Computer Engineering Technology
2008-09 Assessment Report

I. Introduction

In 1965, OIT was invited to join a Technical Education consortium sponsored by a number of major computer manufacturers. In response, OIT developed an Electro-Mechanical Engineering Technology program. This program was based on a mix of existing EET, MET, Math and other support courses. The name of the program was changed to Computer Systems Engineering Technology in 1973 in order to better represent the course material and capabilities of graduates. Course offerings were expanded, refined and renumbered using CST prefixes to reflect their computer systems content. Since that time, the program has continued to evolve in order to track new developments in the field and keep graduates current. As of this time, the program is only offered on the Klamath Falls campus. Total enrollment in the program as of Fall 2007 was 109 students. As of fall 2008, there were 101 students in the program, and enrollment of new freshmen was about equal to that in Fall 2007, which was up from the previous year. It is projected that total enrollments will continue to grow given larger freshmen classes and small graduating senior classes -- 7 students graduated in 2007-08. The 2006 graduate survey shows all Bachelor's degree graduates either employed in their field, or pursuing continuing education (2). Of those reporting, the average graduate salary was $51,939.

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

As a result of an ABET accreditation visit conducted in Fall of 2008, we revised our Program Educational Objectives. The reviewers felt that the Program Educational Objectives for both the Baccalaureate and the Associate degree programs sounded more like outcomes (in that they described skills needed at graduation) rather than program educational objectives (describing career and .professional accomplishments). The revised PEOs were presented and approved by our IAB. Pending the final ABET response, the current PEOs are presented below.

Mission

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

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

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

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

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

CET Program Educational Objectives

Program Educational Objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

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

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

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

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

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

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

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

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

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

CET Bachelor of Science Program Student Learning Outcomes

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

(1) an ability to identify, formulate, and solve computer engineering technology problems, including the specification, design, implementation, and operation of systems and components, that meet performance, and quality requirements in a timely manner (Objective A & C) ;

(2) an ability to design, conduct, and interpret experiments including applying the results to verify the system (Objective A);

(3) an ability to function effectively on teams (Objective B);

(4) an understanding of professional, ethical and social responsibility (Objective C);

(5) a recognition of the need for, and an ability to engage in, life-long learning (Objective C).

(6) the ability to apply mathematics including differential and integral calculus, probability, and discrete mathematics to hardware and software problems (Objective A);

(7) mastery of the techniques skills, and computer topics appropriate to the degree program, with depth in at least two sub disciplines (microprocessors, ASICs, software, computer architecture) of the computer engineering technology program (Objective A);

(8) an ability to use applied engineering tools, techniques, and skills including computer-based tools for design, analysis and simulation (Objective A);

(9) an ability to design, fabricate and test systems containing hardware and software components; as well as to analyze and interpret test results in order to improve the system (Objective A);

(10) an ability to convey technical material through oral presentation and interaction with an audience (Objective B);

(11) an ability to convey technical material through written reports which satisfy accepted standards for writing style (Objective B);

(12) an ability to improve system design with regard to quality and project management (Objective A).

CET Associate Degree Student Learning Outcomes

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

(1) an ability to identify, formulate, and solve computer engineering technology problems, including the test, implementation, and operation of systems and components, that meet performance and quality requirements in a timely manner (Objective A & C) ;

(2) an ability to design, conduct, and interpret experiments including applying the results to verify a system (Objective A);

(3) an ability to function effectively on teams (Objective B);

(4) an understanding of professional, ethical and social responsibility (Objective C);

(5) a recognition of the need for, and an ability to engage in, life-long learning (Objective C).

(6) the ability to apply mathematics including differential and integral calculus and discrete mathematics to hardware and software problems (Objective A);

(7) an ability to use applied engineering tools, techniques, and skills including computer-based tools for analysis, simulation, and testing (Objective A);

(8) an ability to fabricate and test engineering systems containing hardware and software components (Objective A);

(9) an ability to convey technical material through oral presentation and interaction with an audience (Objective B);

(10) an ability to convey technical material through written reports which satisfy accepted standards for writing style (Objective B);

III. Assessment Cycle

During the Fall assessment meeting, the assessment plans were adjusted to better mesh with the newly developed OIT Institutional Student Learning Outcomes (ISLOs) assessment cycle. Planning to assess program outcomes that are related to ISLOs in the same year that those ISLOs are to be assessed should reduce some duplication of effort. This adjustment necessitated that some assessments completed last year per the original schedule would be repeated again this year, and others would be shifted out by a year from the original plan, but since we had just completed an accreditation visit, this seemed appropriate.

CET BS Program Assessment Plan – Fall 2008-09

Learning Outcome	2008-09	2009-10	2010-11	2011-12	20012-13	20013-14
(1) an ability to identify, formulate, and solve computer engineering technology problems, including the specification, design, implementation, and operation of systems and components, that meet performance, and quality requirements in a timely manner;			•			•
(2) an ability to design, conduct, and interpret experiments including applying the results to verify the system;	•			•		
(3) an ability to function effectively on teams;		•			•	
(4) an understanding of professional, ethical and social responsibility;		•			•	
(5) a recognition of the need for, and an ability to engage in, life-long learning.			•			•
(6) the ability to apply mathematics including differential and integral calculus, probability, and discrete mathematics to hardware and software problems;	•			•		
(7) mastery of the techniques skills, and computer topics appropriate to the degree program, with depth in at least two sub disciplines (microprocessors, ASICs, software, computer architecture) of the computer engineering technology program;		•			•	
(8) an ability to use applied engineering tools, techniques, and skills including computer-based tools for design, analysis and simulation;	•			•		
(9) an ability to design, fabricate and test systems containing hardware and software components; as well as to analyze and interpret test results in order to improve the system;	•			•		
(10) an ability to convey technical material through oral presentation and interaction with an audience;			•			•
(11) an ability to convey technical material through written reports which satisfy accepted standards for writing style;			•			•
(12) an ability to improve system design with regard to quality and project management		•			•	

CET AS Program Assessment Plan – Fall 2008

Learning Outcome	2008-09	2009-10	2010-11	2011-12	20012-13	2007-08
(1) an ability to identify, formulate, and solve computer engineering technology problems, including the test, implementation, and operation of systems and components, that meet performance and quality requirements in a timely manner;			•			•
(2) an ability to design, conduct, and interpret experiments including applying the results to verify a system;	•			•		
(3) an ability to function effectively on teams;		•			•	
(4) an understanding of professional, ethical and social responsibility;		•			•	
(5) a recognition of the need for, and an ability to engage in, life-long learning;			•			•
(6) the ability to apply mathematics including differential and integral calculus and discrete mathematics to hardware and software problems;	•			•		
(7) an ability to use applied engineering tools, techniques, and skills including computer-based tools for analysis, simulation, and testing;	•			•		
(8) an ability to fabricate and test engineering systems containing hardware and software components;	•			•		
(9) an ability to convey technical material through oral presentation and interaction with an audience;			•			•
(10) an ability to convey technical material through written reports which satisfy accepted standards for writing style			•			•

IV. Summary of 2008-09 Assessment Results

During the 2008-09 academic year, the program faculty assessed four student learning outcomes as summarized below. These outcomes are mapped to the CET curriculum in Appendix A. Additional information can be found in department assessment records.

Student Learning Outcome #2 (B.S. and A.E. degrees): an ability to design, conduct, and interpret experiments including applying the results to verify the system.

Direct Assessment #1
This assessment focused on the application of basic probability.
Data Collection Date: 3/12/09
Coordinator: Douglas W. Lynn

Assessment Method: Students were asked to determine the execution time of a serial interrupt service routine in the final Lab of CST 331. To complete this assignment, students needed to select the signals to be traced, set up the analyzer and its trigger, and properly interpret the logic analyzer output in order to identify the end of the service routine. They were given a similar requirement in the previous lab, with more guidance for that assignment.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Properly set up the experiment (pick the right set of signals)	correct / incorrect	70% correct	90.9% (10/11)
Set up the equipment (setup the analyzer and its trigger)	correct / incorrect	70% correct	100% (11/11)
Interpret the results	correct <= 1 hint / incorrect	70% no more than 1 hint	72.7% (8/11)

Evaluation 3/19/09: Students exceeded and met expectations on this assessment.
Actions 5/20/09: No actions need to be taken as a result of this assessment.

