evaluate	**Plan** **Inquiry & Analysis includes problem solving & Info literacy, critical analysis & logical thinking** **Quantitative Literacy & Reasoning** Upcoming assignments & assessments; Reflect and Evaluate
PLAN: Course Selections. Assignment Design, Rubric Design. (Program Planning report due start of winter quarter, feedback given by spring term).		
Assess **Inquiry & Analysis includes problem solving & Info literacy, critical analysis & logical thinking** **Quantitative Literacy & Reasoning** **Collect** Academic Assessment (FALL & WINTER) **Analyze** (SPRING)	**Assess** **Communication, Teamwork, Ethical Reasoning** **Collect** Academic Assessment (FALL & WINTER) **Analyze** (SPRING)	**Assess** **Diverse Perspectives including Cultural Sensitivity & Global Awareness** **Collect** Academic Assessment (FALL & WINTER) **Analyze** (SPRING)
ASSESS: Direct Measures- (circle) Faculty Grades (Rubric), Standardized Tests, Exams, Pre and Post Test Designs, Competency-Based Demonstrations, Portfolios Indirect Measures- (circle) Faculty Grades-DFW, Surveys & Reflections, Course Evaluations, Graduation Rates, Retention Rates. Program Collect and Analyze Report due at the end of spring term and feedback given by fall term.		
Act **Diverse Perspectives including Cultural Sensitivity & Global Awareness** Close loops, make improvements and remeasure Engage campus (professional development)	**Act** **Inquiry & Analysis includes problem solving & Info literacy, critical analysis & logical thinking** **Quantitative Literacy & Reasoning** Close loops, make improvements and remeasure Engage campus (professional development)	**Act** **Communication, Teamwork, Ethical Reasoning** Close loops, make improvements and remeasure Engage campus (professional development)

Section 5 – Assessment Cycle

The table below is the updated assessment cycle for 2019-2023. The assessment cycle below reflects changes made as a result of the ABET ETAC a-k to 1-5 learning outcomes change. PSLO are assessed in a three year cycle and the ESLO are assessed in a six year cycle. Each PSLO will have two direct measurements (two classes) with one indirect measurement, and each ESLO will have one direct measurement.

PSLO	ESLO	2019-2020 (This report)	2020-2021	2021-2022	2022-2023
(1) an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly engineering problems appropriate to the discipline; (ESLO Inquiry and Analysis)	**Inquiry and Analysis**		**CET/ESET: CST 133 (Kevin)** **CET: CST 334, 442, 418 (Doug)** **ESET: CST 456 (Stephen)**		
(2) an ability to design solutions for well-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline;		**CST 315 (Pramod, George)** **CST 473** **(Kevin, Phong)**			**CST 315 (George and Unknown)** **CST 473 (Unknown Phong)**
(3) an ability to apply written, oral, and graphical communication in well-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature; (ESLO Communication)	**Communication**	**CST 371 (Mike, Phong)** **CST 473 (Kevin, Phong)**		**CST 472 (Phong and Unknown)** **CST 372 (Phong and Mike)**	
(4) an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results; (ESLO Quantitative Literacy)	**Quantitative Literacy**		**ESLO** **CST 337 (Doug)** **CST 134 (George,)**		
(5) an ability to function effectively as a member of a technical team. (ESLO Teamwork)	**Teamwork**	**ESLO** **CST 371 (Mike, Phong)**		**CST 371 (Mike, Phong)**	

				CST 231 (Kevin, Unknown)	
N/A	**Diverse Perspectives**				**CST 471 (Kevin, Phong) ESLO Only** **CST 371(Mike, Phong)**
N/A	**Ethical Reasoning**	**-**	**-**	**CST 472 (Phong and Unknown)** **CST 372 (Phong and Mike)**	

Section 6 – Assessment Activity

This year's assessment focused on the learning outcomes below, noting that we are now on ABET ETAC 1-5 learning outcomes.

Reference the following table and page numbers. Indirect assessment is provided as Student Exit survey in appendix. The indirect assessment for 2,3,5 indicate that we are meeting the PSLO, although due to small sample size it is not statistically strong.

Assessment	**Program Student Learning Outcomes** **3-year cycle** **Computer/Embedded Systems Engineering Technology B.S.**	**2019-2020**	**Page**	**Status**
A (2)	an ability to design solutions for well-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline;	**CST 472 KF** **CST 472 WL** **CST 315 KF** **CST 315 WL**	**p.16** **p.18** **p.20** **p.21**	**OK**
B (3)	an ability to apply written, oral, and graphical communication in well-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature; (ESLO Communication)	**CST 371 KF** **CST 371 WL** **CST 472 KF** **CST 472 WL**	**p.32** **p.29** **p.23** **p.27**	**OK**
C (5)	an ability to function effectively as a member of a technical team. (ESLO Teamwork)	**CST 371-373 KF** **CST 371-373 WL**	**p.40** **p.37**	**OK**

Assessment A – KF - 472

Learning Outcome (2): an ability to design solutions for broadly-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline;

Course/Event: CST 472

Level: Capstone

Assessor & Campus: Kevin Pintong at Klamath Falls

Activity: Student wrote work agreement outlining list of engineering tasks to complete for term. At end of term, student progress reviewed using individual work agreement between student and instructor.

Rubric:

1. See rubric below

Sample and Reliability: Eleven student artifacts assessed. Limited sample size may skew results. Scoring was performed by faculty of record for CST 472.

Multiple Sites: Terminology used in assignments are different but same content was covered.

Performance Target: Student achieves grade of > 70% according to rubrics for each item. Overall, > 75% of students achieve success.

Performance Level:

Item		ESET	CET
1	Was the student more than 70% complete at the end of term according to discussion between student and instructor?	6/7 (86%) Avg.84.07/100, 1 below 70.	4/4 (100%) Avg. 81.25/100, all above 75.
2	Was the student able to formulate a list of items to design for the term? (Student resubmitted until the list was sufficiently broken down and addressed original requirements (Specific, Measureable, Attainable, Realistic, Timebound)	7/7(100%)	4/4 (100%)
	Overall	Pass Target	Pass Target

History of Results: Not Available.

Faculty Discussion: Results are discussed in next cycle.

Interpretation: No improvement needed.

Initial development of work agreement assignment (Item 2)

Itemize a minimum of 20 items to be graded using a minimum of three different main topics. List work in such a manner that each item is similar in weight. It is recommended that you itemize more than 20 items. Increasing the number of items to be graded can improve your final score by reducing the weight for each individual item, as the minimum of 20 items means that each item will be weighted at 5 points. No partial credit will be assigned- Each item will be graded as complete or incomplete.

Grading of final progress according to work agreement assignment (Item 1)

Formula for final percent assigned: Items Complete / Total Items * 100.The functionality and grading criteria described here will dictate 20 percent of student grade as referenced by the work agreement section of the syllabus. Due date for the functionality listed above is the final exam date for the course.

Design well-defined tech problems Rubric				
Performance Criteria	**No/Limited Proficiency (1)**	**Some Proficiency (2)**	**Proficiency (3)**	**High Proficiency (4)**
Understand tech problem(Come up with work agreement)				7/7 ESET 4/4 CET
Design solution to problem (% complete at end of term)				6/7 ESET 4/4 CET

Assessment A – WL - 472

Learning Outcome (2): an ability to design solutions for well-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline;

Course/Event: CST 472

Level: Capstone

Assessor & Campus: Phong Ngyuen at Wilsonville

Activity: Student beta prototype was assessed using an instructor assigned grading rubric (0-100)

Rubric:

2. See rubric below

Sample and Reliability: Ten student artifacts assessed. Limited sample size may skew results. Scoring was performed by faculty of record for CST 472.

Multiple Sites: Terminology used in assignments are different but same content was covered.

Performance Target: Student achieves grade of > 70% according to rubrics for each item. Overall, > 75% of students achieve success.

Performance Level:

Item		ESET
1	Understand technical problem	2/2 (100 %)
2	Design solution to problem	2/2 (100%)
3	Tools	2/2 (100%)
	Overall	Pass Target

History of Results: Not Available.

Faculty Discussion: Results are discussed in next cycle.

Interpretation: No improvement needed.

Design well-defined tech problems Rubric				
Performance Criteria	**No/Limited Proficiency (1)**	**Some Proficiency (2)**	**Proficiency (3)**	**High Proficiency (4)**
Understand tech problem			2	
Design solution to problem			1	1
Tools			2	

Assessment A – KF - 315

Learning Outcome (2): an ability to design solutions for broadly-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline;

Course/Event: CST 315

Level: Practice

Assessor & Campus: George Drouant at Klamath Falls

Activity: A laboratory exercise requiring student to build a microcontroller based water level control system using the LM393 comparator.
Rubric:

1. See below, and see appendix E for actual assignment.

Sample and Reliability: Twenty four artifacts collected. Scoring performed by instructor of record.

Multiple Sites: Terminology used in assignments are different but same content was covered. In this case, different labs were used.

Performance Target: Student achieves grade of > 70% according to rubrics for each item. Overall, > 75% of students achieve success.

Performance Level:

Item		Embedded	Computer
1	Understand technical problem	10/11 (91%)	12/13 (92%)
2	Design solution to problem	10/11 (91%)	12/13 (92%)
3	Understand how to use tools	10/11 (91%)	12/13 (92%)
	Overall	Pass Target	Pass Target

History of Results: Not Available.

Faculty Discussion: Results are discussed in next cycle.

Interpretation: No improvement needed.

Assessment A – WL - 315

Learning Outcome (2): an ability to design solutions for broadly-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline;

Course/Event: CST 315

Level: Practice

Assessor & Campus: Pramod Govindan at Wilsonville

Activity: A laboratory exercise requiring student to build simple Analog to Digital and Digital to Analog converters as shown below. See assignment in Appendix A. Student graded from scale of 0-100
Rubric:

2. See below, and see appendix for actual assignment.

Sample and Reliability: Eleven student artifacts assessed. Limited sample size may skew results. Scoring was performed by faculty of record for CST 315.

Multiple Sites: Terminology used in assignments are different but same content was covered.

Performance Target: Student achieves grade of > 70% according to rubrics for each item. Overall, > 75% of students achieve success.

Performance Level:

Item		ESET
1	Understand technical problem	4/4 (100%)
2	Design solution to problem	3/4 (75%)
3	Understand how to use tools	4/4 (100%)
	Overall	Pass Target

History of Results: Not Available.

Faculty Discussion: Results are discussed in next cycle.

Interpretation: No improvement needed.

Rubric:

Design well-defined tech problems Rubric				
Performance Criteria	**No/Limited Proficiency (1)**	**Some Proficiency (2)**	**Proficiency (3)**	**High Proficiency (4)**
Understand tech problem			4	
Design solution to problem		1	1	2
Tools			1	3

	High Proficiency	Proficiency	Some Proficiency	Limited or no Proficiency
Understanding of Technical Problem	Clearly defines the problem and outlines necessary objectives in an efficient manner.	Problem statement has some ambiguity or misses some important issues	Problem is defined incorrectly or too narrowly. Key information is missing or incorrect	Problem not defined at all
Design of system to solve problem	can describe planned experiments and how they relate to the problem; relate hypotheses to previous knowledge;	Description of planned experiments, relation of hypotheses, identification of steps and timeline, can be accomplished	Fails to formulate hypotheses to test. Does not express possible outcomes.	No clue on how to solve problem
Tools	Consistently uses new procedures and tools successfully, and can describe rationale for them. Runs appropriate control and replicate experiments	Uses new methods and tools, but may notalways be successful. May not accurately xplain rationale. Control and replicate xperiments run	Errors made in analytical methods, but sources of error aren't found. Appropriate control or replicate experiments not run.	Unfamiliar with rudimentary electrical measurement tools

Assessment B – KF - 472

Learning Outcome (3): an ability to apply written, oral, and graphical communication in well-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature; (ESLO Communication)

Course/Event: CST 472

Level: Capstone

Assessor & Campus: Kevin Pintong at Klamath Falls

Activity: Student gave presentation and submitted PowerPoint based on preliminary design review.

Rubric:

3. OIT presentation rubric
4. Scoring Rubric for CSE 472 presentation

Sample and Reliability: Ten student artifacts assessed. Limited sample size may skew results. Scoring was performed by faculty of record for CST 472.

Multiple Sites: Terminology used in assignments are different but same content was covered.

Performance Target: Student achieves grade of > 75% according to rubrics for each item. Overall, > 75% of students achieve success.

