2019-2020: Computer Engineering BS

Definition of Unit:

Providing Department:
Computer Engineering BS

Department/Unit Contact:
Allen MacKenzie

Mission/Vision Statement:

Mission Statement: “Provide quality undergraduate and graduate education and perform research in the areas of electrical and computer engineering to enhance the competitiveness of our graduates and contribute to economic, scientific, and social development.”

Student Outcomes

Define Goal:

Within a few years following graduation, our graduates will have:

- progressed in their careers as indicated by promotions, positions of leadership, awards, recognitions, entrepreneurial activities, products or processes developed, patents, and/or publications;
- advanced their knowledge and expertise as indicated by continuing education, advanced degrees, and/or professional registration;
- contributed to the profession and society as indicated by research, national and international collaboration, professional service, community service, and/or public service.

Intended Outcomes / Objectives:

Students will demonstrate:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Relationship of Student Outcomes to Program Educational Objectives

Student Outcome		Program Educational Objective		
		i	ii	iii
1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	X	X	
2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	X		X
3	an ability to communicate effectively with a range of audiences	X		X
4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	X		X
5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	X		X
6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	X	X	
7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	X	X	

DRILL DOWN----------
RELATED ITEM LEVEL 1

Assessment Tools

Frequency of Assessment:

All assessments are completed on a semester or annual basis, unless otherwise noted in the description of a tool. The assessment schedule is attached.

Rationale:

Our assessment process relies on the following assessments.

The Capstone Assessment. Written and oral final presentations of each senior capstone project are evaluated every semester. In Spring 2020, a new rubric was used to assess every project for the attainment of SO1-SO5 and SO 7. This new assessment tool provides direct evaluation of the attainment of these six student outcomes. For SO1-3, the results of the survey evaluating the poster and oral presentation are averaged with the results of the final report assessment; for SO4, SO5, and SO7, the final report assessment stands alone.

The Final Exam Assessment (FEA). Specific exam questions for specific ECE courses are used to directly assess Student Outcome 1 each semester. The FEA is conducted in ECE 3020: Discrete-Time Signal and Systems, ECE 3130: Microcomputer Systems, ECE 3300: Electronics I, and ECE 3510: Electromagnetic Fields. (ECE 3510 is not required of BSCmpE students; the other three courses are.) This assessment is performed by the faculty member who administered the exam plus an expert in the field. Data is disaggregated for BSCmpE students.

The Laboratory Assessment. A specific exercise in ECE 3060: Electrical Engineering Lab II is used to assess the achievement of Student Outcome 6 each semester. Specifically, students are asked to design and conduct an experiment, to analyze and interpret the resulting data, and to use engineering judgment to draw conclusions. This new assessment, initiated in Spring 2020, provides direct evaluation of the attainment of this student outcome, disaggregated for BSCmpE students.

The Senior Exit Survey. Each semester, both a written survey and a group oral interview of graduating seniors are performed. Students are asked a variety of questions about their experiences in the program, including being asked to rate their attainment of each student outcome; this data is disaggregated for BSCmpE students. In addition to numerical feedback, comments are obtained regarding the overall ECE program experience, specific courses, and specific faculty and staff.

The Faculty Course Assessment (FCA). For each course each semester, the instructor provides an assessment of the achievement of the course instructional outcomes. The results of this assessment are used to ensure that the course instructional outcomes listed on the course syllabus are accurate and that they are actually achieved. All course outcomes which are rated at levels 2 (poor) or 1 (unable to perform / not covered) are flagged for investigation to determine the cause and what action needs to be taken to remedy the problem. While this assessment of the course instructional outcomes is used primarily for the purpose of maintaining individual course quality, for certain courses, the course instructional outcomes are related to certain student outcomes. In these cases, the results of this assessment are also used to assess student outcomes.