Student Learning Outcome #6 (B.S. and A.E. degrees): The ability to apply mathematics including differential and integral calculus, probability, and discrete mathematics to hardware and software problems.

Direct Assessment #1
This assessment focused on computation.
Data Collection Date: 12/09/08
Coordinator: Douglas W. Lynn

Assessment Method: An exam question was given on the CST 344 final that asked the students to convert a decimal number to IEEE 754 floating point format. Part of this problem required students to convert a decimal fraction to a binary fraction – something their calculators do not directly do.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Correct Method and Result	number of errors	70% <=1 minor error	92.9% <=1 minor error 11 correct 2 1 minor error 1 incorrect

Evaluation 3/10/09: Students demonstrated proficiency on this task.
Actions 5/13/09: No changes need to be made as a result of this evaluation.

Direct Assessment #2
This assessment focused on computation.
Data Collection Date: 12/09/08
Coordinator: Douglas W. Lynn

Assessment Method: An exam question was given on the CST 344 final that asked the students to determine the number of binary bits needed to provide 20 decimal digits of precision in a floating point format. This problem requires students to solve for n in the expression: 1020 = 2n .

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Correct Result	number of errors	70% <=1 minor error	71.4% <=1 minor error 10 correct 4 didn’t formulate problem properly or used a different approach

Evaluation 3/10/09: Students demonstrated acceptable performance on this task. It is possible that the results would have been better if a direct question related to exponents had been posed. As it stands, this question requires students to first realize that they need to use the exponent expression in order to solve the problem (a concept presented in class). However, I would find it difficult to pose the direct question on an exam.

Actions 5/13/09: Perhaps adding a similar question to a homework set would be a good way to have more students be aware of the correct method to use later on the exam.

Direct Assessment #3
This assessment focused on computation.
Data Collection Date: 01/24/09
Coordinator: Douglas W. Lynn

Assessment Method: A question (3.14) was given on a CST 418 homework set that required students to compute: 10log(k) + 10log(T) + 10 log(B) to work out the thermal nose in dbW.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Correct Result	number of errors	70% <=1 minor error	100% <=1 minor error 16/16 correct

Evaluation 3/10/09: 100% were able to compute the result correctly.
Actions 5/13/09: No changes need to be made as a result of this assessment.

Direct Assessment #4
This assessment focused on computation.
Data Collection Date: 01/24/09
Coordinator: Douglas W. Lynn

Assessment Method: A question (4.1) was given on a CST 418 homework set that required students to compute the effective data rate in bits/second of an airliner travelling at a given speed and carrying its maximum capacity in floppy disks. To solve this problem, students have to correctly carry out several dimensional conversions.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Correct Formulation	number of errors	70% correct formulation	68.8% had a correct formulation 11 correct 5 incorrect
Computation Error	number of errors	70% correct computation	56.3% correct computation 9 correct 7 incorrect
Correct Result	number of errors	70% <=1 minor error	56.3% all correct 9 all correct 7 formulation or calculation error

Evaluation 3/10/09: Performance did not meet expectations. This was a somewhat surprising result, though perhaps not in light of the number of steps that had to be carried out correctly in order to get a correct result, and students may not be motivated to take care in the formulation and computation since it was a homework problem.

Actions 5/13/09: Across the curriculum continually remind students to make sure to check their answers, and to emphasize the need to always do their best work on homework and exam questions.

Direct Assessment #5
This assessment focused on problem formulation.
Data Collection Date: 02/11/09
Coordinator: Douglas W. Lynn

Assessment Method: A question (6d) was given on the CST 442 midterm exam that required students to compute the change in CPI from making jumps take one cycle as opposed to two.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Correct Formulation	number of errors	70% correct formulation	28.6% had a correct formulation 4 correct 10 incorrect

Evaluation 3/10/09: Performance did not meet expectations. Students were aware of how CPI is computed as a result of several homework and previous exam questions, though they seemed incapable of applying that knowledge on the exam question. To correctly solve this problem, students have to realize that CPIold = $1.17 = x + .02 \times 2$, and that what they want is CPInew = $x + .02 \times 1 = 1.17 - .02 \times 1 = 1.15$. One thought was that this was the fourth part of a four part question. Students may have assumed that the last part was not worth that many points and not put much effort into it.