Performance Level:

Item		ESET	CET
1	Public speaking rubric	6/7 (86%) 3.34/4 avg score	4/4 (100%) 3.6/4 avg score
2	Course assignment rubric (Achieve >75%)	6/7 (86%) 84.14/100 avg score	4/4 (100%) 83.4/100 avg score
	Overall	Pass Target	Pass Target

History of Results: Not Available.

Faculty Discussion: Results are discussed in next cycle.

Interpretation: Data provided in this report indicates that the Program Student Learning Objectives are being met for Klamath Falls. Limited sample size. May need to work on student delivery and style in subsequent senior project.

OIT Public Speaking Rubric				
Performance Criteria	**No/Limited Proficiency (1)**	**Some Proficiency (2)**	**Proficiency (3)**	**High Proficiency (4)**
Content			3/7(ESET)	4/4 (CET) 4/7 (ESET)
Organization				4/4 (CET) 7/7 (ESET)
Style		1/4 (CET) 4/7 (ESET)		3/4 (CET) 3/7 (ESET)
Delivery		¼ (CET) 4/7 (ESET)	¼ (CET) 1/7 (ESET)	2/4 (CET) 2/7 (ESET)
Visuals		¼ (CET) 1/7 (ESET)	¼ (CET) 1/7 (ESET)	2/4 (CET) 5/7 (ESET)
Total Avg		0/4 (CET) 1/7 (ESET)	2/4 (CET) 4/7 (ESET)	2/4 (CET) 2/7 (ESET)

Course Presentation Rubric

Category	Scoring Criteria	Possible	Avg Grade
Content	Introduce and remind audience of proposed system purpose; update timeline and requirements, budget. Explain any updates and changes.	5	
	Detailed system description- Including system block diagram highlighting system architecture.	5	
	Detailed hardware description – describe hardware in sufficient detail.*	30	
	Detailed software description – describe software in sufficient detail code.*		
	Accurate information is presented and sufficient information for an engineering audience is provided.	5	
	Live demo of system working	30	

Presentation	Was the speaker appropriately animated and did they maintain good eye contact with the audience?	3	
	Did the presenter use a clear voice and provide smooth delivery?	3	
	Did you feel engaged during the presentation?	3	
	Were you able to read the slides, and were they proofread?	3	
	Did you feel that the presenter communicated their project to you in a clear and concise manner?	3	
Cust. Interaction	Did the presenter correctly answer questions in a professional manner?	4	
Organization	Was information presented in a logical sequence?	3	
	Were sources (figures, tables, etc.) appropriately cited?	3	
	Total Points	**100**	**83.4 (CET)** **84.14 (ESET)**

Assessment B– WL - 472

Learning Outcome (3): an ability to apply written, oral, and graphical communication in well-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature; (ESLO Communication)

Course/Event: CST 472

Level: Capstone

Assessor & Campus: Phong Ngyuen at Wilsonville

Activity: Student gave presentation and submitted PowerPoint based on preliminary design review.

Rubric:

1. OIT presentation rubric
2. Scoring Rubric for CSE 472 presentation

Sample and Reliability: Ten student artifacts assessed. Limited sample size may skew results. Scoring was performed by faculty of record for CST 472.

Multiple Sites: Terminology used in assignments are different but same content was covered.

Performance Target: Achieve an average of 3/4 according to OIT oral presentation rubric grading. Achieve an average of 80/100 according to Embedded Program Rubric grading

Performance Level:

Item		ESET
1	Public speaking rubric	5/5 (100%) Avg 3.64/4
2	Course assignment rubric (Achieve >75%)	5/5 (100%) Avg 87.5/100
	Overall	Pass Target

History of Results: Not Available.

Faculty Discussion: Results are discussed in next cycle.

Interpretation: Data provided in this report indicates that the Program Student Learning Objectives are being met for Klamath Falls. Limited sample size. May need to work on student delivery and style in subsequent senior project.

OIT-BEMB PSLO 3 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;	
Criterion	Met.
Summary	All projects from 472 fulfilled requirements of rubrics
Improvement Narrative	Both project Preliminary Design Review were well conducted
Attachments	Appendix A

RESULTS:

OIT Public Speaking Rubric				
Performance Criteria	**No/Limited Proficiency (1)**	**Some Proficiency (2)**	**Proficiency (3)**	**High Proficiency (4)**
Content			2	3
Organization			1	4
Style			3	2
Delivery			1	4
Visuals			2	3

Assessment B– WL - 371 – Direct

Learning Outcome: 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;

Course/Event: CST 371

Level: Capstone

Assessor & Campus: Phong Ngyuen at Wilsonville

Activity: Evaluation of presentation and powerpoint based on simulation of a Preliminary Design Review. Evaluation is based on a rubric

Rubric: See Appendix D- OIT Public speaking rubric

Sample and Reliability: Five student artifacts assessed. Limited sample size may skew results. Scoring was performed by faculty of record for CST 371.

Multiple Sites: Terminology used in assignments are different but same content was covered.

Performance Target: Achieve an average of 3/4 according to OIT oral presentation rubric grading. Achieve an average of 80/100 according to Embedded Program Rubric grading

Performance Level:

CST 371

Item		ESET
1	Instructor evaluation > 80/100 with Embedded Program Rubric	100% students met Avg. 94.5/100
2	OIT Presentation rubric average ¾ or more	100% students met Avg. 3.5/ 4
		Pass metric

Successful performance criteria: 85% of teams were able to achieve >80/100 in documents

Students were rated on a point scale on rubric for each document

History of Results: Not Available.

Faculty Discussion: Results are discussed in next cycle.

Interpretation: Both project Preliminary Design Review were well conducted

OIT Public Speaking Rubric				
Performance Criteria	**No/Limited Proficiency (1)**	**Some Proficiency (2)**	**Proficiency (3)**	**High Proficiency (4)**
Content			Team Bicycle	Team ASB
Organization				Team Asb Team Bicyle
Style			Team ASB Team Bicycle	
Delivery			Team Bicycle	Team ASB
Visuals			Team Bicycle	Team ASB

Embedded Program Rubric – CST 371

I. Presentation skills	Average Grade
A. Preparation (practiced prior to presenting, materials ready)	10
B. Eye contact/projection of voice/proper attire/no distraction	8.5
Improved on voice projection. Eye contact needs work for 2 of 3 members	
II. Document	
A. Problem identification	8.5
B. Plan/paper design (parts, costs, schematic, explanations of design details…)	9
C. Schedule (changes, problems, any deviations…)	9
D. Control	9
III. Hardware	
Initial parts testing	8.5
IV Software	
A. Overall software flow chart	10
B. Software tools required	10
III. Demonstration	10

TOTAL:	94.5

Learning Outcome: 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;

Course/Event: CST 371

Level: Capstone

Assessor & Campus: Michael Healy at Klamath Falls

Activity: Evaluation of presentation and powerpoint based on simulation of a Preliminary Design Review. Evaluation is based on a rubric

Rubric: See Appendix D- OIT Public speaking rubric

Sample and Reliability: Six student artifacts assessed. Limited sample size may skew results. Scoring was performed by faculty of record for CST 371.

Multiple Sites: Terminology used in assignments are different but same content was covered.

Performance Target: Achieve an average of 3/4 according to OIT oral presentation rubric grading. Achieve an average of 80/100 according to CET & Embedded Program Rubric grading.

Performance Level:

CST 371

Item		ESET	CET
1	Instructor evaluation > 80/100 with Embedded Program Rubric	100% students met Avg. 99/100	100% students met Avg. 99/100
2	OIT Presentation rubric average ¾ or more	100% of mixed teams met Avg. 3.8/ 4	
		Pass	

Successful performance criteria: 100% of teams were able to achieve >80/100 in documents.

Students were graded based on a percentage for each category in the presentation document.

History of Results: Not Available.

Faculty Discussion: Results are discussed in next cycle.

Interpretation: All Preliminary Design Reviews were fairly well conducted.

OIT Public Speaking Rubric				
Performance Criteria	**No/Limited Proficiency (1)**	**Some Proficiency (2)**	**Proficiency (3)**	**High Proficiency (4)**
Content				BluBlock RaspbRad Squeege Tempsur ElecDirBd ChromStr
Organization				BluBlock RaspbRad Squeege Tempsur ElecDirBd ChromStr
Style		ChromStr		BluBlock RaspbRad Squeege Tempsur ElecDirBd
Delivery		Tempsur		BluBlock RaspbRad Squeege ElecDirBd ChromStr
Visuals		Tempsur	ChromStr	BluBlock RaspbRad Squeege ElecDirBd

11.1.2019

Memo

To
JP Students

From
Prof. Healy

CC

Re
Rubric for Preliminary Design Review – **Tentatively scheduled for weeks 7 and 8 of the term (11/12 – 11/22)**

The Preliminary Design Review, or Baseline Design Review, serves as the initial technical review in which you attempt to present what you're working on to parties *outside of your team*. It's also an opportunity to solicit feedback regarding not only your project but also your process effectiveness. In other words, it allows to *see* your process from outside of your own team's frame of reference. It does this by forcing you to answer the following questions:

- How do I present to others what our team is doing in a concise manner, using language that makes sense? (effective communication)
- How do I describe the individual elements of my process and my project, and show how they link to the larger effort of what we are working towards, *and explain it all in under 35 minutes*? (comprehensive)
- Have I considered all the process elements that will result in our eventual success on this capstone? (inclusiveness / team self-evaluation)

Use powerpoint or equivalent, plus any props that you think you need in order to provide a complete presentation that doesn't exceed 35 minutes. Anticipate a Q & A session to follow immediately. Use the grading criteria below as a guide.

Presentation Document: Problem Identification

10% - A concise description of the problem as described in your project proposal. Probably one slide.

Presentation Document: Plan Preview

10% - This is a preview since you haven't submitted your Plan document yet. One or two slides showing subassembly breakdown, parts, costs, and a view of whatever schematics you have developed to date.

Presentation Document: Schedule

10% - One slide highlighting changes (anticipated changes), problems so far, and how you expect to handle deviations.

Presentation Document: Control

10% – One slide to discuss your thoughts on handling the contingencies for your Control document.

Hardware / Software / Demonstration

40% – I would expect *at least* three slides in order for you to show some depth of detail. You choose what you want to emphasize here. Some ideas:

- A discussion of hardware test plans
- What do you need to do as your parts begin rolling in?
- What is your team currently focused on?
- Share your ideas with respect to power calculations or package layout
- You could show a state machine diagram or other data flow / data management schemes that highlight your i/o
- You could software flowcharts. Do you have some pseudo code you can go through? Talk about some software tools you plan to use.

Get creative with your demonstrations. You may not have much in the way of output to demonstrate by week 7/8. Ideas:

- You could provide a conceptual demonstration similar to the way that architectural firms commission artists to render building plans. Automobile manufacturers build concept cars or publish 2-dimensional cels.

- You could find something on the internet that would serve as a demonstration. Embed it into your powerpoint.
- Physical props may be used.
- Use your camera to record a process that you're using or to film some early test you're working on.
- Use screen captures to demonstrate one of the software tools you plan to use.

Presentation Skills: Ample Preparation

10% – All team members **must be involved**. Divvy up the slides so each of you has something to present. Preparation includes preparation of materials. Run through your slides to be sure everything is ready. Look for typos and misprints. Practice your presentation a couple of times so you know you can keep it under 35 minutes.

Presentation Skills: Professionalism and Projection

10% – Proper attire. Business casual: no jeans, no tee shirts, and no sneakers.

Project your voice.

Speak in a tone and volume that can be heard by someone if they were standing at the very back of the room. Recognize the difference between practicing in an empty room as opposed to the real deal when the room is full. (I anticipate using PV107.) Bodies absorb sound, and people create a lot of ambient noise.

Make eye contact with your audience. Do this by visually engaging various audience members in a random fashion. This has a couple of positive effects. First of all it can automatically result in your not appearing distracted or fidgety. It also projects confidence – in other words, you won't appear nervous regardless of how you really feel psychologically.

Learning Outcome (3): an ability to function effectively as a member of a technical team
Course/Event: CST 371-373

Level: Capstone

Assessor & Campus: Phong Ngyuen at Wilsonville.

Activity: Student was evaluated using teamwork rubric and paper on teamwork.

Rubric:
1. OIT teamwork rubric in Appendix B

Sample and Reliability: Five student artifacts assessed. Limited sample size may skew results. Scoring was performed by faculty of record for CST 371-373.