The Student Course Assessment (SCA). For each course each semester, students are asked to self-assess their attainment of the course instructional outcomes. The results of this assessment are used to ensure that the course instructional outcomes listed on the course syllabus are accurate and that they are actually achieved. Course outcomes which receive low ratings are flagged for investigation to determine the cause and what action is needed to remedy the problem.

Attainment of Student Outcomes

The raw data from most tools is obtained on a 1-5 scale with 5 being the best score. For the final exam assessment, scores on selected exam questions are reported out of 100%. For comparability, we translate this into a 5 point scale with the formula X/20, this translates into an average grade of 60 on the selected exam problems receiving a 3.0, the threshold for acceptability on our 5 point scale.

Our target for each student outcome and each assessment tool is to achieve greater than 3.5 out of 5. We categorize the attainment of each outcome using each assessment tool as:

- Highly Satisfactory (HS) if the rating is 3.75 or
- Satisfactory (S) if the rating is 3.0 or
- Unsatisfactory (U) if the rating is less than 0.

RELATED ITEM LEVEL 2

Results: SO 1

Results:

Student Outcome 1: Identify, Formulate, and Solve Complex Engineering Problems

Student outcome 1 is “an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.”

Historical Attainment of Student Outcome 1

	15-16	16-17	17-18	18-19	19-20
Capstone Assessment (New Rubric)	-	-	-	-	4.50
Final Exam Assessment	3.69	3.58	4.12	-	3.98
Senior Exit Survey	4.52	4.07	4.17	4.06	4.50
Faculty Course Assessment	4.36	4.25	4.17	4.29	4.02
Student Course Assessment	4.04	4.08	4.12	4.14	4.18

In Spring 2020, the format of the Capstone Assessment final presentations changed due to the ongoing pandemic. Instead of a longer oral presentation, a “virtual poster session” was held, in which the advisory board was given the opportunity to review a poster from each team (over a few days) and then each team made a short presentation (in a videoconference setting) describing their project and answering questions from the advisory board and from other students and faculty. Even with the change in venue, the Capstone Assessment had a highly satisfactory level of attainment (HS, >3.75). The Final Exam Assessment resumed for 2019-2020 and continued to meet a highly satisfactory level of attainment (HS, >3.75). Although all indicators suggest strong attainment of this student outcome, we continue to monitor to ensure that the outcome is attained as directly measured by the FEA and Capstone Assessment.

Attachments:

RELATED ITEM LEVEL 2

Results: SO 2

Results:

Student Outcome 2: Apply Engineering Design

Student outcome 2 is “an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.”

Historical Attainment of Student Outcome 2

	15-16	16-17	17-18	18-19	19-20
Capstone Assessment (New Rubric)	-	-	-	-	4.33
Senior Exit Survey	4.22	4.06	4.04	3.78	4.29
Faculty Course Assessment	4.45	4.30	3.89	4.21	3.69
Student Course Assessment	4.06	4.01	4.09	4.07	4.16

Students showed a highly satisfactory level of attainment (HS, >3.75) on the new Capstone Assessment even given the change to an online format due to COVID. The Senior Exit Exam and Student Course Assessment also showed highly satisfactory levels of attainment (HS, >3.75). The Faculty Courses Assessment went down slightly into the satisfactory level of attainment which is above the target (3.5), but a bit below the “highly satisfactory” threshold. For the decline in Faculty Courses Assessment, particular courses and associated course instructional objectives contributing to this lower rating have been identified and referred to the appropriate course coordinators and curriculum committee for further monitoring and possible action.

Attachments:

RELATED ITEM LEVEL 2

Results: SO 3

Results:

Student Outcome 3: Communicate Effectively

Student outcome 3 is “an ability to communicate effectively with a range of audiences.”

Historical Attainment of Student Outcome 3

	15-16	16-17	17-18	18-19	19-20
Capstone Assessment (New Rubric)	-	-	-	-	4.35
Senior Exit Survey	4.22	4.03	4.31	3.94	4.21
Faculty Course Assessment	4.40	4.27	4.04	4.26	4.07
Student Course Assessment	4.20	4.28	4.22	4.05	4.19

All metrics met the highly satisfactory level of attainment (HS, >3.75) for 2019-2020. Students demonstrated strong communication ability on the new Capstone Assessment even with the shift to an online environment. In general, student continue to perform very well on this student outcome.