Actions 5/13/09: Next time, make the question a standalone question and also, across the curriculum continually remind students to check their answers for reasonableness.

Direct Assessment #6
This assessment focused on problem formulation and application of calculus.
Data Collection Date: 02/28/09
Coordinator: Douglas W. Lynn

Assessment Method: A homework question (10.6) was given in CST 418 (Networks) that required the students to solve for the optimal packet size in the transmission of a message over an N hop network.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Correct Formulation	number of errors	70% <=1 minor error	91.7% <=1 minor error 11 correct 0 minor errors 1 incorrect
Errors in algebra	number of errors	70% <=1 algebraic errors	100% 12/12 correct algebraically
Errors in finding the derivative	number of errors	70% <=1 error	100% 12/12 correct

Evaluation 1/8/09: Students demonstrated proficiency performance on algebra and calculus skills on this assessment. This represents an improvement over the results of this same assessment completed in the previous year where students were able to demonstrate acceptable algebra and calculus skills, but had difficulty formulating the problem in the first place (33% correctly formulated – but that was from a small sample size of 6 students).

Actions 1/8/09: No actions need to be taken as a result of this assessment.

Direct Assessment #7
This assessment focused on the application of basic probability.
Data Collection Date: 3/18/09
Coordinator: Douglas W. Lynn

Assessment Method: The following question was given in the CST 418 (Networks) final exam: If the probability of an error in one packet of a message traversing one hop of a network is Pe, what is the probability that N packets can be delivered across an n hop virtual circuit without any errors? To correctly solve this problem students must realize that Pne = 1 - Pe, that N x n packets have to be transmitted without error and that probabilities multiply.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Pne = 1 - Pe	correct / incorrect (or not attempted)	85% correct	89.5% (17/19)
Probabilities multiply	correct / incorrect (or not attempted)	85% correct	100% (19/19)
Overall Correctness	correct, 1 mistake, incorrect (2 or more errors).	75% no more than 1 mistake	89.5% (17/19)

Evaluation 3/19/09: Performance was acceptable. These results represent a dramatic improvement over the previous assessment completed in Fall 2007. As a result of the poor results of the earlier assessment, the instructor added a bit more emphasis on probability in the class this year, adding more emphasis in lecture and a basic probability handout.

Actions 5/13/09: Continue this level of emphasis on probability in future classes. Also, it was observed that this problem needs to be broken into parts in order to directly assess each element of the problem.

Direct Assessment #8
This assessment focused on the application of discrete mathematics using Truth Tables and Karnaugh Maps.
Data Collection Date: 11/21/08
Coordinator: Phong Nguyen

Assessment Method: A question focusing on solving for a minimized SOP Boolean Equation from a 4-variable truth-table was given in the CST 162 (Intro to Logic Design) test. The following table provides the results

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
1. Construct the K-Map properly, especially the 01 to 11 transition	correct / incorrect or not attempted)	85% correct	100% (15/15)
2. Enter 1's, 0's and don't cares correctly into the K-map	correct / incorrect (or not attempted)	85% correct	86.7% (13/15)
3. Make correct loops of 1' s in accordance with K-Map rules	correct / incorrect (or not attempted)	80% correct	33.3% (5/15)
4. Properly include don't cares in loops so as to arrive at a minimal expression	correct / incorrect (or not attempted)	80% correct	80% (12/15)
5. Properly translate loops to product terms.	correct / incorrect (or not attempted)	80% correct	80% (12/15)

Evaluation 11/24/08: The performance was acceptable in 4 out of 5 criteria. The majority of incorrect loops was due to a redundant loop of 4 1's being included in the final expression.

Actions 5/13/09: Overall the performance was judged acceptable. It was decided to revise lecture material to concentrate more on looping 1's so that a minimum number of loops are used and include instruction on recognition of redundant loops.

Direct Assessment #9
This assessment focused on graphical comprehension.
Data Collection Date: 10-24-08
Coordinator: Claude Kansaku

Assessment Method: A question was given in the first exam of CST 335. The question presented a semi-log graph of the frequency response of a low-pass filter without identifying it as such. The student must be able to recognize the shape of the frequency response plot as that of a low-pass filter. Furthermore, the student must be able to use a linear y-axis decibel value to determine the corresponding frequency value from the logarithmic x-axis.

Background: This content is primarily covered in EET 237/238. However, it is reviewed in CST 335 as an introduction to signal characteristics. The first lab was to manually measure the response of a passive low-pass filter. Students input a series of sinusoidal signals of a fixed amplitude. They were required to measure the output amplitude at each frequency and plot the values converted to decibels on a semi-log graph. This exam question tested their comprehension of that material.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Recognize the semi-log template for a passive low-pass filter	correct / incorrect	90% correct	66.7% (10/15)
Locate the cutoff frequency on the semi-log graph as defined by -3db of attenuation	correct / incorrect	70% correct	33.3% (5/15)

Evaluation 5/20/09: The performance did not meet expectations. While the plot took a careful reading, the value could be determined accurately. A number of students specified approximate values. It is not clear why they chose that approach; either they did not know how to fully read the graph or they decided to not be accurate.

Actions 5/20/09: Next time the question is given, and in general, emphasize the need for accuracy. EE221 and 223 replaces the former EET237/238, so the preparation for this content will change. This question will be re-administered and evaluated Fall 2009 as a new baseline. This time the question will specify how accurately the answer is to be given.

Student Learning Outcome #8 (B.S. degree) and #7 (A.E. degree): an ability to use applied engineering tools, techniques, and skills including computer-based tools for design, analysis and simulation.

Direct Assessment #1
Data Collection Date: Spring 2009
Coordinator: Ralph Carestia

Assessment Method: Seniors in the CET program ASIC testability class were given two designs (in EDIF form) to test. They did not have any of the source files to analyze; therefore, they only had the specification of how the design was to be implemented. The assignment was broken into two parts: first students were asked to develop a test plan for testing the design and turn it in. Second a test plan was given to them where they needed to develop the test bench and/or TCL script to verify the correctness of each design and determine the errors in each of the designs (how many & what they were). Next they needed to do a timing analysis on the designs and determine the worst case timing for each design. Finally they were to discuss the results.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Understand design and develop test plan	Percent at exemplary or accomplished levels	80%	91.7% (11/12)
Applies testing strategies to design under test	Percent at exemplary or accomplished levels	70%	58.3% (7/12)
Develops an appropriate test-bench for the design	Percent at exemplary or accomplished levels	70%	66.7% (8/12)
Demonstrates an understanding of the results extracted of the test-bench model for the design	Percent at exemplary or accomplished levels	60%	41.7% (5/12)

Evaluation Spring 2009: Students did quite well in their ability to understand the problem. Students work was acceptable in their ability to gather information apply testing strategies, develop a test bench, carry out the plan and demonstrate an understanding of the results. They somewhat struggled in their test plan coverage. Only about 42% found all of the design errors. The instructor felt that as this course evolves there will be more emphasis on developing testing plans which increase the coverage testing. Therefore even though they exceeded expectations, more examples and homework problems will be given to improve their performance.

Actions: This data has not yet been evaluated by the full program faculty.

Student Learning Outcome #9 (B.S. degree) and #8 (A.E. degree): an ability to design, fabricate and test systems containing hardware and software components; as well as to analyze and interpret test results in order to improve the system.

Direct Assessment #1
Data Collection Date: Winter 2009
Coordinator: Ralph Carestia

Assessment Method: Sophomores in CST 232, Computer Design with Programmable Logic Laboratory, were asked to fabricate a prototype board using wire wrap techniques, as a take-home final exam. The focus on this activity was the fabrication, testing and demonstration of this project. Students were given an elevator design and were asked to develop the Verilog code for the problem, build the prototype board, and test and evaluate the results.

Performance Criteria	Measurement Scale	Minimum Acceptable Performance	Results
Knowledge	Four-point proficiency scale	80% at 3 or 4	100%
Problem solving	Four-point proficiency scale	80% at 3 or 4	100%
Fabrication	Four-point proficiency scale	80% at 3 or 4	81.8%
Testing	Four-point proficiency scale	80% at 3 or 4	81.6%
Demonstration	Four-point proficiency scale	80% at 3 or 4	90.9%

Evaluation Spring 2009: Students did quite well in their ability to understand the problem, gather information, and write the code for the design. They somewhat struggled in the area of the testing process in that they did not make use of the test equipment in the ASIC lab to debug problems, or test several scenarios. Fabrication of the most of the boards was clean and easy to follow the wiring. Appropriate routing was found on most boards.

Actions: No action at this time. These skills will also be emphasized in the B.S. degree program in the microprocessor classes and the junior project.

V. Summary of Student Learning

In Spring 2009, the program faculty met several times to discuss the assessment data that was collected this year and to summarize strengths in student learning and actions to be taken:

Student Learning Outcome #2 (B.S. and A.E. degrees): an ability to design, conduct, and interpret experiments including applying the results to verify the system.
In the one assessment conducted in this area this year, the students (junior level) met expectations.

Student Learning Outcome #6 (B.S. and A.E. degrees): The ability to apply mathematics including differential and integral calculus, probability, and discrete mathematics to hardware and software problems.
Students met and exceeded expectations in six out of nine assessments conducted in this area. In the three assessments where they did not meet expectations, there was no clear common explanation as to why they didn't meet expectations. In general we feel that our student's mathematical ability is quite good, but there is always room for improvement. In particular we feel that it would be good to emphasize the need for students to check the results of their answers for reasonableness, the need to be careful in their computations and the need for students to develop the attitude that they need to always do their best work.

Student Learning Outcome #8: an ability to use applied engineering tools, techniques, and skills including computer-based tools for design, analysis and simulation.
The one assessment conducted for this SLO has not yet been reviewed by program faculty.

Student Learning Outcome #9 (B.S. degree) and #8 (A.E.) degree: an ability to design, fabricate and test systems containing hardware and software components; as well as to analyze and interpret test results in order to improve the system.
In the one assessment conducted in this area this year, the students (sophomore level) met expectations.

VI. Changes Resulting from Assessment

During the 2007-08 academic year, faculty identified the need to provide more directed instruction on probability in CST 418. Student performance was re-assessed in CST 418 during assessment of SLO #6 above. Addition of extra material and emphasis on probability in CST 418 resulted in a much improved assessment in this area. All students met performance criteria.

Appendix A: SLO Curriculum Maps

Outcome Assessment Points, BS Program H = Highly assessable M = Weakly assessable blank = Low to not assessable		(1) problem solving	(2) experiment	(3) teamwork	(4) ethical / social resp	(5) life-long learning	(6) calc, prob, discrete	(7) master skills + depth	(8) design, analysis, sim	(9) design, fab, test, improve	(10) oral presentation	(11) written presentation	(12) quality, proj. manage
Freshman Year	Eval. Cycle ⇨	Y1	Y2	Y1	Y3	Y2	Y1	Y3	Y2	Y1	Y3	Y2	Y3
CST 102	Intro to Comp ET	M	M	M	M					M		M	
CST 162	Intro to Digital Logic	H	M				M						
MATH 111	College Algebra												
WRI 121	English Comp												
CST 116	C++ Prog I												
CST 130	Computer Org						M						
MATH 112	Trigonometry												
WRI 122	English Comp												
CST 126	C++ Prog II												
CST 131	Comp Arch						M						
MATH 251	Diff Calculus						M						
SPE 111	Fund of Speech										M		
SSC	SS Elective												
Sophomore Year													
CST 250	Assembly Lang												
MATH 252	Integral Calculus						M						
PSY 201	Psychology												
WRI 227	Tech Report											M	
CST 133	Dig Elec II – Seq w HDL						M			M			
CST 204	Intro to controllers						M		M	M			
EE 221	DC & 1st Ord Trans												
CST 231/2	Comp Des w/PLD	M	H			M	M		M	H			
MATH 254N	Vector Calc						H						
CST 313	Comp Soft Tech	M	M				M	M	M	M			
EE 223	AC & 2nd Ord Trans												
SPE 321	Team Comm			M							H		
HUM	Hum Elective												
MATH	Math Elective						H						

Outcome Assessment Points, BS Program continued		(1) problem solving	(2) experiment	(3) teamwork	(4) ethical / social resp	(5) life-long learning	(6) calc, prob, discrete	(7) master skills + depth	(8) design, analysis, sim	(9) design, fab, test, improve	(10) oral presentation	(11) written presentation	(12) quality, proj. manage
Junior Year	Eval. Cycle ⇨	Y1	Y2	Y1	Y3	Y2	Y1	Y3	Y2	Y1	Y3	Y2	Y3
EE 321	Intro Amp & Semi												
CST 335	I/O Interfacing	M	M	M		M				M			
CST 371	Embedded Sys Dev I	H	M	H		M			H	M	H	H	M
PHY 221	Physics w/Calculus												
CST 321	Intro to proc	M	M				M	M	M	M		H	
CST 372	Embedded Sys Dev II	H	M	H		M	M	M	H	H	M	M	M
PHY 222	Physics w/Calculus												
WRI 327	Adv Tech Writing											H	
CST 331	Microproc Interface	M	M				M	M	M	M		M	
CST 351	Advanced PLDs	H	H		M	M		M	H	M			M
CST 373	Embedded Sys Dev III	H	H	H	M	H	M	M	M	H	H	H	H
PHY 223	Physics w/Calculus												
HUM	Hum Elective				M								
Senior Year													
BUS 304	Engr Management				M								
CST 344	Intermediate Arch	M			M		M	M	M	M			
CST 441	Logic Synth w VHDL	H	H		M	M		H	H	M			
CST 418	Data Comm & Net	M				M	H						
CST xxx	Tech Elective					M							
CST 442	Advanced Arch.	M				M	H	H	M	M			
CST 451	ASIC Des using FPGAs	H	H		M	M		H	M	H	H	H	M
SSC	SS Elective				M								
IMGT 345	Engr Economy				M								M
CST 464	RISC-Based proc	M	M	M		M		M	M	M			
CST 461	Adv Topics in VLSI	M	H				M	H	H			M	
PSY 347	Org Behavior				M								
HUM	Hum Elective				M								

Outcome Assessment Points, AE Progam H = Highly assessable M = Weakly assessable blank = Low to not assessable		(1) problem solving	(2) experiment	(3) teamwork	(4) ethical / social resp	(5) life-long learning	(6) calc, discrete	(7), analysis, sim, test	(8) fabricate, test	(9) oral presentation	(10) written presentation
Freshman Year	Eval. Cycle ⇨	Y1	Y2	Y1	Y3	Y2	Y1	Y2	Y1	Y3	Y2
CST 102	Intro to Computer Eng. Tech.	M	M	M					M		M
CST 162	Intro to Digital Logic	H	M				M				
MATH 111	College Algebra										
WRI 121	English Composition										
CST 116	C++ Programming I										
CST 130	Computer Organization						M				
MATH 112	Trigonometry										
WRI 122	English Composition										
CST 126	C++ Programming II										
CST 131	Computer Architecture						M				
MATH 251	Differential Calculus						M				
SPE 111	Fundamentals of Speech									M	M
SSC	Social Science Elective										
Sophomore Year											
CST 250	Computer Assembly Language										
MATH 252	Integral Calculus						M				
PSY 201	Psychology										
WRI 227	Technical Report Writing										M
CST 133	Dig. Elec. II – Seq. Logic w HDL						M				
CST 204	Introduction to Microcontrollers						M				
EE 221	Circ. I – DC & 1st Order Trans.										
CST 231	Computer Design w/PLD	M	H			M	M	M	H		
CST 232	Comp. Design w/PLD Lab	H	H			M	M	M	H		
PHY 221	General Physics w/Calculus										
CST 313	Comp Software Techniques	H	M	H			M	M	M		M
EE 223	Circ. II – AC & 2nd Order Trans.										
PHY 222	General Physics w/Calculus										
HUM	Humanities Elective				M						
CST xxx	Technical Elective**					M					