Multiple Sites: Terminology used in assignments are different but same content was covered.

Performance Target: Achieve 70% average or greater as cohort.

Performance Level:

Item		ESET
1	Instructor evaluation (Note, only two groups so sample size is very small)	79%
2	Team self evaluation	91%
	Overall	Pass Target

History of Results: Not Available.

Faculty Discussion: Results are discussed in next cycle.

Interpretation: 4 of 5 students were satisfactory in teamwork. One in a team of two graded team at pre foundation and foundation level in three criteria. The reasons are legitimate. However, the team members were able to reconcile their differences and completed a good product.

4 of 5 students wrote good papers backing their decisions on the rubric. The unsatisfactory paper was simplistic and did not cover all points.

RESULTS:

INSTRUCTOR RUBRIC EVALUATION OF TEAMS – 2 teams total. Numbers in each box represent where teams were assessed to be

Performance Criteria	Capstone Level (4) The following are achieved *without prompting* from instructor:	Practice Level (3)	Foundatin Level (2)	Pre-Foundation Level (1)	Pre-Foundation Level (0)
Identify and achieve goal/purpose	2				
Assume roles and responsibilities	1		1		
Communicate effectively		2			
Reconcile disagreement	1	1			
Share appropriately		1	1		
Develop strategies for effective action		1	1		
Cultural Adaptation	1	1			

11/14 = 79%

TEAM MEMBERS EVALUATION OF OWN TEAM – 5 students in 2 teams. Numbers in each box represent where teams were assessed to be

Performance Criteria	Capstone Level (4) The following are achieved *without prompting* from instructor:	Practice Level (3)	Foundation Level (2)	Pre-Foundation Level (1)	Pre-Foundation Level (0)
Identify and achieve goal/purpose	5				
Assume roles and responsibilities	4			1	
Communicate effectively	4		1		
Reconcile disagreement	5				
Share appropriately	4		1		
Develop strategies for effective action	4	1			
Cultural Adaptation	4	1			

31/35 = 91%

Learning Outcome (3): an ability to function effectively as a member of a technical team
Course/Event: CST 371-373

Level: Capstone

Assessor & Campus: Michael Healy at Klamath Falls

Activity: Students were evaluated using teamwork rubric.

Rubric:

1. OIT teamwork rubric in Appendix B

Sample and Reliability: Nine ESET and nine CET students were observed throughout the term. Scoring was performed by faculty of record for CST 371-373.

Multiple Sites: Terminology used in assignments are different but same content was covered.

Performance Target: Achieve 70% average or greater. Achieve up to 15% of term grade based on Professor Evaluation.

Performance Level:

Item		ESET	CET
1	Instructor evaluation	100%	93%
	Overall	Pass	Pass

History of Results: Not Available.

Faculty Discussion: Results are discussed in next cycle.

Interpretation: One of the nine CET students scored 6/15% on the Professor Evaluation. This student was at pre foundation level for two criteria and foundation level in one criteria. Reasons were primarily due to genuine scheduling issues, but professional behavior and tactfulness also needed to be addressed. Fortunately the student and the team were able to change and adapt, and found much more success during the subsequent terms.

These are my criteria for the ***Professor Evaluation*** item listed on your course syllabus. Each criterion is worth 3 percentage points for a cumulative total of 15% of your final term grade.

1. Putting forth a minimal effort toward completion of tasks.
2. Difficulty completing tasks. Repeatedly falling short of individual work deadlines.
3. Effortful involvement in all team meetings and class events.
4. Getting along well with other team members. Exhibiting tact and professional behavior.
5. Being supportive and helpful of your teammates in recognition of the common goals, tasks, and deadlines.

Prof. Mike Healy

RESULTS:

EVALUATION OF INDIVIDUAL STUDENTS – 9 ESET (E), 9 CET (C).

Performance Criteria	Capstone Level (4) The following are achieved *without prompting* from instructor:	Practice Level (3)	Foundation Level (2)	Pre-Foundation Level (1)	Pre-Foundation Level (0)
Identify and achieve goal/purpose	9 (E) 8 (C)			1 (C)	
Assume roles and responsibilities	9 (E) 8 (C)		1 (C)		
Communicate effectively	9 (E) 9 (C)				
Reconcile disagreement	9 (E) 9 (C)				
Share appropriately	9 (E) 8 (C)			1 (C)	
Develop strategies for effective action	9 (E) 9 (C)				
Cultural Adaptation	9 (E) 9 (C)				

ESET: 63/63 (100%) > Foundational Level

CET: 60/63 (95%) > Foundational Level

Objective:

1. To design and build a simple Analog-to-Digital (ADC) and Digital-to-Analog (DAC) converter using OpAmp circuits and resistors.
2. To apply Thévenin's theorem to analyze an R-2R ladder network.
3. To build DAC and connect ADC to DAC, and compare the input signal to the reconstructed output signal.

(This is a 2 week lab).

Pre-lab assignment:

DAC:

1. A practical circuit to implement a DAC converter is a **R-2R ladder** network, as shown in Figure 1a.

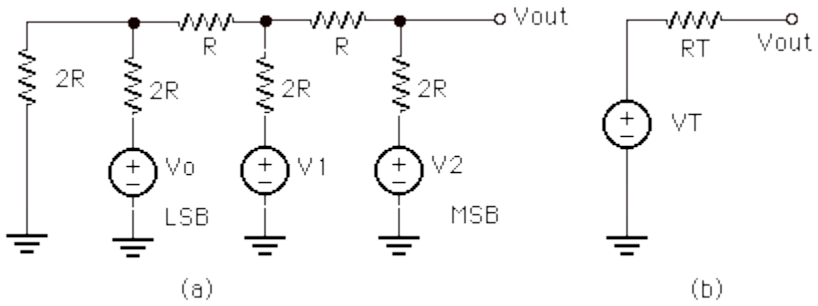


Figure 1: (a) R-2R ladder network; (b) Thévenin's equivalent network

Do a detailed circuit analysis in your notebook to show that the Thévenin's equivalent resistance and voltage, as shown in Figure 1b, is equal to:

$R_T = R$ and

$V_T = (V_2/2 + V_1/4 + V_o/8)$

You can use the superposition principle to find Thévenin's equivalent voltage.

2. Assume that the voltages in the circuit of Fig. 1 can be either 0 or 5V, what is the smallest increment of the output voltage V_{out} in the previous circuit of Fig. 1 (for one increment in binary number), i.e. the value of 1 LSB?

3. Design an OpAmp interface circuit whose input connects to the output of the R-2R ladder network so that each increment in the binary number produces 1V (or a -1V) increase (decrease) in output

voltage V_{DAC} (e.g. a $(001)_2$ gives a 1V output, a $(011)_2$ gives a 3V, while a $(111)_2$ gives a 7V output). Give the circuit and the calculations to find the resistor values.

4. In your lab report, calculate the expected analog output voltage (at the output of the OpAmp circuit) for each of the binary words of Table I

Table 1

b2	b1	b0	VDAC (calc.) (Volt)	Vout(meas.) (Volt)	% diff.
0	0	0	.	.	.
0	0	1	.	.	.
0	1	0	.	.	.
0	1	1	.	.	.
1	0	0	.	.	.
1	0	1	.	.	.
1	1	0	.	.	.
1	1	1			

5. Draw a diagram similar to the one given below in Figure 2, using the calculated values for V_{DAC}.

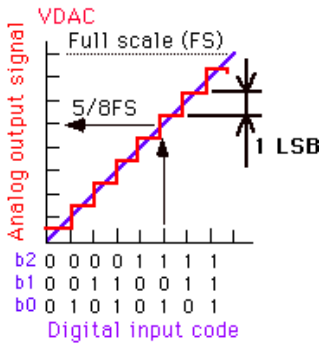


Figure 2

ADC:

6. Figure 3 shows a circuit that implements an *Analog-to-Digital Converter (ADC)*. This circuit takes an analog signal and gives a digital ouput.

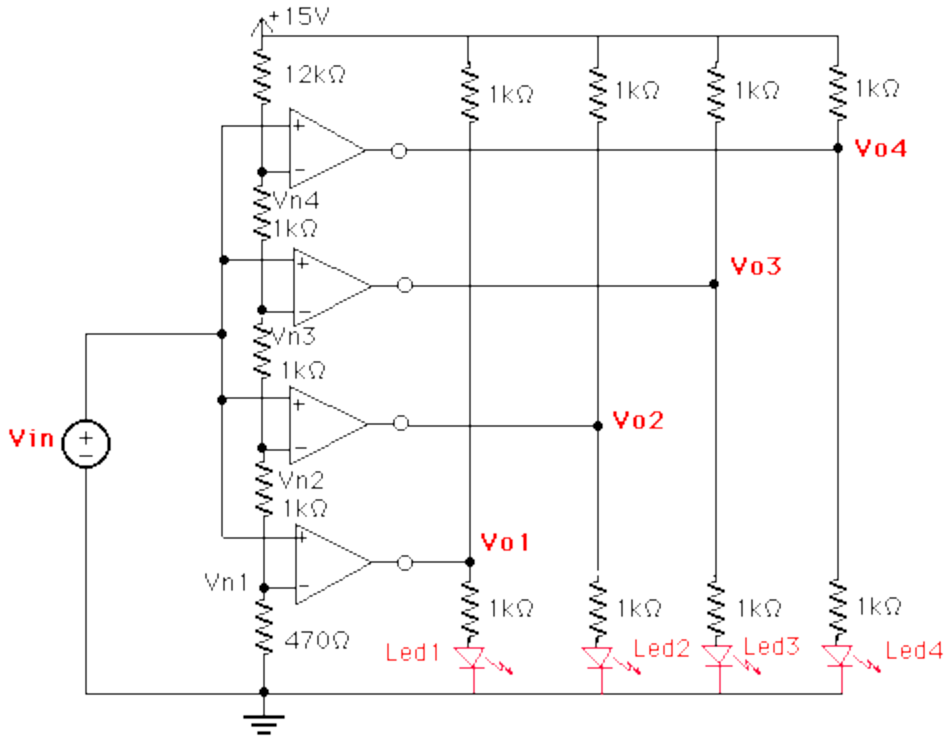


Figure 3: Flash Analog-to-Digital Converter

The circuit consists of 4 comparators whose inverting inputs are connected to a voltage divider. A comparator is basically an operational amplifier used without feedback. The outputs of the comparators in Figure 3 correspond to a digital word. When the input rises above V_{N1}, the first comparator will switch to a high output voltage causing the LED to light up, indicating a (0001). For larger input voltages the output of other comparators will switch high as well. For large input voltages (above V_{n3}) all comparators will be high corresponding to (1111) digital output. Thus the comparators encode the analog input as a digital word on a *thermometer scale*.

All comparators work in parallel which makes this ADC very fast. For that reason it is called a Flash Converter.

Calculate and record in your report, the values of V_{ni} when (for what value range of Vin) each comparator will switch.

In-lab assignment:

A. Equipment:

- 1. Digital multimeter
- 2. Programmable power supply: 5V, -5V
- 3. Protoboard
- 4. Cables and connectors
- 5. Resistors: 1kOhm, 12kOhm, 470Ohm

- 6. Potentiometer
- 7. Four LEDs
- 8. Four Quad Comparator LM 339 (quad=four devices in one package)

B. Procedure

- Build the flash ADC as shown in Figure 3. Use one LM339 comparator for building the circuit. LM339 is a quad comparator that needs pull-up resistors to enable output voltages.

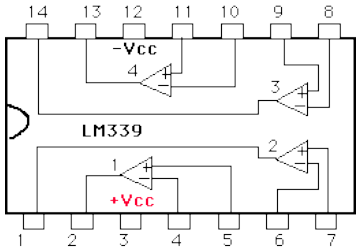


Figure 4: Pin-out of the LM339 Quad Comparator

- Vary the input voltage and record the values of the input voltage when each LED switches on. Note down the value of the input voltage when each of the LED lights up.

Table II

	Led1	**Led2**	**Led3**	**Led4**
Input voltage required for LEDs to turn ON				

- ***Give a demo to the lab instructor.***

Appendix B:

ESLO 4 Teamwork:
Oregon Tech students will collaborate effectively in teams or groups.

Definition
Teamwork encompasses the ability to accomplish group tasks and resolve conflict within groups and teams while maintain and building positive relationships within these groups. Team members should participate in productive roles and provide leadership to enable an interdependent group to function effectively.

Performance Criteria	Capstone Level (4) **The following are achieved *without prompting* from instructor**:	Practice Level (3)	Foundation Level (2)	Pre-Foundation Level (1)	Pre-Foundation Level (0)
Identify and achieve goal/purpose	• When appropriate, realistic, prioritized and measurable goals are agreed upon and documented. • All team members share the common objectives/purpose. • Team achieves goal.	• When appropriate, realistic, prioritized and measurable goals are agreed upon and documented. • All team members share the common objectives/purpose. • Team achieves goal.	• Group shares common goals and purpose. • Few priorities are unrealistic or undocumented. • Group achieves goal.	• Individuals share some goals but a common purpose may be lacking. • Priorities may be unrealistic and documentation may be incomplete. • Group may not achieve goal.	• Clear goals are not formulated or documented; thus all members don't accept or understand the purpose/task of the group. • Group does not achieve goal.

Assume roles and responsibilities	• Members consistently and effectively fulfill roles and responsibilities. • Leadership roles are clearly defined and/or shared. • Members move team toward the goal by giving and seeking information or opinions, and assessing ideas and arguments critically. • Members are all self-motivated and complete assignments on time. • Most members attend all meetings. • Members reflect on group processes, provide feedback to other group members and make changes as necessary.	• Members consistently and effectively fulfill roles and responsibilities. • Leadership roles are clearly defined and/or shared. • Members move team toward the goal by giving and seeking information or opinions, and assessing ideas and arguments critically. • Members are all self-motivated and complete assignments on time. • Most members attend all meetings. • Members reflect on group processes, provide feedback to other group members and make changes as necessary.	• Members often fulfill roles and responsibilities. Leadership roles are generally defined and/or shared. • Generally, members are motivated and complete assignments in a timely manner. • Many members attend most meetings.	• Some members may not fulfill roles and responsibilities. • Leadership roles are not clearly defined and/or effectively shared. • Some members are not motivated and some assignments are not completed in a timely manner. • Meetings rarely include most members.	• Members do not fulfill roles and responsibilities. • Leadership roles are not defined and/or shared. • Members are not self-motivated and assignments are not completed on time. • Many members miss meetings. • Members continue processes that prove nonfunctional.

Performance Criteria	Capstone Level (4) **The following are achieved *without prompting* from instructor**:	Practice Level (3)	Foundation Level (2)	Pre-Foundation Level (1)	Pre-Foundation Level (0)
Communicate effectively	• Members always communicate openly and respectfully. • Members listen to each other's ideas. • Members support and encourage each other. • Communication patterns foster a positive climate that motivates the team and builds cohesion and trust.	• Members always communicate openly and respectfully. • Members listen to each other's ideas. • Members support and encourage each other. • Communication patterns foster a positive climate that motivates the team and builds cohesion and trust.	• Members usually communicate openly and respectfully. • Members often listen to most ideas. • Members usually support and encourage each other.	• Members may not consistently communicate openly and respectfully. • Members may not listen to each other.	• Members do not communicate openly and respectfully. • Members do not listen to each other. • Communication patterns undermine teamwork
Reconcile disagreement	• All members welcome disagreement and use difference to improve decisions. • All members respect and accept disagreement and employ effective conflict resolution skills. • Subgroups absent.	• All members welcome disagreement and use difference to improve decisions. • All members respect and accept disagreement and employ effective conflict resolution skills. • Subgroups absent.	• Many members welcome disagreement and use difference to improve decisions. • Most members respect and accept disagreement and work to account for differences. • Subgroups rarely present.	• Few members welcome disagreement. Difference often results in voting. • Some members respect and accept disagreement and work to account for differences. • Subgroups may be present.	• Members do not welcome disagreement. • Difference often results in voting. Subgroups are present.

Share appropriately	• All members contribute significantly to discussions, decision making and work. • The work product is a collective effort; team members have both individual and mutual accountability for the successful completion of the work product.	• All members contribute significantly to discussions, decision making and work. • The work product is a collective effort; team members have both individual and mutual accountability for the successful completion of the work product.	• Many members contribute to discussions, decision-making and work. • Individuals focus on separate sections of the work product, but have a coordinator who ties the disparate parts together (they rely on the sum of each individual's work).	• Contributions are unequal although all members contribute something to discussions, decision making and work. • Coordination is sporadic so that the final work product is of uneven quality.	• Contributions are unequal. • Certain members dominate discussions, decision making, and work. • Some members may not contribute at all. • Individuals work on separate sections of the work product, but have no coordinating effort to tie parts together.

Performance Criteria	Capstone Level (4) **The following are achieved *without prompting* from instructor**:	Practice Level (3)	Foundation Level (2)	Pre-Foundation Level (1)	Pre-Foundation Level (0)
Develop strategies for effective action	• Members use effective decision making processes to decide on action. • Group shares a clear set of norms and expectations for outcomes. • Group reaches consensus on decisions and produces detailed plans for action.	• Members use effective decision making processes to decide on action. • Group shares a clear set of norms and expectations for outcomes. • Group reaches consensus on decisions and produces detailed plans for action.	• Members usually use effective decision making processes to decide on action. • Most of the group shares norms and expectations for outcomes. • Group reaches consensus on most decisions and produces plans for action.	• Members sometimes use decision making processes to decide on action. Some of the members of the group do not share norms and expectations for outcomes. Group sometimes fails to reach consensus. Plans for action are informal and often arbitrarily assigned.	• Members seldom use decision making processes to decide on action. • Individuals often make decisions for the group. • The group does not share common norms and expectations for outcomes. • Group fails to reach consensus on most decisions. • Group does not produce plans for action.
Cultural Adaptation	• Members always recognize and adapt to differences in background and communication style.	• Members always recognize and adapt to differences in background and communication style.	• Members usually recognize and adapt to differences in background and communication style.	• Members may recognize, but do not adapt to differences in background and communication style	• Members do not recognize differences in background or communication style.

Appendix D

OIT Public Speaking rubric

OIT Public Speaking Rubric				
Performance Criteria	**No/Limited Proficiency (1)**	**Some Proficiency (2)**	**Proficiency (3)**	**High Proficiency (4)**
Content	Few or no attributed sources. Supporting materials lack credibility and/or don't relate to thesis. Limited or no attempt to inform or persuade.	Some attributed sources used. Supporting materials are somewhat credible and/or don't clearly relate to thesis. Attempt to inform or persuade.	Adequate number of credible and appropriately attributed sources used. Supporting materials relate to thesis. Informs or persuades.	A variety of credible and appropriate sources used. Supporting materials relate in an exceptional way to a focused thesis. Informs or persuades.
Organization	Lacks organizational structure. Introduction and/or conclusion missing. No transitions used.	Organizational structure present but unclear with underdeveloped introduction and conclusion. Transitions are awkward.	Appropriate organizational pattern used and easy to follow with developed introduction and satisfying conclusion. Main points are smoothly connected with transitions.	Organizational pattern is compelling and moves audience through speech with ease. Introduction draws in the audience and conclusion is satisfying. Main points are smoothly connected with transitions.
Style	No understanding of audience regarding topic or purpose of speech. Little enthusiasm and passion for topic. No regard for time constraints.	Some understanding of audience regarding topic or purpose of speech. Some enthusiasm and passion for topic. Some regard for time constraints.	Competent understanding of audience regarding topic and purpose. Enthusiasm and passion for topic. Speech given within time constraints.	Thorough understanding of audience regarding topic and purpose. Clear enthusiasm and passion for topic. Speech given within time constraints.
Delivery	No gestures or eye contact. Monotone voice or insufficient volume. Little poise. Reading of notes only. Abundant oral	Some gestures and eye contact. Ineffective use of language and voice. Little poise. Heavy reliance on notes. Multiple oral fillers and nonverbal distractions.	Adequate use of gestures, eye contact, language, and voice. Poised with minor reliance on notes. Limited oral fillers and nonverbal distractions.	Effective use of gestures, eye contact, vivid language, and voice to add interest to speech. Poised with use of notes for reference only. No

	fillers and nonverbal distractions.			oral fillers and nonverbal distractions.
Visuals	No visuals or poorly-designed and documented visuals that distract from speech or do not create interest. Limited reference to visuals or so much reference delivery is hindered.	Visuals present, but simply designed with limited use of documentation. Visuals are referred to but do not create interest. Visuals may interfere with delivery.	Well-designed and documented visuals that clarify speech and create interest. Visuals are referred to and sufficiently discussed, while not interfering with delivery.	Well-designed and documented visuals that clarify speech, create interest, and hold attention of the audience. Visuals are sufficiently discussed and effectively integrated into speech.

OREGON INSTITUTE OF TECHNOLOGY

Computer Systems Engineering Technology Department

CST 315 – Embedded Sensor Interfacing I/O

Lab 8 – Water Level Control System

EQUIPMENT AND SUPPLIES:

- Oscilloscope with probes
- Set of probes for DMM
- Alligator clip cables to connect to the bench power supply
- 330 Ohm resistor
- 220 Ohm resistor
- 1 Meg resistor
- 3 – 100K resistors
- 2 – 3.3K resistors
- 2 – 10K resistors
- Water level sensor
- LM393 Comparator
- 4N33 Optoisolator
- TN0610N3-G N-Channel MOSFET
- Arduino microcontroller
- Pump motor with tubing
- Diode (1N4004)
- 2 – plastic buckets

In today's lab you will construct a microcontroller based water level control system – see diagrams below. You will use the water level sensor you built and tested, along with the relaxation oscillator you constructed from the LM393 comparator. The second half of the LM393 will be used as a buffer between the water level sensor and the input of the Arduino microcontroller (Arduino pin 8 is suggested as the input pin). The Arduino will control the operation of a pump motor – you may use a simple on/off control scheme or one based on pulse width modulation to control the pump. The pump motor control circuit is the same circuit you constructed to operate a relay in the last lab with the exceptions that the relay is replaced by the pump, and the voltage is reduced from 12V to 5V.

Your system will pump water from Bucket A (initially filled with water) to Bucket B (initially empty). The control system will fill Bucket B to a depth of three inches. When a depth of three inches is reached the system will stop filling Bucket B. The pump must not turn on again unless water is removed from Bucket B. The instructor will use a cup to transfer water from Bucket B to Bucket A. The control system will detect the drop in water level and again fill Bucket B to three inches of water.

Figure 1

Figure 2

Figure 3

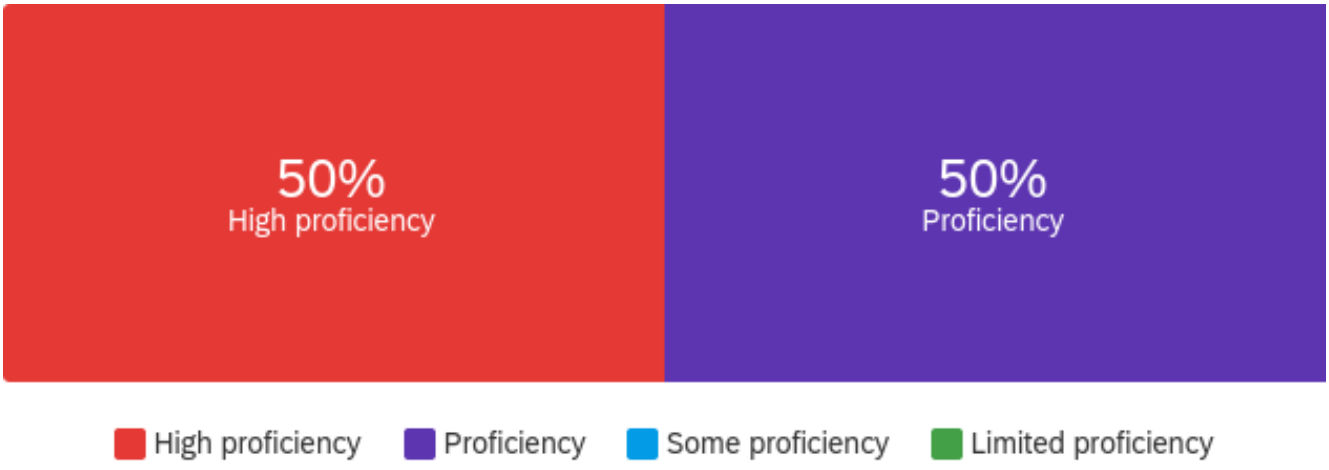
Appendix F

BEMB Embedded Systems Engineering Technology BS

(2019-20) Student Exit Survey

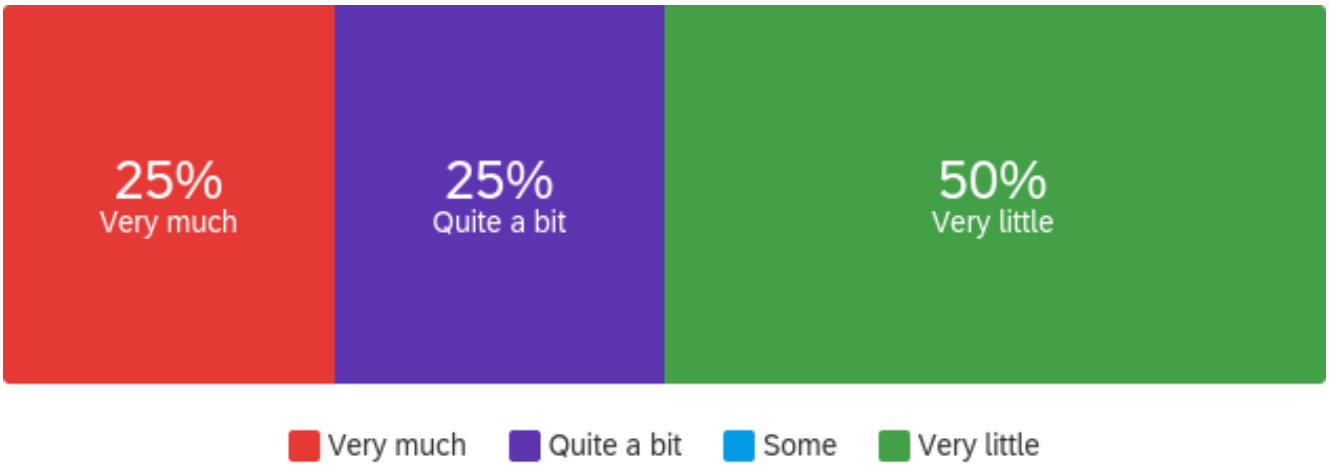
February 1st 2021, 4:53 pm PST

Q ESLO 1 - Oregon Tech Essential Student Learning Outcomes Please rate your proficiency in the following areas.



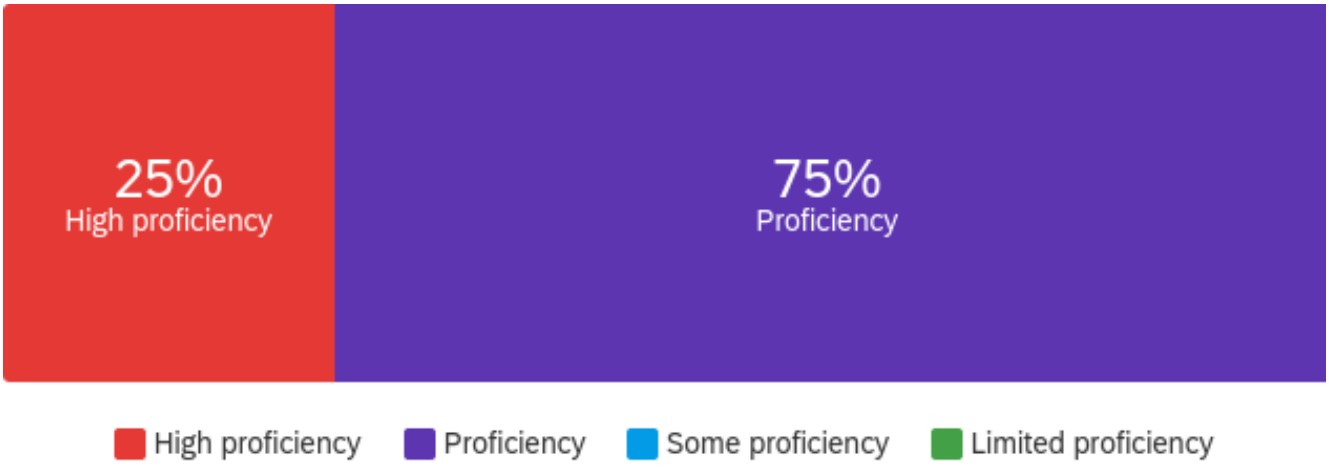
#	Question	High proficiency		Proficiency		Some proficiency		Limited proficiency		Total
1	ESLO 1a. Communication: Writing effectively	50.00%	2	50.00%	2	0.00%	0	0.00%	0	4
2	ESLO 1b. Communication: Speaking effectively	50.00%	2	25.00%	1	25.00%	1	0.00%	0	4
3	ESLO 2. Inquiry & Analysis: Thinking critically and analytically	75.00%	3	25.00%	1	0.00%	0	0.00%	0	4
4	ESLO 3. Ethical Reasoning: Making ethical judgements	25.00%	1	75.00%	3	0.00%	0	0.00%	0	4
5	ESLO 4. Teamwork: Work effectively with groups and teams	75.00%	3	25.00%	1	0.00%	0	0.00%	0	4
6	ESLO 5. Quantitative Literacy: Using quantitative/numerical information to solve problems, evaluate claims, and support decisions	75.00%	3	25.00%	1	0.00%	0	0.00%	0	4
7	ESLO 6. Diverse Perspectives: Understanding of diverse perspectives to improve interactions with others	50.00%	2	25.00%	1	25.00%	1	0.00%	0	4

Q ESLO 2 - Oregon Tech Essential Student Learning Outcomes How much has your experience at Oregon Tech contributed to your knowledge, skills, and personal development in these areas?



#	Question	Very much		Quite a bit		Some		Very little		Total
1	ESLO 1a. Communication: Writing effectively	25.00%	1	25.00%	1	0.00%	0	50.00%	2	4
2	ESLO 1b. Communication: Speaking effectively	25.00%	1	25.00%	1	25.00%	1	25.00%	1	4
3	ESLO 2. Inquiry & Analysis: Thinking critically and analytically	50.00%	2	0.00%	0	50.00%	2	0.00%	0	4
4	ESLO 3. Ethical Reasoning: Making ethical judgements	25.00%	1	25.00%	1	25.00%	1	25.00%	1	4
5	ESLO 4. Teamwork: Work effectively with groups and teams	50.00%	2	0.00%	0	25.00%	1	25.00%	1	4
6	ESLO 5. Quantitative Literacy: Using quantitative/numerical information to solve problems, evaluate claims, and support decisions	50.00%	2	25.00%	1	0.00%	0	25.00%	1	4
7	ESLO 6. Diverse Perspectives: Understanding of diverse perspectives to improve interactions with others	25.00%	1	25.00%	1	0.00%	0	50.00%	2	4

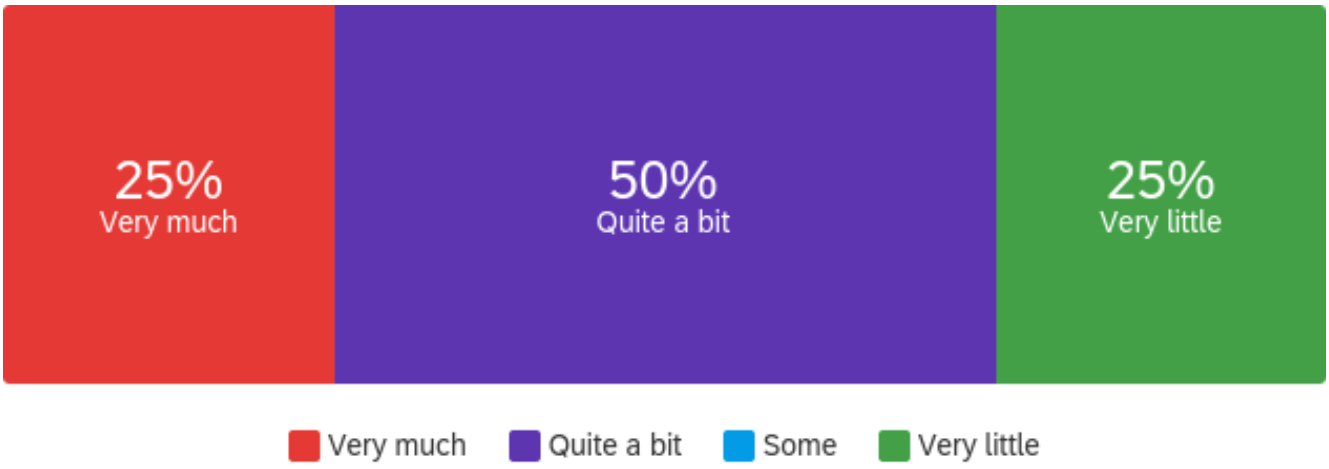
Q BEMB 1 - Program Student Learning Outcomes for Embedded Systems Engineering Technology B.S. Please rate your proficiency in the following areas.



#	Question	High proficiency		Proficiency		Some proficiency		Limited proficiency		Total
1	a. Application of mathematics including differential and integral calculus, probability, and discrete mathematics to hardware and software problems.	25.00%	1	75.00%	3	0.00%	0	0.00%	0	4
2	b. Application of project management techniques to embedded systems projects.	50.00%	2	25.00%	1	0.00%	0	25.00%	1	4
3	c. Application of knowledge of embedded systems engineering technology, along with some specialization in at least one area of computer systems engineering technology.	75.00%	3	0.00%	0	25.00%	1	0.00%	0	4
4	d. A broad education and knowledge of contemporary issues necessary to reason about the impact of embedded system based solutions to situations arising in society.	25.00%	1	75.00%	3	0.00%	0	0.00%	0	4
5	e. Identification and synthesis of solutions for embedded systems problems.	75.00%	3	25.00%	1	0.00%	0	0.00%	0	4
6	f. Design, execution and evaluation of experiments on embedded platforms.	75.00%	3	25.00%	1	0.00%	0	0.00%	0	4
7	g. Analysis, design and testing of systems that include both hardware and software.	75.00%	3	0.00%	0	0.00%	0	25.00%	1	4
8	h. Documenting the experimental processes and to writing of satisfactory technical reports/papers.	50.00%	2	0.00%	0	25.00%	1	25.00%	1	4

9	i. Delivery of technical oral presentations and interacting with a presentation audience.	25.00%	1	75.00%	3	0.00%	0	0.00%	0	4
10	j. Recognition for and the motivation to further develop their knowledge and skills as embedded engineering advances occur in industry.	75.00%	3	25.00%	1	0.00%	0	0.00%	0	4
11	k. Working effectively, independently, and in multi-person teams.	50.00%	2	50.00%	2	0.00%	0	0.00%	0	4
12	m. Professional and ethical execution of responsibilities.	100.00%	4	0.00%	0	0.00%	0	0.00%	0	4

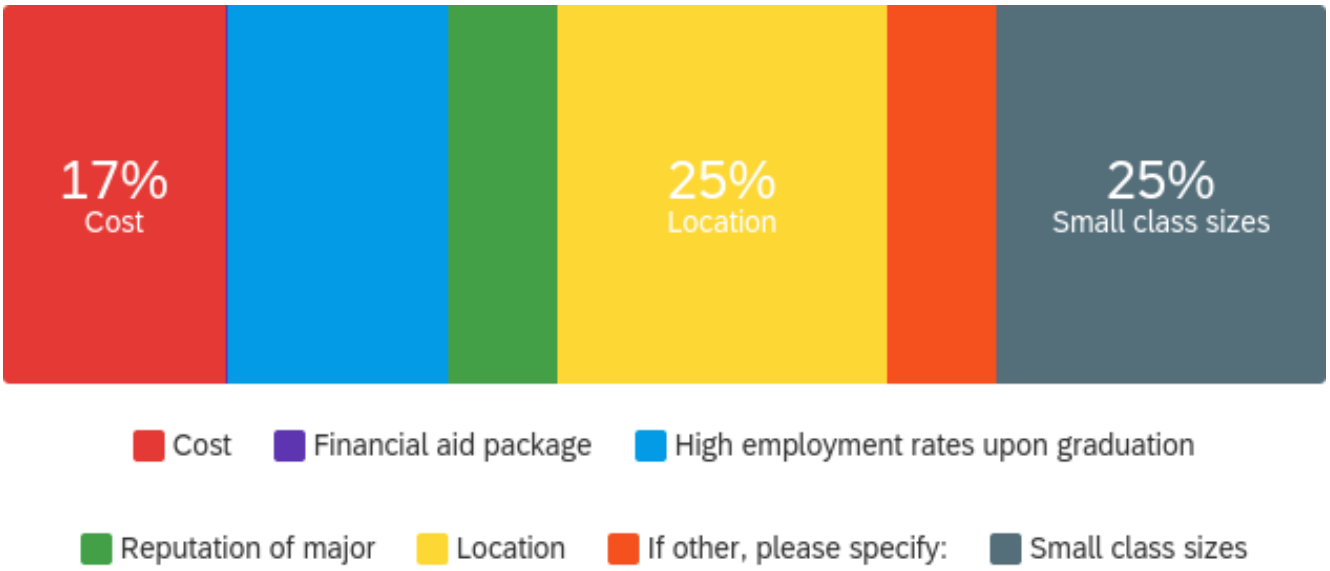
Q BEMB 2 - Program Student Learning Outcomes for Embedded Systems Engineering Technology B.S. How much has your experience at Oregon Tech contributed to your knowledge, skills, and personal development in these areas?



#	Question	Very much		Quite a bit		Some		Very little		Total
1	a. Application of mathematics including differential and integral calculus, probability, and discrete mathematics to hardware and software problems.	25.00%	1	50.00%	2	0.00%	0	25.00%	1	4
2	b. Application of project management techniques to embedded systems projects.	50.00%	2	25.00%	1	25.00%	1	0.00%	0	4
3	c. Application of knowledge of embedded systems engineering technology, along with some specialization in at least one area of computer systems engineering technology.	50.00%	2	50.00%	2	0.00%	0	0.00%	0	4
4	d. A broad education and knowledge of contemporary issues necessary to reason about the impact of embedded system based solutions to situations arising in society.	50.00%	2	0.00%	0	50.00%	2	0.00%	0	4
5	e. Identification and synthesis of solutions for embedded systems problems.	50.00%	2	25.00%	1	25.00%	1	0.00%	0	4
6	f. Design, execution and evaluation of experiments on embedded platforms.	50.00%	2	50.00%	2	0.00%	0	0.00%	0	4
7	g. Analysis, design and testing of systems that include both hardware and software.	50.00%	2	25.00%	1	25.00%	1	0.00%	0	4
8	h. Documenting the experimental processes and to writing of satisfactory technical reports/papers.	25.00%	1	25.00%	1	50.00%	2	0.00%	0	4
9	i. Delivery of technical oral presentations and interacting with a presentation audience.	25.00%	1	75.00%	3	0.00%	0	0.00%	0	4

10	j. Recognition for and the motivation to further develop their knowledge and skills as embedded engineering advances occur in industry.	25.00%	1	50.00%	2	0.00%	0	25.00%	1	4
11	k. Working effectively, independently, and in multi-person teams.	25.00%	1	50.00%	2	25.00%	1	0.00%	0	4
12	m. Professional and ethical execution of responsibilities.	25.00%	1	25.00%	1	0.00%	0	50.00%	2	4

Q BEMB 3 - What attracted you to Oregon Tech? Please check all that apply.

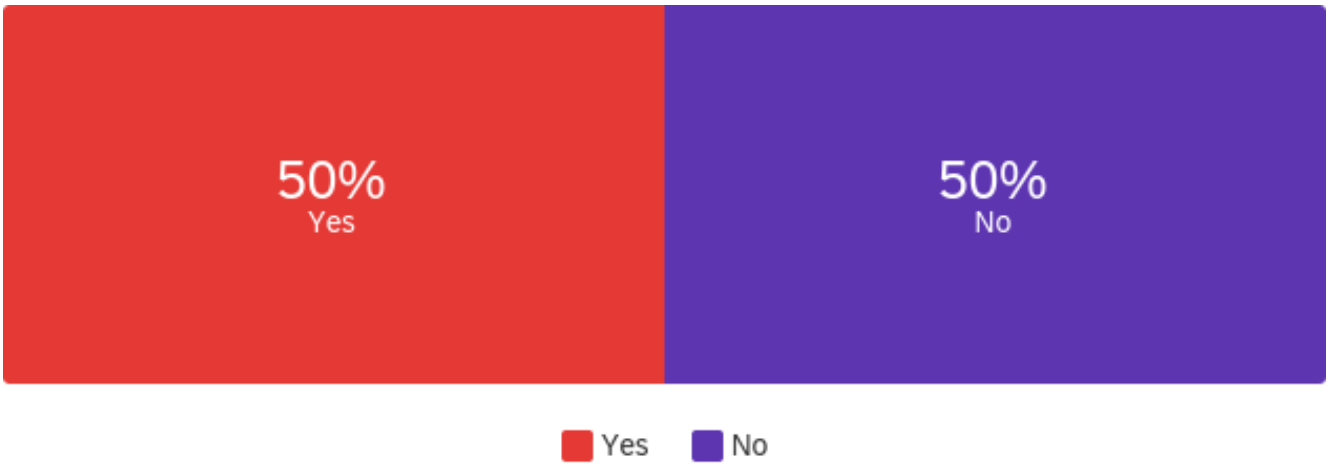


#	Answer	%	Count
1	Cost	16.67%	2
2	Financial aid package	0.00%	0
3	High employment rates upon graduation	16.67%	2
4	Reputation of major	8.33%	1
5	Location	25.00%	3
6	If other, please specify:	8.33%	1
7	Small class sizes	25.00%	3
	Total	100%	12

If other, please specify:

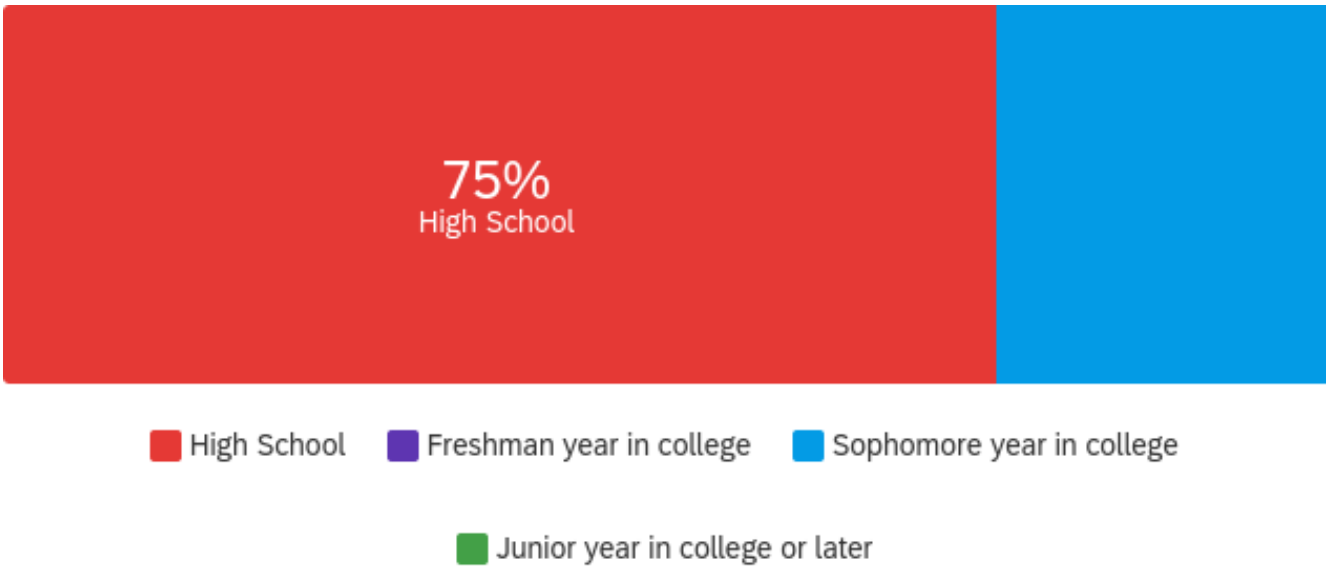
If other, please specify: - Text
Low standards of enrollment criteria, "hands on learning"

Q BEMB 4 - Was Oregon Tech your first choice?



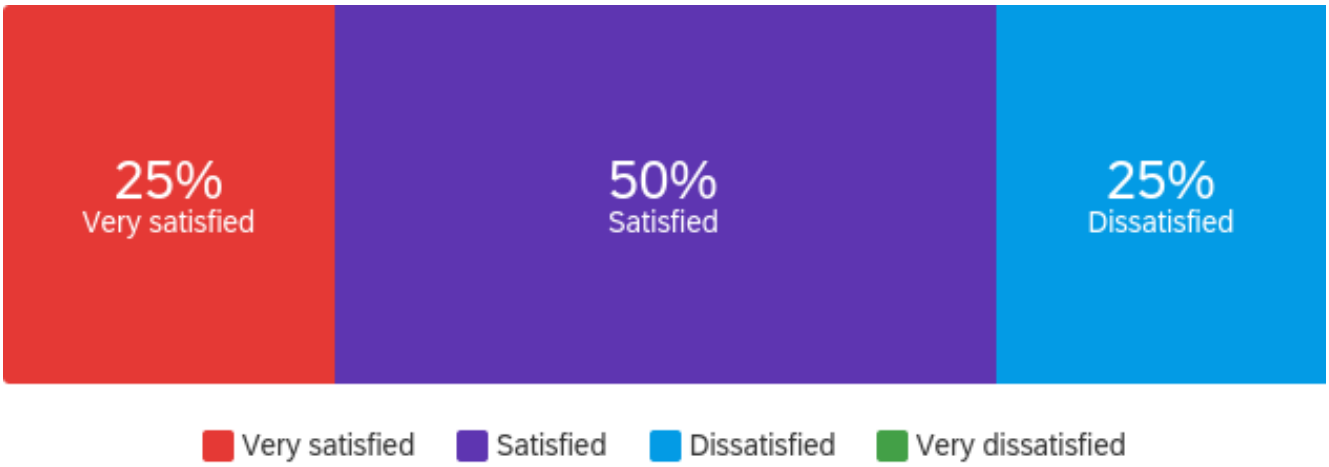
#	Answer	%	Count
1	Yes	50.00%	2
2	No	50.00%	2
	Total	100%	4

Q BEMB 5 - At what stage in your studies did you choose your major?



#	Answer	%	Count
1	High School	75.00%	3
2	Freshman year in college	0.00%	0
3	Sophomore year in college	25.00%	1
4	Junior year in college or later	0.00%	0
	Total	100%	4

Q BEMB 6 - Please indicate your level of satisfaction with the program in the following areas.

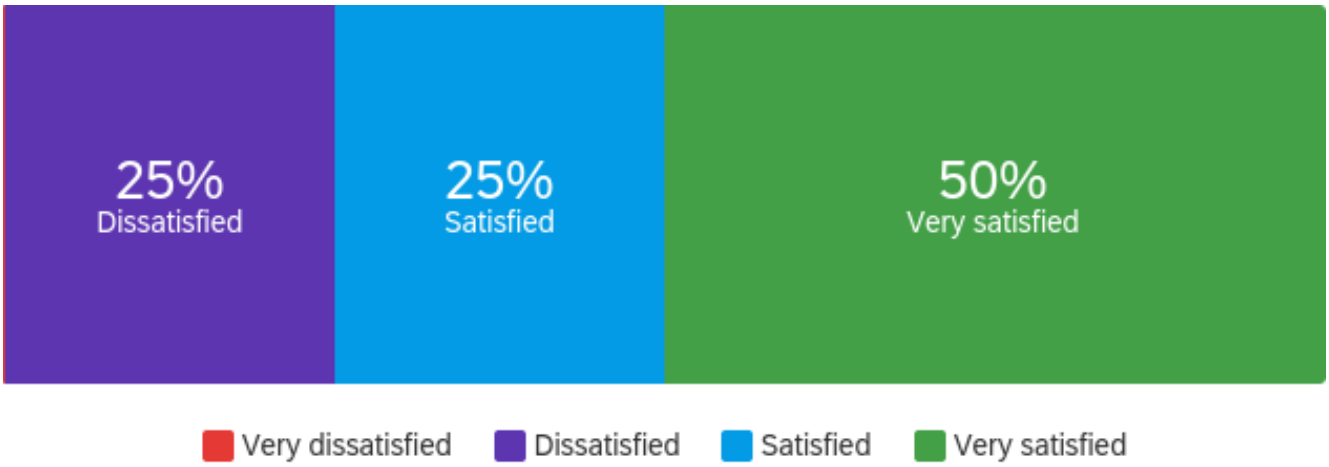


#	Question	Very satisfied		Satisfied		Dissatisfied		Very dissatisfied		Total
1	Advising	25.00%	1	50.00%	2	25.00%	1	0.00%	0	4
2	Class schedule	50.00%	2	25.00%	1	25.00%	1	0.00%	0	4
3	Curriculum	0.00%	0	50.00%	2	50.00%	2	0.00%	0	4
4	Facilities	0.00%	0	25.00%	1	75.00%	3	0.00%	0	4
5	Quality of Instruction	25.00%	1	50.00%	2	25.00%	1	0.00%	0	4

Q BEMB 7 - What are one or two specific things we could do to improve the program?

What are one or two specific things we could do to improve the program?
Have a better attitude towards the students. The atmosphere of CSET is not welcoming and poor0 in my opinion.
The embedded systems engineering program is very weak; the upper level courses are largely useless and we're among the worst classes I've taken. However, the lower level classes were excellent and taught me everything I needed to know for the upper level courses.
Most of the curriculum focuses on devices and services that are approaching end of life. Also most embedded systems run Linux. The single class in "Linux Programming" or "UNIX" is not satisfiable for familiarity with running embedded Linux.
Increase the rigor of the upper level Embedded Courses, they don't feel on par in difficulty as some of the lower level courses did.

Q BEMB 8 - Please indicate your level of satisfaction with advising in the program.

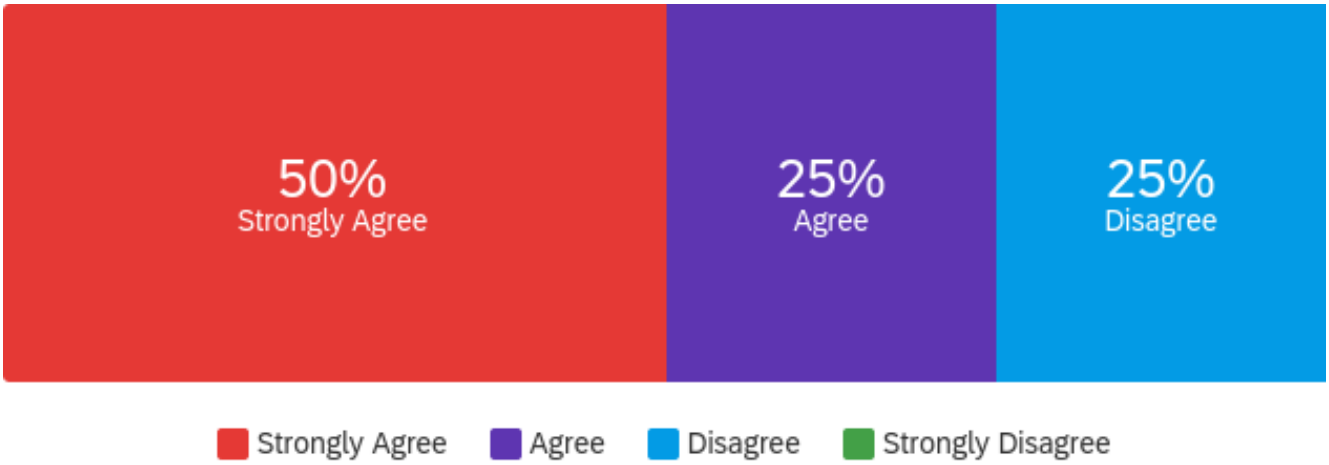


#	Question	Very dissatisfied		Dissatisfied		Satisfied		Very satisfied		Total
1	Availability of faculty advisor	0.00%	0	25.00%	1	25.00%	1	50.00%	2	4
2	Time faculty advisor spent with you	0.00%	0	25.00%	1	25.00%	1	50.00%	2	4
3	Faculty advisor understanding of the requirements of the major	0.00%	0	0.00%	0	0.00%	0	100.00%	4	4
4	Faculty advisor's assistance in choosing courses	0.00%	0	0.00%	0	75.00%	3	25.00%	1	4
5	Faculty advisor's assistance in understanding the options in different Oregon Tech majors	0.00%	0	0.00%	0	100.00%	4	0.00%	0	4
6	Faculty advisor's assistance in helping with career development and career opportunities	0.00%	0	25.00%	1	75.00%	3	0.00%	0	4
7	Faculty advisor's assistance in recommending externships/internships	0.00%	0	50.00%	2	50.00%	2	0.00%	0	4
8	Faculty advisor's assistance in understanding the requirements for graduate school	0.00%	0	50.00%	2	50.00%	2	0.00%	0	4

Q BEMB 9 - Do you have any comments about advising?

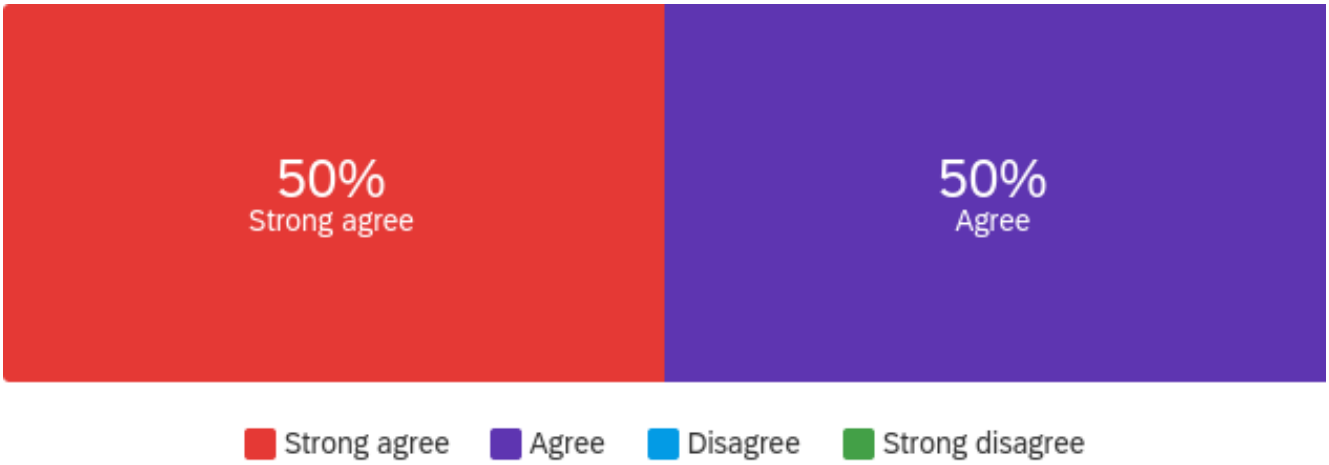
Do you have any comments about advising?
My advisor was very overworked and rarely available. Nice guy though.
I was pretty happy with my advisor, he helped me stay on track and was able to negotiate my complaints easily.
Advising was always thorough and went above and beyond what was needed.

Q BEMB 10 - Please provide feedback on the Computer Systems Engineering Technology faculty as a whole.



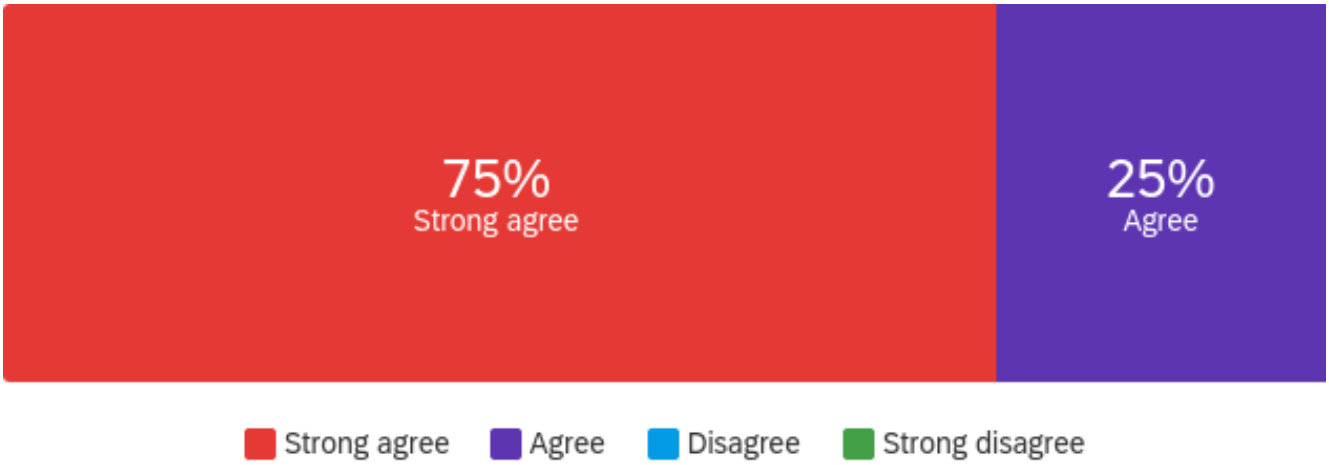
#	Question	Strongly Agree		Agree		Disagree		Strongly Disagree		Total
1	Faculty are fair	50.00%	2	25.00%	1	25.00%	1	0.00%	0	4
2	Faculty are demanding	25.00%	1	75.00%	3	0.00%	0	0.00%	0	4
3	Faculty are helpful	25.00%	1	75.00%	3	0.00%	0	0.00%	0	4
4	Faculty help you understand how what are you learning could be applied	50.00%	2	25.00%	1	25.00%	1	0.00%	0	4
5	faculty help you develop intellectually	25.00%	1	75.00%	3	0.00%	0	0.00%	0	4
6	Faculty make courses interesting	50.00%	2	25.00%	1	25.00%	1	0.00%	0	4
7	Faculty makes courses relevant	0.00%	0	75.00%	3	25.00%	1	0.00%	0	4

Q BEMB 11 - Please provide feedback about the Computer Systems Engineering Technology programs by indicating how much you agree with each one of the following statements.



#	Question	Strong agree		Agree		Disagree		Strong disagree		Total
1	Curriculum provides sufficient depth of information about specific topics	50.00%	2	50.00%	2	0.00%	0	0.00%	0	4
2	Curriculum provides sufficient breadth of information	50.00%	2	50.00%	2	0.00%	0	0.00%	0	4
3	Curriculum provides courses that meet your interests	25.00%	1	50.00%	2	25.00%	1	0.00%	0	4
4	Courses are available as needed	0.00%	0	50.00%	2	50.00%	2	0.00%	0	4
5	Curriculum provides opportunities for hands-on experiences	75.00%	3	0.00%	0	25.00%	1	0.00%	0	4
6	Lower division courses provide adequate foundation for upper division courses	75.00%	3	0.00%	0	25.00%	1	0.00%	0	4

Q BEMB 12 - Please indicate your level of agreement with the following statements about the laboratories in the Computer Systems Engineering Technology programs.



#	Question	Strong agree		Agree		Disagree		Strong disagree		Total
1	The lab component of the courses was helpful for understanding course material	75.00%	3	25.00%	1	0.00%	0	0.00%	0	4
2	The performance of the computer systems in the laboratory was sufficient	25.00%	1	75.00%	3	0.00%	0	0.00%	0	4

Q BEMB 13 - What have been the three best things about your major? These might be experience, particular courses or professors, general characteristics or features of the program--anything at all that was important to you.

What have been the three best things about your major? These might be experience, particular courses or professors, general characteristics or features of the program--anything at all that was important to you.
We learned a lot of different programming languages. We had a real good approach to hands on learning. We were able to teach ourselves and not rely on the teachers to complete lab work.
Hands on learning, practical experience, several really great professors who taught me a ton and prepared me for my career technically and professionally
The labs were often times very well executed to learn the material and perform synthesis on the material. Junior and Senior Project developed interpersonal relationships within the department, leadership and time management skills. When it felt like the professors cared, it felt like the genuinely cared about me as a whole person, not just meeting their metrics.
Hand's on labs Dual Capstone Projects Helpfulness of faculty / open door policy

Q BEMB 14 - What have been the three worst things about your major? These might be experience, particular courses or professors, general characteristics or features of the program--anything at all that was important to you.

What have been the three worst things about your major? These might be experience, particular courses or professors, general characteristics or features of the program--anything at all that was important to you.

The amount of time needed to complete the labs in almost every class. The culture of CSET is not very welcoming. It was getting better right before Covid-19, but I'm not sure if I could tell one of my close friends to got to the Klamath Falls CSET campus.

Upper level courses, advisor was hard to talk with

It took a lot of time to make it feel like the professor's cared and for some professors I would only get this feeling one on one. Occasionally professors would say off-hand comments that would make me uncomfortable and would call us out for feeling uncomfortable. The curriculum was often times out dated and I needed to backfill from more modern material to feel like I was actually learning something currently relevant. Oftentimes members of the department would feel like they had their own inside jokes and would crack them in front of students making the students feel left out. Many students who were learning programming for the first time only got in depth experience with a single Integrated Development Environment setting them up for failure if they needed to switch to a different IDE, like during my Junior Project.