Attachments:

RELATED ITEM LEVEL 2

Results: SO 4

Results:

Student outcome 4 is “an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.”

Historical Attainment of Student Outcome 4

	15-16	16-17	17-18	18-19	19-20
Capstone Assessment (New Rubric)	-	-	-	-	3.70
Senior Exit Survey	4.17	4.17	3.84	3.83	4.36
Faculty Course Assessment	4.86	4.38	4.58	4.75	4.33
Student Course Assessment	4.44	4.50	4.42	4.43	4.40

The new Capstone Assessment measures as 3.70, which is above the target for satisfactory (S, > 3.0) but just below the threshold for highly satisfactory (HS, >3.75). All other metrics for this student outcome are highly satisfactory (HS, >3.75) for 2019-2020. Given the satisfactory level of attainment and new nature of the Capstone Assessment rubric, this student outcome merits further monitoring and might possibly be better integrated throughout the curriculum.

Attachments:

RELATED ITEM LEVEL 2

Results: SO 5

Results:

Student Outcome 5: Function Effectively on a Team

Student outcome 5 is “an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.”

Historical Attainment of Student Outcome 5

	15-16	16-17	17-18	18-19	19-20
Capstone Assessment (New)	-	-	-	-	4.17
Senior Exit Survey	4.39	4.28	4.19	3.89	4.64
Faculty Course Assessment	4.29	4.06	4.18	4.38	3.95
Student Course Assessment	4.28	4.36	4.20	4.22	4.46

Students continue to excel in metrics related to functioning effectively as a team. All assessments are highly satisfactory (HS, >3.75) for 2019-2020.

Attachments:

RELATED ITEM LEVEL 2

Results: SO 6

Results:

Student Outcome 6: Develop and Conduct Appropriate Experimentation, Analyze and Interpret Data, and Use Engineering Judgment

Student outcome 6 is “an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.”

Historical Attainment of Student Outcome 6

	15-16	16-17	17-18	18-19	19-20
Laboratory Assessment (New)	-	-	-	-	3.84
Senior Exit Survey	4.61	4.33	4.19	4.11	4.43
Faculty Course Assessment	4.50	4.31	3.92	4.10	3.90
Student Course Assessment	4.14	4.14	3.96	4.20	4.16

Starting this year, the new Laboratory Assessment separately assessed the ability of students to “develop and conduct appropriate experimentation” and to “analyze and interpret data.” The subscore for developing and conducting appropriate experimentation was 4.00; the BSCmpE subscore for analyzing and interpreting data was 3.67. However, there were only 3 BSCmpE students enrolled in ECE 3060; hence the BSCmpE results have low confidence. While the new Laboratory Assessment met the highly satisfactory attainment level, we will continue to monitor this assessment going forward. All other metrics were above the highly satisfactory level of attainment.

Attachments:

RELATED ITEM LEVEL 2

Results: SO 7

Results:

Student Outcome 7: Acquire and Apply New Knowledge

Student outcome 7 is “an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.”

Historical Attainment of Student Outcome 7

	15-16	16-17	17-18	18-19	19-20
Capstone Assessment (New Capstone)	-	-	-	-	4.18
Senior Exit Survey	4.72	3.83	4.31	4.33	4.36
Faculty Course Assessment	3.71	4.11	4.49	3.70	4.02
Student Course Assessment	4.33	4.47	4.25	3.99	4.38

The Capstone Assessment provides a new direct measure of student performance on the ability to acquire and apply new knowledge. All metrics for this outcome are at the highly satisfactory (HS, >3.75) level of attainment for 2019-2020. The Faculty Course Assessment has improved back into the highly satisfactory level from the satisfactory level last year (2018-2019).

Attachments: