Weber State University
Biennial Report on Assessment of Student Learning

Cover Page

Department/Program: Electrical & Computer Engineering/Masters of Science in Electrical Engineering
Academic Year of Report: 2020/21 (covering Summer 2019 through Spring 2021)
Date Submitted: November 30, 2021
Report author: Justin Jackson

Contact Information: Justin Jackson
Phone: 6078
Email: justinjackson@weber.edu

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

___ Information is current; no changes required.

Update if not current:

The mission of the Master of Science Program in Electrical Engineering, in adherence to the core themes of the mission of Weber State University, is to provide students a high quality graduate-level education in Electrical Engineering. This education, which emphasizes advanced engineering principles coupled with hands-on experience, enables students to make significant contributions to society as professional engineers. The program stresses design and problem solving using math, science and advanced electrical engineering principles.

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:

At the end of their study at WSU, Master of Science in Electrical Engineering students will:

- Demonstrate the ability to apply knowledge of math, science and engineering.
- Demonstrate the ability to design a system, component or process.
- Demonstrate the ability to identify, formulate and solve engineering problems.
- Demonstrate the ability to apply master’s level knowledge to the specialized area of electrical engineering.

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):

(Please review your current curriculum grid and verify that at least one course has been identified for each outcome in which you expect your students to demonstrate the desired competency of a graduating student. This could be shown in a variety of ways: classroom work, clinical or internship work, a field test, an ePortfolio, etc.)

	Program Learning Outcomes			
	Learning Outcome 1	Learning Outcome 2	Learning Outcome 3	Learning Outcome 4
ECE 6010 - Design Project	H	H	H	H
ECE 6020 - Thesis	H	H	H	H
ECE 6110 - Digital VLSI Design	H	H	H	H
ECE 6120 - Advanced VLSI Design	H	H	H	H
ECE 6130 - Advanced Semiconductor Devices	H	H	H	H
ECE 6140 - Sensors and Instrumentation	H	L	H	L
ECE 6210 - Digital Signal Processing	H	L	H	H
ECE 6220 - Image Processing	H	L	H	H
ECE 6230 - Engineering Applications in Deep Learning	H	L	H	H
ECE 6310 - Electromagnetics II	H	L	H	L
ECE 6320 - Antennas and Wave Propagation	L	H	H	L
ECE 6410 - Communication Circuits and Systems	H	H	L	H
ECE 6420 - Digital Communication	L	H	H	H
ECE 6620 - Digital System Testing	L	L	H	H
ECE 6640 - Optical Communication Systems	L	H	H	H
ECE 6710 - Real-Time Embedded Systems	H	H	H	L
ECE 6730 - Robotics	L	H	H	L
ECE 6800 - Individual Studies	L	L	L	L
ECE 6900 - Special Topics	L	L	L	L

	Program Learning Outcomes			
	Learning Outcome 1	Learning Outcome 2	Learning Outcome 3	Learning Outcome 4
CS 6610 Computer Architecture	H	L	H	H

H – Indicates mastery, L – Introduces or elaborates

D. Program and Contact Information

___ Information is current; no changes required.

Update if not current:

The WSU Master of Science in Electrical Engineering (MSEE) program provides a graduate degree in a high-demand and growing discipline. Further, it offers professionals in the local work force an opportunity to earn an advanced engineering degree, bolster innovation in the community, and thereby promote economic growth. Finally, for those students who are interested, this program provides the necessary preparation for doctoral programs at other institutions of higher learning.

Contact Information:
Dr. Justin B. Jackson
Weber State University
Noorda Engineering Building
Ogden, UT 84408
(801) 626-6078

Master of Science in Electrical Engineering

E. Assessment Plan

MSCE Assessment Plan

The assessment plan is executed using two types of instruments:

1. Course assessment rubrics.
2. Thesis/Project/Portfolio assessment.

These assessment instruments are described below.

Course assessment rubrics

The course assessment rubric is a direct assessment instrument that articulates the expectations for student performance. The rubric consists of three elements:

Dimensions (performance indicators)
Scale (levels of performance) of 1, 2, 3 or 4
Descriptors (descriptions of the levels of performance)

Each course in the MSCE curriculum grid marked "H" has an associated assessment rubric that measures students' performance with respect to the 4 student learning outcomes listed in Section C. Through the continuous use of these rubrics, assessment at both the course and program level is an ongoing process that provides a measurable means of program improvement.