Q BEMB 15 - What are one or two specific things we could do to improve your major?

What are one or two specific things we could do to improve your major?
Increase funding to CSET and have a better more inviting place to learn then the basement of Purvine Hall.
The upper level courses are very lacking
More focus on Embedded Linux instead of small microcontrollers, since internet of things usually runs on Embedded Linux.
Add AC circuits or equivalent for better circuit analysis/understanding Add some lectures or courses on boot loaders/u-boot/kernels, and other topics about bringing up an OS on an embedded platform

Q BEMB 16 - Please comment about department activities. Movie night, game night, registration BBQ, etc.

Please comment about department activities. Movie night, game night, registration BBQ, etc.

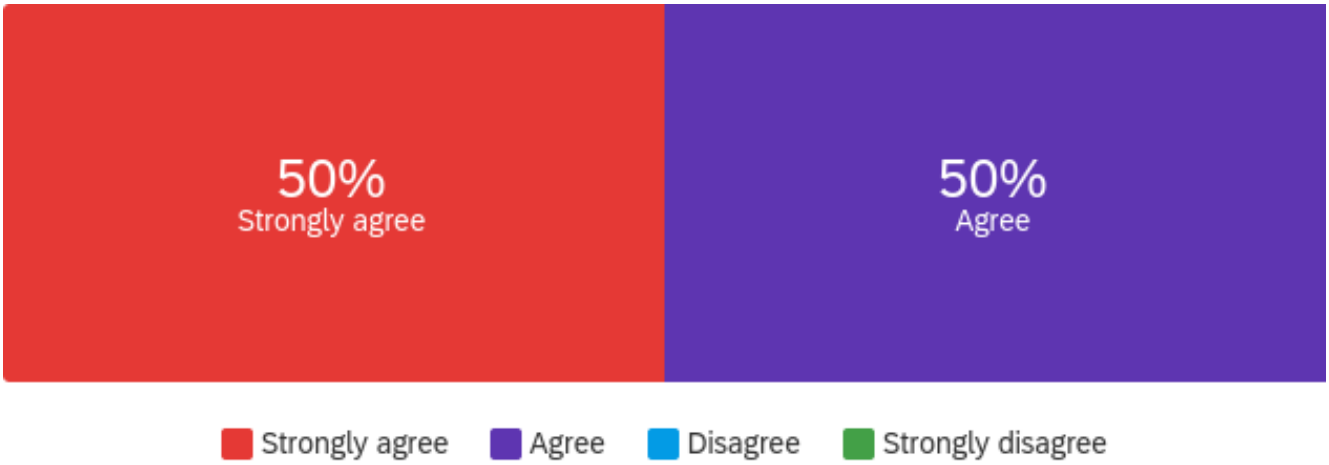
I never really went to them. Not a big get together person.

BBQ was very fun

Movie night and game night were enjoyable but the announcement for each event was small and as such turnout was small. If a banner were put up saying "Game night tonight" across the downstairs it may increase turnout besides CSET Ambassadors and people connected with them. Registration BBQ was enjoyable but felt like it could use some get to know you games. Junior BBQ felt like a product of elite projection, since it was so far away from campus. Preventing people who live on campus from easily being able to go. It also made me a little uncomfortable that it was at a professor's house.

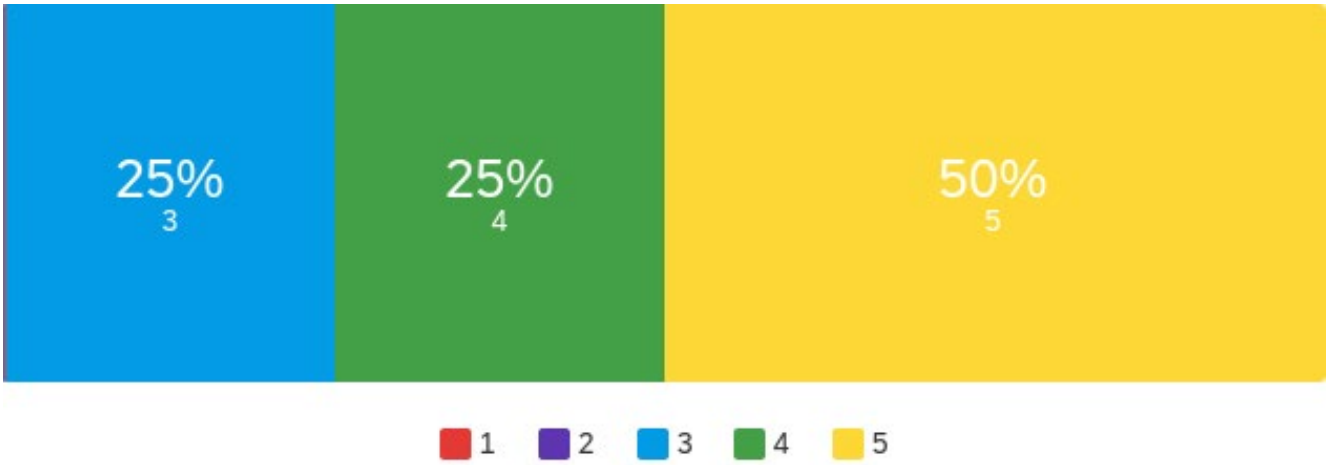
Department activities were always lots of fun and a great way to interact with the department, even if not a lot of people always showed up.

Q BEMB 17 - Please indicate your level of agreement with the following statements about your ability in Hardware labs. I have adequate ability to:



#	Question	Strongly agree		Agree		Disagree		Strongly disagree		Total
1	Design, prototype and debug digital and microprocessor systems	50.00%	2	50.00%	2	0.00%	0	0.00%	0	4
2	Test and analyze problems in digital and microprocessor systems	50.00%	2	50.00%	2	0.00%	0	0.00%	0	4
3	Write and debug software for microprocessor systems	50.00%	2	50.00%	2	0.00%	0	0.00%	0	4
4	Write and debug HDL (i.e. Verilog) for digital systems	75.00%	3	25.00%	1	0.00%	0	0.00%	0	4
5	Use CAE design, debug and simulation software tools int he lab (i.e. Quartus, MPLab etc.)	75.00%	3	0.00%	0	25.00%	1	0.00%	0	4
6	Use test equipment in the lab (i.e. Oscilloscopes, Logic, Analyzers, etc.)	100.00%	4	0.00%	0	0.00%	0	0.00%	0	4
7	The lab test equipment was appropriate for the lab experiments	75.00%	3	25.00%	1	0.00%	0	0.00%	0	4

Q BEMB 18 - What is your overall rating of the quality of education you received at Oregon Tech?



#	Answer	%	Count
1	1	0.00%	0
2	2	0.00%	0
3	3	25.00%	1
4	4	25.00%	1
5	5	50.00%	2
	Total	100%	4

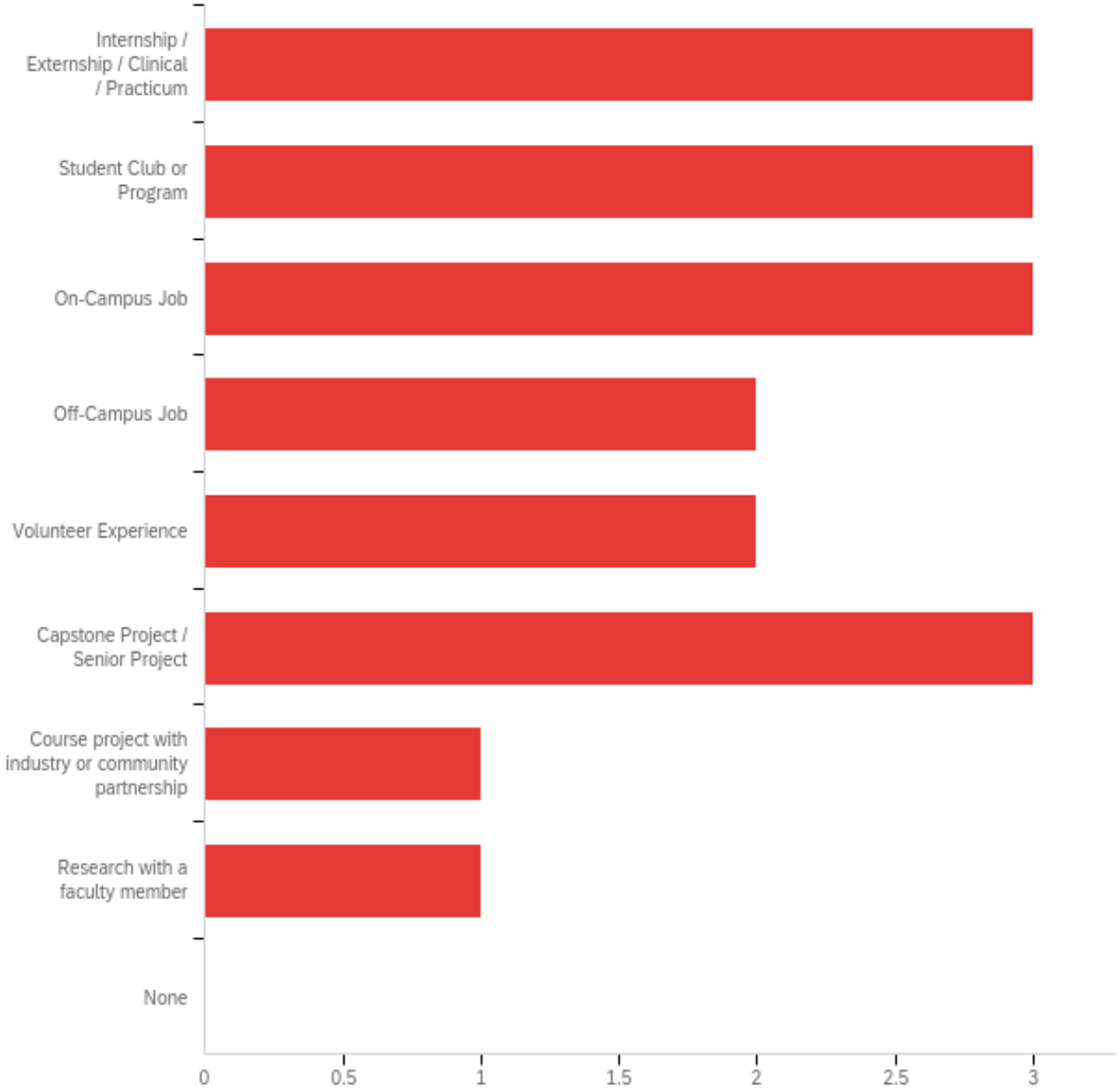
Q BEMB 19 - Do you have any other comments about your time at Oregon Tech?

Do you have any other comments about your time at Oregon Tech?

Many departments felt underfunded. I think the quality of education is generally stellar.

All in all, Oregon Tech has suited me well since 2017. The small class sizes have allowed me to truly get to know my professors and share stories about the latest technology with them. I don't think that Oregon Tech suited me well in 2013. While I partially own that I also think that the strainer's holes are large. Oregon Tech didn't help very much creating a support network for my first time away from my parents.

Q Experiential Learning 1 - Oregon Tech recognizes that learning occurs in a variety of venues and experiences. Please check all of the following learning experiences you participated in while enrolled as a student at Oregon Tech.



#	Answer	%	Count
1	Internship / Externship / Clinical / Practicum	16.67%	3
4	Student Club or Program	16.67%	3
5	On-Campus Job	16.67%	3
6	Off-Campus Job	11.11%	2

8	Volunteer Experience	11.11%	2
10	Capstone Project / Senior Project	16.67%	3
12	Course project with industry or community partnership	5.56%	1
13	Research with a faculty member	5.56%	1
20	None	0.00%	0
	Total	100%	18

Q Experiential Learning 2 - Please tell us more about your Internship / Externship / Clinical / Practicum.

Name of company or organization:	Brief description of experience:	What term(s) did you participate:	Duration in weeks:	Average hours per week:
Intel	Really awseme. Learned a lot of real world applications towards my degree.	Summer and Fall 2019	26	40
Bay Area Hospital	Information Services Intern - Programming / I.T. Work	Summer 16, Summer 17, Summer 18, Summer 19	48	40