Weber State University
Biennial Report on Assessment of Student Learning

Cover Page

Department/Program: Electrical and Computer Engineering/Computer Engineering
Academic Year of Report: 2021/22 (covering Summer 2019 through Spring 2021)
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We have updated the Institutional Effectiveness website, which includes an update for each program page. All Biennial Assessment and Program Review reports will now be available on a single page. Please review your page for completeness and accuracy, and indicate on the list below the changes that need to be made. Access your program page from the top-level results page. Select the appropriate college and then your program from the subsequent page.

A. **Mission Statement**

_ X_ Information is current; no changes required.

Update if not current:

B. **Student Learning Outcomes**
(please note the addition of certificate and associate credential learning outcomes)
___ Information is current; no changes required.

Update if not current:

Program Educational Objectives

The Objectives of the ECE undergraduate programs in Electrical and Computer Engineering are to educate graduates to become

productive, accountable, and responsible professionals in engineering who will:

1. Apply their engineering skills, through theory and application, in industry, government, society, or in graduate school;
2. Practice high technical and ethical standards and communicate their work to colleagues, industry, and professional organizations;
3. Work effectively and contribute in interdisciplinary fields while encouraging expression and valuing diversity;
4. Understand the importance of lifelong learning and continuous professional growth in a changing world as shown through self-directed learning, specialized trainings, certifications, licensing, and graduate programs.

Student outcomes describe what students are expected to know and be able to do by the time of graduation. Graduates of the WSU Electrical and Computer Engineering Programs will have:

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.

C. Curriculum (please note, we are using Google Sheets for this section so that updates are easier to make)

___ Information is current; no changes required.

Update if not current (you may request access to the Google Sheet if that is easiest, or we can make the updates):

ELECTRICAL & COMPUTER ENGINEERING COURSE-OUTCOME MATRIX

H = Outcome Highly Applicable to Course (Rubric Utilized)
M = Outcome Moderately Applicable to Course

Blank = Outcome Not Applicable to Course

			Student Outcomes						
			1	2	3	4	5	6	7
Required									
	ENGR 1000	Introduction to Engineering				M	M		
	ECE 1000	Introduction to Electronics Engineering				M	M		

ECE 1270	Introduction to Electrical Circuits	H		M			H	M
ECE 1400	Fundamentals of Engineering Computing	H					H	
ECE 2260	Fundamentals of Electrical Circuits	H		M			H	M
ECE 2700	Digital Circuits	H			M	M	M	
ECE 3000	Engineering Seminar		H	H	H			H
ECE 3090	Project Management		H	H	H	H		H
ECE 3110	Microelectronics I	H		M			M	M
ECE 3120	Microelectronics II	H		M			M	M
ECE 3210	Signals & Systems	H					M	
ECE 3310	Electromagnetics I	H					M	
ECE 3510	Power Systems	H				M	H	
ECE 3610	Digital Systems	H	M			M	M	
ECE 3710	Embedded Systems	H	M	M		M	M	
ECE 3890	Internship		H	H	H	H	H	H
ECE 4010	Senior Project I	H	H	H	H	H	H	H
ECE 4020	Senior Project II	H	H	H	H	H	H	H
ECE 4100	Control Systems	H	M				H	

D. Program and Contact Information

___ Information is current; no changes required.

Update if not current:

Computer Engineering

The WSU Computer Engineering (CE) program is completing its seventh year (2021-2022) of operation. As of November 30, the program has 141 declared majors and has produced 10 graduates.

The program received its initial accreditation August 2019 by the Engineering Accreditation Commission (EAC) of ABET. ABET accredits engineering programs on a six-year cycle, so the WSU Electrical Engineering program is accredited to August 2025. A self- study report will be submitted to ABET by the July 1, 2024 deadline followed by an on-site accreditation visit sometime fall semester 2024.

Per the agreement between EAST and the Office of Institutional Effectiveness, the ABET self-study report and the ABET on-site evaluation will constitute the Computer Engineering program review.

Electrical & Computer Engineering Department Website

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E. Assessment Plan

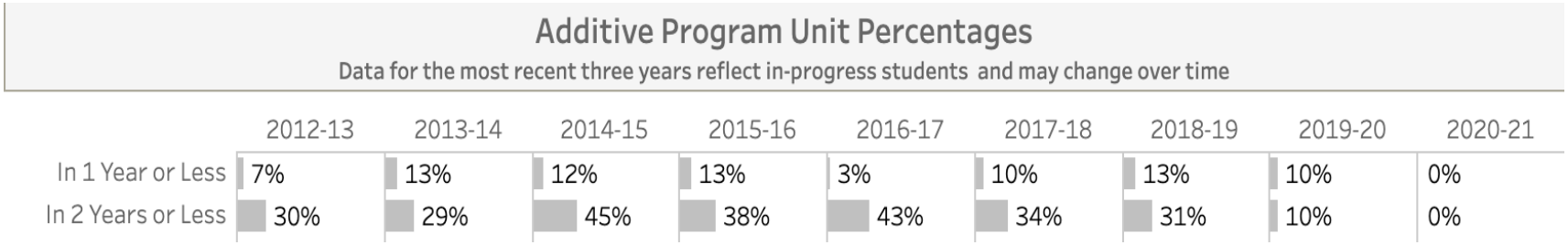
We have traditionally asked programs to report on outcome achievement by students at the course level. We are encouraging programs to consider alternative assessment approaches and plans that are outcome-based as opposed to course-based, though course-based assessment can continue to be used. A complete assessment plan will include a timeline (which courses or which outcomes will be assessed each year), an overall assessment strategy (course-based, outcome-based, reviewed juries, ePortfolio, field tests, etc.), information about how you will collect and review data, and information about how the department/program faculty are engaged in the assessment review.

_X_ Information is current; no changes required.

Update if not current:

F. Student Achievement

i. Percent of students completing degrees after 90 credit hours within 2 years and a reflection on that metric (this information can be accessed on the Program Review Undergraduate dashboard – tab labeled, 'Time to Grad from 90CH – please reach out to oie@weber.edu if you need help with this metric). What department initiatives are in place to address this?



From 2014-15 through 2018-19, this program averages a 38.2% completion within 2 years of 90CH. Note: This data includes both EE and CE programs.

Evidence of Learning

There are varieties of ways in which departments can choose to show evidence of learning.

1) Course-based assessment
    a. This is the format we have traditionally suggested programs use for assessment. The familiar 'evidence of learning worksheets' are included in the template and can also be accessed from the IE website. The critical pieces to include are:
        i. learning outcomes addressed in the course,
        ii. method(s) of measurement used,
        iii. threshold for 'acceptable – that is, the target performance,
        iv. actual results of the assessment,
        v. interpretation/reflection on findings,
        vi. the course of action to be taken based upon the interpretation,
        vii. how that action will be evaluated.

2) Outcome-based assessment
    a. Moving from course-based to outcome-based assessment has the potential for programs to gather and reflect upon data that are more meaningful, and to connect assessment findings from throughout the program. The approach may be much easier for associates and certificate programs where only select students in classes are earning the credential. For more information email (gniklason@weber.edu)

    b. Reporting options include:
        i. A traditional evidence-of-learning worksheet with an outcome (across multiple courses) as the focus (instead of a course with multiple outcomes).
        ii. A report that is more narrative-based.
        iii. Other tools such as an ePortfolio in which key or signature assignments have been identified by the faculty, and uploaded by the student with their reflection. The key or signature assignments are aligned to student learning outcomes. (ePortfolio is an excellent assessment tool for certificates and associate degrees.)
        iv. There are other approaches such as juried reviews, physical portfolios, field tests, etc.

3) General Education course assessment needs to continue to be reported at the course level using either the traditional template or a more narrative-based format. See the Checklist and Template page for area-specific worksheets as well.

Note: if you cannot download templates directly from this document, please visit our template page for downloads.

A. Evidence of Learning: Courses within the Major
(**this is a sample page for purpose of illustration only**; a blank template can be found on the next page or at this site)

We have been using course rubrics as a student outcome assessment instrument since fall semester 2011. Since that time, the course-level threshold has been triggered over 50 times. With the exception of ECE 3120, all ECE courses have been triggered at least once. When a course-level trigger occurs, it is the responsibility of the faculty member to initiate action and implement improvement in that particular course.

Example Rubric:

ECE COURSE RUBRIC	Computer Engineering Majors							
COURSE	ECE 3110 Microelectronics I							
SEMESTER	Fall							
YEAR							S = 1 or 2: action initiated by instructor	
INSTRUCTOR							S = 3 or 4: no action initiated by instructor	
NUMBER OF CE STUDENTS								
Performance Indicator (PI)	Student Outcomes	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Exemplary		Initiate action by instructor ?	Action to be initiated
Model semiconductor devices such as diodes, BJT transistors, and field effect devices.	1	Cannot model any semiconductor devices	Can model diodes	Can model diodes and BJTs or FETs	Can model diodes, BJTs, and FETs			
Design and model semiconductor circuits.	1	Cannot design and model semiconductor circuits	Can model semiconductor circuits	Can design and model semiconductor circuits	Can design, model, and apply semiconductor circuits to realistic constraints			
Explain the difference between the BJT and MOSFET amplifier configurations.	1	Cannot explain differences between amplifier configurations	Can explain the differences between BJT and MOSFET amplifiers	Can explain the differences between BJT configurations and MOSFET configurations	Can explain the differences between configurations and best applications and uses of each			
Design, build, and evaluate BJT and MOSFET amplifiers.	1	Cannot design, build and evaluate amplifiers	Can construct pre-designed amplifiers	Can construct and evaluate pre-designed amplifiers	Can design, build, and evaluate BJT and MOSFET amplifiers			
					Average Score for Course =	#DIV/0!		
					(Transfer this number to course continuous improvement record)			

The graduate survey is an eleven-question survey instrument administered to seniors at graduation. Each question asks graduates to indicate the degree to which the student learning outcome was achieved in their program. The responses are given on the following five-point Likert scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree. The trigger point was set by faculty at 3.5. This instrument has been administered to graduating seniors since fall semester 2014. The survey also asks the graduate to provide feedback on the strengths and weaknesses of the ECE programs.

The Traceable Progress System (TPS) is used to initiate and document course-level and program-level improvements initiated by the department faculty. The use of the course-level TPS may be triggered by a low PI in a course rubric or by a reason that lies outside the formal quantitative process. The use of the program-level TPS is for the addition of new courses, deletion of existing courses, and other curricular changes. The Traceable Progress System was added to our continuous improvement efforts to facilitate improvements that may lie outside the regular assessment process.

Engineering faculty decided that we needed an instrument to directly and globally assess the technical knowledge of our senior students. We discussed using the Fundamentals of Engineering (FE) examination administered by the National Council of Examiners for Engineering and Surveying (NCEES). However, we did not want to be constrained by the lack of detailed score reporting, cost, and timing of the FE examination, so we designed an internal exam that resembles the FE exam. Questions similar or identical to those in old FE review manuals were chosen to build the exam. The exam consists of six questions for each topic for a total of 90 questions. To avoid giving a single long exam, we split the exam into two equal parts by giving students 45 questions in ECE 4010 Senior Project I and 45 questions in ECE 4020 Senior Project II. The exam was administered to students for the first time during the 2017-2018 academic year.

Appendix A

Most departments or programs receive a number of recommendations from their Five/Seven-Year Program Review processes. This page provides a means of updating progress towards the recommendations the department/program is enacting.

Date of Program Review: ####	Recommendation	Progress Description
Recommendation 1	Text of recommendation	#### +1 progress
		#### +2 progress
		#### +3 progress
		#### +4 progress
Recommendation 2	Text of recommendation	#### +1 progress
		#### +2 progress
		#### +3 progress
		#### +4 progress
Recommendation 3	Text of recommendation	#### +1 progress
		#### +2 progress
		#### +3 progress
		#### +4 progress
(add as needed)		

Additional narrative:

Appendix B

Please provide the following information about the full-time *and adjunct faculty* contracted by your department during the last academic year (summer through spring). Gathering this information each year will help with the headcount reporting that must be done for the final Five Year Program Review document that is shared with the State Board of Regents.