The course assessment rubric works as follows. At the end of each semester, the instructor scores each performance indicator (PI) for the course. A four-point scale is used. The rubrics are designed with a "trigger point." If the score of a PI is 1 (unsatisfactory) or 2 (improving), the instructor initiates action to make course level changes with respect to the applicable PI for the course. If the score of a PI is 3 (satisfactory) or 4 (exemplary), no action is taken by the instructor. Then, the mean PI score for each course and section* is transferred to a program level "continuous course improvement" record, a document that summarizes the mean PI scores. This spreadsheet utilizes a trigger point of 2.67 and if a mean PI score falls below the trigger point, the faculty at the program level must make significant changes to the course or the program to remedy the problem. Thus, depending on the trigger points activated, both the instructor and program faculty have input to the continuous improvement process.
*ECE 6010 assessment data are recorded in the continuous course improvement record only for the semester in which the student defends.

Thesis/Project/Portfolio Assessment

The thesis/project/portfolio assessment is a direct assessment instrument that is completed by all faculty attending the final design review (defense) of a student's project/thesis or by all faculty reviewing a student's portfolio (for those students opting for athe course-only option). This instrument assesses the student's mastery of the program-level learning outcomes listed in Section C.

The project defense assessment instrument works as follows: Faculty attending a final design review or reviewing a portfolio answer four questions corresponding to the four learning outcomes listed in Section C. Responses from these questions fall into a four-point asymmetrical Likert scale:

4 = strongly agree
3 = agree
2 = mixed, and
1 = disagree.

The program director or the student's committee chair calculates the mean response for each question. These responses are recorded in either a Defense Assessment Report or a Portfolio Assessment Report, which is kept and filed by the enrollment director. The enrollment director computes a graduating cohort average for each of the four questions and enters those averages into the continuous improvement record. If the mean value for any question falls below 2.67, the program faculty must initiate action to address the unsatisfactory learning outcome result(s). Conversely, if all mean values are at or above 2.67, no action is initiated by the faculty.

Evidence of Learning

A. Course Assessment Rubrics
   Assessment rubrics for the reporting period Fall 2019 – Spring 2021 are included, below

ECE 6110 (Digital VLSI) Course Assessment Form

Instructor <u>Justin Jackson</u> Semester and Year **<u>Fall 2019</u>**

The following instrument is used to assess the performance of students in ECE 6110 based on exams, homework and laboratory work. A rating of 1-4 is assigned by the instructor to each course outcome if at least 80% of students meet the corresponding criterion. If fewer than 80% of students meet the <u>Improving (2)</u> criterion, a rating of <u>Unsatisfactory (1)</u> must be assigned.

Performance Indicator	Improving (2)	Satisfactory (3)	Excellent (4)	Rating	Action Plan (if rating less than 3)
Ability to design a standard cell library from CMOS	Able to design standard digital logic utilizing a schematic capture tool.	Able to design standard digital logic utilizing a schematic capture and a layout tool.	Able to design standard digital logic utilizing a schematic capture and a layout tool, including verification and simulation of logic.	4	
Ability to design large scale integrated digital systems	Able to design large-scale digital systems utilizing schematic capture tool and hand layout techniques.	Able to design large-scale digital systems utilizing schematic capture tool, hand layout techniques, and auto routing tools.	Able to design large-scale digital systems utilizing schematic capture tool, hardware description languages, hand layout techniques, and auto routing tools.	3	
Ability to design custom digital systems to speed, power, and size constraints	Able to design custom digital systems to size constraints.	Able to design custom digital systems to size and power constraints.	Able to design custom digital systems to size, power, and speed constraints and understand trade-offs and impact on design.	3	

ECE 6710 (Real-Time Embedded Systems) Course Assessment Form

Instructor Fon Brown   Semester and Year Fall 2019

The following instrument is used to assess the performance of students in ECE 6710 based on exams, homework and laboratory work. A rating of 1-4 is assigned by the instructor to each course outcome if at least 80% of students meet the corresponding criterion. If fewer than 80% of students meet the Improving (2) criterion, a rating of Unsatisfactory (1) must be assigned. An action plan is required for each rating of 1 or 2.

Performance Indicator	Improving (2)	Satisfactory (3)	Excellent (4)	Rating	Action Plan (if rating less than 3)
Write multi-threaded real-time applications	Able to write code to perform a context switch but unable to schedule tasks.	Able to write code to context switch and schedule tasks of fixed priority.	Able to write code to context switch and schedule using a dynamic priority protocol.	3	
Create and use synchronization primitives.	Able to write code to implement semaphores but unable to use it properly.	Able to write code to implement semaphores then use it properly.	Able to write code to implement a message queue or mailbox and use it properly.	4	
Control access to resources shared by multiple threads.	Able to control access to a single resource.	Able to control access to multiple resources without deadlock.	Able to control access to multiple resources using a priority ceiling protocol.	3	
Design applications with cooperative threads.	Able to write an application where tasks communicate through shared memory using critical sections.	Able to write an application where tasks communicate through shared memory using semaphores.	Able to write an application where tasks communicate through mailboxes or message queues.	4	
Determine whether a set of tasks is schedulable	Able to prove schedulability for independent tasks.	Able to prove schedulability for tasks that share resources and have critical sections.	Able to prove schedulability for tasks that share resources, have critical sections, self-suspend and are subject to priority inversion.	4	

CS 6610 (Advanced Computer Architecture) Course Assessment Form

Instructor Hugo E. Valle Semester and Year. Fall 2019

The following instrument is used to assess the performance of students in CS 6610 based on exams, homework or laboratory work. A rating of 1-4 is assigned by the instructor to each course outcome if at least 80% of students meet the corresponding criterion. If fewer than 80% of students meet the Improving (2) criterion, a rating of Unsatisfactory (1) must be assigned.

Performance Indicator	Improving (2)	Satisfactory (3)	Excellent (4)	Rating	Action Plan (if rating less than 3)
Employ the quantitative design and analysis of micro architecture	Able to understand how to classify instruction set architectures, memory addressing, including type and size of operands.	Able to understand and operations in the instruction set, instruction for the control flow, encoding an instruction set, and the MIPS architecture, and the five stage pipeline.	Able to understand the RISC instruction set and extending the MIPS pipeline to handle multicycle operations.	4	
Use advanced optimization of cache performance	Able to understand basic optimization techniques such as: larger block size to reduced miss rate, bigger caches to reduce miss rate, and multilevel caches to reduce miss penalty.	Able to understand intermediate optimization techniques such as: higher associativity to reduce miss rate, giving priority to read misses over writes to reduce miss penalty, avoiding address translation during index of the cache to reduce hit time.	Able to understand advanced1 optimization techniques such as: reducing the hit time, increasing cache bandwidth, reducing the miss penalty, reducing the miss rate, and reducing the miss penalty or miss rate via parallelism.	4	
Apply principals of advanced branch prediction	Able to understand branch in a pipeline, branch prediction accuracy and benefits, and basic Instruction Level Parallelism (ILP)	Able to understand data dependencies and hazards, and control dependencies, as well as compiler techniques for exposing ILP	Able to understand how to reduce branch costs with correlation branch prediction, overcoming data hazards with dynamic scheduling,	4	

			and hardware based speculation.		
Analyze mechanism used in the design of graphics processing units	Able to understand vector architecture, vector mask registers, and handling loops.	Able to understand memory banks, handling sparse matrices in vector architecture.	Able to understand NVIDIA GPU computational structures, conditional branching in GPUs, and detecting and enhancing loop-level parallelism.	2	I will revise this topic for next semester. The curriculum is too long. I will substitute this with some programming assignments.
Employ strategies used in the design of symmetric and distributed shared-memory architectures	Able to understand Flynn's taxonomy for parallel machines, and centralized shared-memory architectures.	Able to understand performance of symmetric shared-memory multiprocessors, and distributed-shared memory and director-based coherence.	Able to understand models of memory, programming models and workloads for warehouse-scale computers.	3	

ECE 6130 (Advanced Semiconductors) Course Assessment Form

Instructor Justin____ Semester and Year **Spring 2020**____

The following instrument is used to assess the performance of students in ECE 6130 based on exams and homework. A rating of 1-4 is assigned by the instructor to each course outcome if at least 65% of students meet the corresponding criterion. If fewer than 65% of students meet the Improving (2) criterion, a rating of Unsatisfactory (1) must be assigned.

Performance Indicator	Improving (2)	Satisfactory (3)	Excellent (4)	Rating	Action Plan (if rating less than 3)
Demonstrate knowledge of band energy diagrams and carrier transport phenomena.	Show an understanding of carrier transport phenomena.	Show an understanding of carrier transport phenomena and pn junction band diagrams.	Show an understanding of carrier transport phenomena, pn, and MOS band diagrams.	4	
Demonstrate knowledge of PN junctions, bipolar transistors, MOS capacitors, and MOSFETs.	Show an understanding of PN junction behavior.	Show an understanding of pn junction and BJT transistor behavior.	Show an understanding of pn junction, BJT transistor, MOS capacitors, and MOSFET behavior.	4	
Demonstrate knowledge of semiconductor technology processes.	Show an understanding of the semiconductor technology process.	Show an understanding of the semiconductor technology process and some common semiconductor processes.	Show an understanding of the semiconductor technology process and understanding of many semiconductor processes.	3	

ECE 6210 (Digital Signal Processing) Course Assessment Form

Instructor: hearn Semester and Year **spring2020**

The following instrument is used to assess the performance of students in ECE 6210 based on exams, homework and projects. A rating of 1-4 is assigned by the instructor to each course outcome if at least 80% of students meet the corresponding criterion. If fewer than 80% of students meet the Improving (2) criterion, a rating of Unsatisfactory (1) must be assigned.

Outcome	Improving (2)	Satisfactory (3)	Excellent (4)	Rating	Action Plan (if rating less than 3)
Demonstrate knowledge of discrete-time signals and systems.	Understand Response of LTI systems to impulse response and arbitrary inputs.	Implement structures for realization of discrete-time, linear shift-invariant systems Linear difference equation.	Knowledge of cross- and autocorrelation sequences.	**3**	
Use linear transforms in discrete time systems (DFT, FFT, and Z-transforms).	Pole-zero analysis and Time domain behavior for causal systems.	Determine the transient and steady state responses for discrete-time LTI systems.	Knowledge of causality and stability for discrete-time LTI systems in the Z-domain.	**3.5**	
Analyze discrete-time signals in the Time and Frequency domains.	Understand principles of Ideal Sampling.	Knowledge of ADC and DAC and Quantization effects.	Knowledge of sampling and reconstruction of Continuous time band-pass signals.	**4**	
Synthesize Discrete time systems, FIR, IIR.	Knowledge of FIR and IIR systems.	Implement cascade structures for FIR and IIR systems.	Knowledge of Cascade, Parallel, and Lattice structures for discrete-time systems.	**3.5**	
Demonstrate knowledge of Linear Prediction and Optimum Linear filters.	Characterize discrete-time random processes.	Knowledge of Linear Prediction error filter properties.	Implement Wiener filters for prediction.	**3**	

Report due 11/15/2021

ECE 6410 (Communication Circuits and Systems) Course Assessment Form

Instructor Chris Trampel__________________________________ Semester and Year **Spring 2020**____

The following instrument is used to assess the performance of students in ECE 6410 based on exam and homework questions. A rating of 1-4 is assigned by the instructor to each course outcome if at least 80% of students meet the corresponding criterion. If fewer than 80% of students meet the Improving (2) criterion, a rating of Unsatisfactory (1) must be assigned.

Performance Indicator	Improving (2)	Satisfactory (3)	Excellent (4)	Rating	Action Plan (if rating less than 3)
Design AM, FM, and PCM communication systems.	Can design AM systems but not FM or PCM systems.	Can design AM and FM but not PCM systems.	Can design AM, FM, and PCM systems.	3	
Predict the effect of noise on AM, FM, and PCM communication systems.	Can predict the effect of noise on AM systems but not FM or PCM systems.	Can predict the effect of noise on AM and FM systems but not PCM systems.	Can predict the effect of noise on AM, FM, and PCM systems.	3	
Apply Shannon information theory to predict channel capacity and analyze source encoding schemes.	Can predict channel capacity but not analyze source encoding schemes.	Can predict channel capacity and analyze source encoding schemes.	Can use Shannon information theory to design communication channels and source encoding schemes.	N/A	
Utilize communication circuit building blocks including oscillators, mixers, amplifiers, and filters.	Can utilize filters and amplifiers but not oscillators or mixers.	Can analyze filters, amplifiers, oscillators, mixers, and filters but not build them.	Can analyze and build filters, amplifiers, oscillators, and mixers.	3	

CS 6610 (Advanced Computer Architecture) Course Assessment Form

Instructor Hugo E. Valle Semester and Year. Fall 2020

The following instrument is used to assess the performance of students in CS 6610 based on exams, homework or laboratory work. A rating of 1-4 is assigned by the instructor to each course outcome if at least 80% of students meet the corresponding criterion. If fewer than 80% of students meet the Improving (2) criterion, a rating of Unsatisfactory (1) must be assigned.

Performance Indicator	Improving (2)	Satisfactory (3)	Excellent (4)	Rating	Action Plan (if rating less than 3)
Employ the quantitative design and analysis of micro architecture	Able to understand how to classify instruction set architectures, memory addressing, including type and size of operands.	Able to understand and operations in the instruction set, instruction for the control flow, encoding an instruction set, and the MIPS architecture, and the five stage pipeline.	Able to understand the RISC instruction set and extend the MIPS pipeline to handle multicycle operations.	4	
Use advanced optimization of cache performance	Able to understand basic optimization techniques such as: larger block size to reduce miss rate, bigger caches to reduce miss rate, and multilevel caches to reduce miss penalty.	Able to understand intermediate optimization techniques such as: higher associativity to reduce miss rate, giving priority to read misses over writes to reduce miss penalty, avoiding address translation during index of the cache to reduce hit time.	Able to understand advanced optimization techniques such as: reducing the hit time, increasing cache bandwidth, reducing the miss penalty, reducing the miss rate, and reducing the miss penalty or miss rate via parallelism.	4	
Apply principals of advanced branch prediction	Able to understand branch in a pipeline, branch prediction accuracy and benefits, and basic Instruction Level Parallelism (ILP)	Able to understand data dependencies and hazards, and control dependencies, as well as compiler techniques for exposing ILP	Able to understand how to reduce branch costs with correlation branch prediction, overcoming data hazards with dynamic scheduling,	4	

			and hardware based speculation.		
Analyze mechanism used in the design of graphics processing units	Able to understand vector architecture, vector mask registers, and handling loops.	Able to understand memory banks, handling sparse matrices in vector architecture.	Able to understand NVIDIA GPU computational structures, conditional branching in GPUs, and detecting and enhancing loop-level parallelism.	2	I will revise this topic for next semester. The curriculum is too long. I will substitute this with some programming assignments.
Employ strategies used in the design of symmetric and distributed shared-memory architectures	Able to understand Flynn's taxonomy for parallel machines, and centralized shared-memory architectures.	Able to understand performance of symmetric shared-memory multiprocessors, and distributed-shared memory and directory-based coherence.	Able to understand models of memory, programming models and workloads for warehouse-scale computers.	3	

This semester I tried a new set of programming assignments (2 out of 4) that will help the students understand the pipeline concepts in a more hands-on approach. The simulation software I used before had a lot of bugs. My plan for next year (Fall 2021) is to improve these 2 labs and create two additional ones.

ECE/CS 6320 Course Assessment Form

Instructor: Christian Hearn________________________________ Semester and Year **Fall** **2020**

The following instrument is used to assess the performance of students in ECE/CS 6XXX based on <state basis, e.g. exams, homework or laboratory work>. A rating of 1-4 is assigned by the instructor to each course outcome if at least 65% of students meet the corresponding criterion. If fewer than 65% of students meet the Improving (2) criterion, a rating of Unsatisfactory (1) must be assigned.

Outcome	Improving (2)	Satisfactory (3)	Excellent (4)	Rating (1-4)
Extension of Maxwell's equations to Radiation Integral	General Solution of Maxwell's Eqns for Radiation Problems	Mathematical understanding of antenna characteristics, Impedance, Radiation Efficiency, Polarization	Extension of 1D line source methods to slot and 2D aperture antennas	4
Classification of Antenna Element: Electrically-small, resonant, broadband, aperture	General understanding of radiation patterns vs. impedance bandwidth for major classes of antenna elements	Recognize tradeoffs and design limitations for antenna classes as applied to a communication system	Solve or contribute to relevant antenna design problems	3
Array Theory	Array Factor for Linear Arrays	Pattern Multiplication for 2D arrays	Phased-Arrays and Array Feeding Techniques	3
Computational Electromagnetics (CEM) for antenna design & analysis	Introduction to Method-of-Moments	Simulation of antenna system using commercial software	Design, build & verify with measurement of prototype	2
Antenna measurements	Friis Transmission Equation for Wireless Communication Systems	Familiar with Antenna Pattern measurements	Antenna Polarization measurements	3

ECE 6420 (Digital Communication) Course Assessment Form

Instructor **Fon Brown** Semester and Year **Fall 2020**

The following instrument is used to assess the performance of students in ECE 6420 based on exam and homework questions. A rating of 1-4 is assigned by the instructor to each course outcome if at least 80% of students meet the corresponding criterion. If fewer than 80% of students meet the Improving (2) criterion, a rating of Unsatisfactory (1) must be assigned.

Performance Indicator	Improving (2)	Satisfactory (3)	Excellent (4)	Rating	Action Plan (if rating less than 3)
Use baseband modulation/demodulation techniques to transmit digital data over a noisy, bandwidth-limited channel (wired or wireless)	Able to simulate Matlab/Simulink models for BPSK and QPSK modulation/demodulation but unable to simulate other techniques.	Able to simulate Matlab/Simulink models for binary PAM, BPSK, QPSK, 16-QAM modulation/demodulation.	Able to simulate Matlab/Simulink models for binary PAM, BPSK, QPSK, 16-QAM and other modulation/demodulation techniques such as FHSS, DSSS, and OFDM.	4	
Analyze the fidelity of the digital data	Able to understand Signal to Noise Ratio (Eb/No).	Able to understand Signal Noise Ratio (Eb/No) and generate BER plots in Matlab/Simulink.	Able to understand Signal Noise Ratio (Eb/No), generate BER plots in Matlab/Simulink, and interpret BER for an unknown communication system.	3	
Design various components of the receiver in a digital communication system	Able to understand key concepts such as up-sampling, down-sampling, low-pass-filtering.	Able to understand and apply key concepts such as up-sampling, down-sampling, low-pass-filtering, carrier phase synchronization, and symbol timing synchronization for various mod/demod	Able to understand and apply key concepts such as up-sampling, down-sampling, low-pass-filtering, carrier phase synchronization, and symbol timing synchronization for various mod/demod techniques described	3	

		techniques described above.	above and design a new communication system.		

ECE 6110 (Digital VLSI) Course Assessment Form

Instructor Justin Jackson_______________________________ Semester and Year **Spring 2021**___

The following instrument is used to assess the performance of students in ECE 6110 based on exams, homework and laboratory work. A rating of 1-4 is assigned by the instructor to each course outcome if at least 80% of students meet the corresponding criterion. If fewer than 80% of students meet the Improving (2) criterion, a rating of Unsatisfactory (1) must be assigned.

Performance Indicator	Improving (2)	Satisfactory (3)	Excellent (4)	Rating	Action Plan (if rating less than 3)
Ability to design a standard cell library from CMOS	Able to design standard digital logic utilizing a schematic capture tool.	Able to design standard digital logic utilizing a schematic capture and a layout tool.	Able to design standard digital logic utilizing a schematic capture and a layout tool, including verification and simulation of logic.	4	
Ability to design large scale integrated digital systems	Able to design large-scale digital systems utilizing schematic capture tool and hand layout techniques.	Able to design large-scale digital systems utilizing schematic capture tool, hand layout techniques, and auto routing tools.	Able to design large-scale digital systems utilizing schematic capture tool, hardware description languages, hand layout techniques, and auto routing tools.	3	
Ability to design custom digital systems to speed, power, and size constraints	Able to design custom digital systems to size constraints.	Able to design custom digital systems to size and power constraints.	Able to design custom digital systems to size, power, and speed constraints and understand trade-offs and impact on design.	4	

ECE 6210 (Digital Signal Processing) Course Assessment Form

Instructor Eric Gibbons Semester and Year Spring 2021

The following instrument is used to assess the performance of students in ECE 6210 based on exams, homework and projects. A rating of 1-4 is assigned by the instructor to each course outcome if at least 80% of students meet the corresponding criterion. If fewer than 80% of students meet the Improving (2) criterion, a rating of Unsatisfactory (1) must be assigned.

Outcome	Improving (2)	Satisfactory (3)	Excellent (4)	Rating	Action Plan (if rating less than 3)
Demonstrate knowledge of discrete-time signals and systems.	Understand Response of LTI systems to impulse response and arbitrary inputs.	Implement structures for realization of discrete-time, linear shift-invariant systems Linear difference equation.	Knowledge of cross- and autocorrelation sequences.	3	
Use linear transforms in discrete time systems (DFT, FFT, and Z-transforms).	Pole-zero analysis and Time domain behavior for causal systems.	Determine the transient and steady state responses for discrete-time LTI systems.	Knowledge of causality and stability for discrete-time LTI systems in the Z-domain.	3	
Analyze discrete-time signals in the Time and Frequency domains.	Understand principles of Ideal Sampling.	Knowledge of ADC and DAC and Quantization effects.	Knowledge of sampling and reconstruction of Continuous time band-pass signals.	3	
Synthesize Discrete time systems, FIR, IIR.	Knowledge of FIR and IIR systems.	Implement cascade structures for FIR and IIR systems.	Knowledge of Cascade, Parallel, and Lattice structures for discrete-time systems.	3	
Demonstrate knowledge of Linear Prediction and Optimum Linear filters.	Characterize discrete-time random processes.	Knowledge of Linear Prediction error filter properties.	Implement Wiener filters for prediction.	2	This topic was not covered this semester. (We did cover optimum linear phase

Report due 11/15/2021

					filters, but not Wiener filters.)

ECE 6510 (Advanced Power Systems) Course Assessment Form

Instructor Trent Tholen Semester and Year **Spring 2021**

The following instrument is used to assess the performance of students in ECE 6510 based on exams, homework and laboratory work. A rating of 1-4 is assigned by the instructor to each course outcome if at least 80% of students meet the corresponding criterion. If fewer than 80% of students meet the Improving (2) criterion, a rating of Unsatisfactory (1) must be assigned.

Performance Indicator	Improving (2)	Satisfactory (3)	Excellent (4)	Rating	Action Plan (if rating less than 3)
Analyze, short, medium, and long transmission lines	Student is able to properly analyze short transmission lines but not medium and long lines.	Student is able to properly analyze short, medium, and long transmission lines.	Student is able to properly analyze short, medium, and long transmission lines and apply insight for line characterization	4	
Design, represent, and analyze power systems.	Student is able to represent but not analyze power systems	Student is able to represent, analyze, and design power systems.	Student is able to represent, analyze, and design power systems and apply insight for proper system operation.	4	
Analyze symmetrical and unsymmetrical faults	Student is able to analyze symmetrical but not unsymmetrical faults.	Student is able to analyze symmetrical and unsymmetrical faults.	Student is able to analyze symmetrical and unsymmetrical faults.	4	
Design and analyze circuits using simulation software	Student is able to analyze circuit using simulation software	Student is able to design and analyze circuits using simulation software	Student is able to design, analyze and optimize circuits using simulation software	4	

B. Project Defense Assessment Reports

Project Defense and Portfolio Assessment Reports for the reporting period Fall 2019 – Spring 2021 are included, below.

Project Defense Report

The following report is to be submitted to the program director by the committee chair shortly after a student has successfully defended his or her project.

Student Name *************** Defense Date 15 Nov 2019

Committee Chair Chris Trampel

Transfer the data from each project defense assessment form to the table below using the assignment Strongly Agree = 4, Agree = 3, Mixed = 2 and Disagree = 1. Leave a cell blank if the evaluator failed to assess. Compute the mean of each outcome and enter it into the bottom row.

Evaluator	The student applied knowledge of math, science and	The student designed a system, component or process	The student identified, formulated and	The student applied master's level knowledge to the area of computer
Chris Trampel	4	4	4	4
Kirk Hagen	3	3	3	3
Fon Brown	4	3	3	1
Justin Jackson	4	4	4	4
Average	3.75	3.50	3.50	3.00

Read the additional comments and note any recurring or systemic concerns below:

Project Defense Report

The following report is to be submitted to the program director by the committee chair shortly after a student has successfully defended his or her project.

Student Name ********************_____________________________ Defense Date 4/2/21________

Committee Chair Justin Jackson__________________________________

Transfer the data from each project defense assessment form to the table below using the assignment Strongly Agree = 4, Agree = 3, Mixed = 2 and Disagree = 1. Leave a cell blank if the evaluator failed to assess. Compute the mean of each outcome and enter it into the bottom row.

Evaluator	The student applied knowledge of math, science and	The student designed a system, component or process	The student identified, formulated and	The student applied master's level knowledge to the area of computer
Fon Brown	4	3	2	4
Tye Gardner	5	5	4	4
Christian Hearn	4	4	4	4
Average	4.33	4	3.33	4

Read the additional comments and note any recurring or systemic concerns below:

Report due 11/15/2021

Project Defense Report

The following report is to be submitted to the program director by the committee chair shortly after a student has successfully defended his or her project.

Student Name ****************** Defense Date 3/30/2021

Committee Chair Justin Jackson

Transfer the data from each project defense assessment form to the table below using the assignment Strongly Agree = 4, Agree = 3, Mixed = 2 and Disagree = 1. Leave a cell blank if the evaluator failed to assess. Compute the mean of each outcome and enter it into the bottom row.

Evaluator	The student applied knowledge of math, science and	The student designed a system, component or process	The student identified, formulated and	The student applied master's level knowledge to the area of computer
Nathan West	3	4	4	3
Shellee Dyer	4	4	4	4
Kristin Robosky	4	4	4	4
Fon Brown	4	4	3	4
Average	3.75	4	3.75	3.75

Read the additional comments and note any recurring or systemic concerns below:

Report due 11/15/2021

Portfolio Assessment Report

The following report is to be compiled by the program director after a student's portfolio has been circulated to the faculty.

Student Name ****************________________________ Submission Date 6/28/21

Transfer the data from each portfolio assessment form to the table below using the assignment: Strongly Agree = 4, Agree = 3, Mixed = 2 and Disagree = 1. Leave a cell blank if the evaluator failed to assess. Compute the mean of each outcome and enter it into the bottom row.

Evaluator	The student applied knowledge of math, science and	The student designed a system, component or process	The student identified, formulated and	The student applied master's level knowledge to the area of electrical
Justin Jackson	3	3	3	3
Shellee Dyer	4	3	3	3
Fon Brown	3	3	3	3
Average	3.33	3.00	3.00	3.00

Read the additional comments and note any recurring or systemic concerns below:

Report due 11/15/2021

Portfolio Assessment Report

The following report is to be compiled by the program director after a student's portfolio has been circulated to the faculty.

Student Name ******************______________________________ Submission Date 6/28/21

Transfer the data from each portfolio assessment form to the table below using the assignment: Strongly Agree = 4, Agree = 3, Mixed = 2 and Disagree = 1. Leave a cell blank if the evaluator failed to assess. Compute the mean of each outcome and enter it into the bottom row.

Evaluator	The student applied knowledge of math, science and	The student designed a system, component or process	The student identified, formulated and	The student applied master's level knowledge to the area of electrical
Justin Jackson	4	4	3	3
Shellee Dyer	4	3	3	3
Fon Brown	3	3	3	3
Average	3.67	3.33	3.00	3.00

Read the additional comments and note any recurring or systemic concerns below:

Report due 11/15/2021

C. Continuous Improvement Records
The continuous improvement records for the reporting period Fall 2019 – Spring 2021 are included, below.

MASTERS of SCIENCE in ELECTRICAL ENGINEERING

CONTINUOUS COURSE IMPROVEMENT RECORD

SEMESTER	YEAR
Fall	2019

GRADUATES
1

Summary of Course Assessment Rubrics

Course	Instructor	Mean PI Score	Action(s) to be implemented by instructor (leave blank if none)
ECE 6110	Jackson	3.33	
ECE 6710	Brown	3.60	
CS 6610	Feuz	3.4	I will revise coverage of GPUs for next semester. The curriculum is too long. I will substitute this with some programming assignments.

Program Action Plan (if one or more mean Performance Indicator (PI) values fall below 2.67):

Summary of Project Defense Assessments (Graduating Cohort)

Program Outcome	Score
Ability to apply knowledge of math, science and engineering	3.75
Ability to design a system, component or process	3.50
Ability to identify, formulate and solve engineering problems	3.50
Ability to apply master's level knowledge to the specialized area of computer engineering	3.00

Program Action Plan (if one or more mean Likert Scores fall below 2.67):

MASTERS of SCIENCE in ELECTRICAL ENGINEERING

CONTINUOUS COURSE IMPROVEMENT RECORD

SEMESTER	YEAR
Spring	2020

GRADUATES
0

Summary of Course Assessment Rubrics

Course	Instructor	Mean PI Score	Action(s) to be implemented by instructor (leave blank if none)
ECE 6130	Jackson	3.67	
ECE 6210	Hearn	3.40	
ECE 6410	Trampel	3.00	

Program Action Plan (if one or more mean Performance Indicator (PI) values fall below 2.67):

Summary of Project Defense Assessments (Graduating Cohort)

Program Outcome	Score
Ability to apply knowledge of math, science and engineering	
Ability to design a system, component or process	
Ability to identify, formulate and solve engineering problems	
Ability to apply master's level knowledge to the specialized area of computer engineering	

Program Action Plan (if one or more mean Likert Scores fall below 2.67):

Report due 11/15/2021

MASTERS of SCIENCE in ELECTRICAL ENGINEERING

CONTINUOUS COURSE IMPROVEMENT RECORD

SEMESTER	YEAR
Fall	2020

GRADUATES
0

Summary of Course Assessment Rubrics

Course	Instructor	Mean PI Score	Action(s) to be implemented by instructor (leave blank if none)
ECE 6420	Brown	3.33	
ECE 6320	Hearn	3.00	
CS 6610	Valle	3.40	Revise GPU topic for next semester. The curriculum is too long. I will substitute this with some programming assignments

Program Action Plan (if one or more mean Performance Indicator (PI) values fall below 2.67):

Summary of Project Defense Assessments (Graduating Cohort)

Program Outcome	Score
Ability to apply knowledge of math, science and engineering	
Ability to design a system, component or process	
Ability to identify, formulate and solve engineering problems	
Ability to apply master’s level knowledge to the specialized area of computer engineering	

Program Action Plan (if one or more mean Likert Scores fall below 2.67):

Report due 11/15/2021

MASTERS of SCIENCE in ELECTRICAL ENGINEERING

CONTINUOUS COURSE IMPROVEMENT RECORD

SEMESTER	YEAR
Spring	2021

GRADUATES
4

Summary of Course Assessment Rubrics

Course	Instructor	Mean PI Score	Action(s) to be implemented by instructor (leave blank if none)
ECE 6210	Gibbons	2.80	
ECE 6110	Jackson	3.67	
ECE 6510	Tholen	4.00	Adjunct

Program Action Plan (if one or more mean Performance Indicator (PI) values fall below 2.67):.

Summary of Project Defense Assessments (Graduating Cohort)

Program Outcome	Score
Ability to apply knowledge of math, science and engineering	3.77
Ability to design a system, component or process	3.58
Ability to identify, formulate and solve engineering problems	3.27
Ability to apply master's level knowledge to the specialized area of computer engineering	3.44

Program Action Plan (if one or more mean Likert Scores fall below 2.67):

Report due 11/15/2021

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			
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. We have had one minority student out so far in our MSEE program.

2) What support (from enrollment services, advising, first-year transition office, access & diversity, etc.) do you need to help you recruit and retain students? N/A

3) We have invited you to re-think your program assessment. What strategies are you considering? What support or help would you like? Not sure.

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? No, N/A

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