Faculty Headcount	2018-19	2019-20	2020-21
With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution)	8	6	7
Full-time Tenured	5	4	3
Full-time Non-Tenured (includes tenure-track)	3	2	4
Part-time and adjunct	2	2	2
With Master's Degrees			
Full-time Tenured			
Full-time Non-Tenured			
Part-time and adjunct			
With Bachelor's Degrees			
Full-time Tenured			
Full-time Non-tenured			
Part-time and adjunct			
Other			
Full-time Tenured			
Full-time Non-tenured			
Part-time			
Total Headcount Faculty			
Full-time Tenured			
Full-time Non-tenured			
Part-time			

Please respond to the following questions.

1) Review and comment on the trend of minority students enrolling in your classes (particularly lower-division, GEN Ed) and in your programs.
   Our male to female student ratio has stayed steady in the 8-10% female student range over the past 8 years. Our Latinx population has also stayed steady at 11-13% since the 16-17 academic year. Non-resident population has been 2% since 13-14 and unknown is steady at 4%. Note: This data includes both EE and CE programs.

2) What support (from enrollment services, advising, first-year transition office, access & diversity, etc.) do you need to help you recruit and retain students?
   PR. We need students to know about our programs. While CE has been at WSU since 2015, many still do not understand that we offer ABET accredited engineering programs at WSU.

3) We have invited you to re-think your program assessment. What strategies are you considering? What support or help would you like?
   We need to make sure that we align with our accreditation body ABET. Since our last review they have changed the student learning outcomes which we are in the process of updating.

4) Finally, we are supporting our Concurrent Enrollment accreditation process. Does your program offer concurrent enrollment classes? If so, have you been able to submit the information requested from the Concurrent Enrollment office?
   Yes we are in the process of adding new concurrent enrollment courses. Yes.

Glossary

Student Learning Outcomes/Measurable Learning Outcomes

The terms 'learning outcome', 'learning objective', 'learning competency', and 'learning goal' are often used interchangeably. Broadly, these terms reference what we want students to be able to do AFTER they pass a course or graduate from a program. For this document, we will use the word 'outcomes'. Good learning outcomes are specific (but not too specific), are observable, and are clear. Good learning outcomes focus on skills: knowledge and understanding; transferrable skills; habits of mind; career skills; attitudes and values.

- Should be developed using action words (if you can see it, you can assess it).
- Use compound statements judiciously.
- Use complex statements judiciously.

Curriculum Grid

A chart identifying the key learning outcomes addressed in each of the curriculum's key elements or learning experiences (Suskie, 2019). A good curriculum:

- Gives students ample, diverse opportunities to achieve core learning outcomes.
- Has appropriate, progressive rigor.
- Concludes with an integrative, synthesizing capstone experience.
- Is focused and simple.
- Uses research-informed strategies to help students learn and succeed.
- Is consistent across venues and modalities.
- Is greater than the sum of its parts.

Target Performance (previously referred to as 'Threshold')

The level of performance at which students are doing well enough to succeed in later studies (e.g., next course in sequence or next level of course) or career.

Actual Performance

How students performed on the specific assessment. An average score is less meaningful than a distribution of scores (for example, 72% of students met or exceeded the target performance, 5% of students failed the assessment).

Closing the Loop

The process of following up on changes made to curriculum, pedagogy, materials, etc., to determine if the changes had the desired impact.

Continuous Improvement
An idea with roots in manufacturing, that promotes the ongoing effort to improve. Continuous improvement uses data and evidence to improve student learning and drive student success.

Direct evidence
Evidence based upon actual student work; performance on a test, a presentation, or a research paper, for example. Direct evidence is tangible, visible, and measurable.

Indirect evidence
Evidence that serves as a proxy for student learning. May include student opinion/perception of learning, course grades, measures of satisfaction, participation. Works well as a complement to direct evidence.

HIEE – High Impact Educational Experiences
Promote student learning through curricular and co-curricular activities that are intentionally designed to foster active and integrative student engagement by utilizing multiple impact strategies. Please see https://weber.edu/weberthrives/HIEE.html