CALIFORNIA STATE UNIVERSITY, FRESNO

LYLES COLLEGE OF ENGINEERING

Master of Science in Engineering - Electrical Engineering Option (MSE-EE)

Student Outcomes Assessment Plan (SOAP)

Updated April, 2012

Mission Statement

The objective of MSE-EE Program is to provide advanced engineering education in Electrical Engineering to resident students as well as practicing engineers working in the high-tech industries surrounding the Fresno metropolitan area. Graduates of this program should be able to advance their career and work on complex engineering problems dictated by continuing advances in technology. Additionally, the program seeks to prepare graduates for advanced research and engineering applications to fulfill the technical needs of local industry in the region and beyond.

MSE-EE Program Objective

The Master of Science in Electrical Engineering program builds upon a previously acquired foundation in basic science, mathematics, and electrical engineering to advance skills in research and applied engineering science. The objective of the program is to **enhance the graduates' ability to advance their chosen careers in industry, academia, and public institutions**. Career advancement can be in the form of successfully completing higher education or practicing engineering where assumed responsibilities are well beyond those expected of entry level engineering positions. Advancing careers in practice can be via

1) a deeper understanding of engineering theoretical and applied concepts,
2) engaging in advanced technological endeavors including research, and
3) contributing effectively to the mission of the organization.

These program objectives are consistent with the essential components of the mission and vision of California State University Fresno:

- Support and develop high quality graduate programs appropriate to the needs of the region
- Engage in high quality research, with particular emphasis on applications that support the region.
- Build upon existing academic programs and create new academic programs to help transform and develop the region

The ECE faculty members of the MSE-EE program offer courses and conduct scholarly work in the broader area of electrical engineering including communication, control systems, VLSI/digital systems, robotics, power systems, and high frequency electronics. These areas overlap and they provide opportunities for integration and cross-area projects. This facilitates providing students with broad backgrounds and programs of study that prepare them best for practice as well as more advanced studies.

The minimum number of units required to complete the MSE-EE degree is 30 units including the culminating experience. The possible options for culminating experience are Comprehensive Exam (0 units), Directed Project (3 units) and Directed Thesis (3-6 units). Through academic advising, students choose the subject that fits their career goals most. The thesis option is usually recommended for those who have interest in pursuing doctorate studies or practice positions with a major research component. Students who are interested most in applied engineering and intend to practice upon graduation are advised to pursue the project or the comprehensive exam option. The project option is usually preferred for those who desire to prepare themselves for development projects with advanced technical emphasis.

Student Learning Outcomes (SLOs)

The graduate of the program should be able to

1. apply advanced mathematics and engineering science concepts to practical problems.
2. demonstrate knowledge in advanced electrical engineering subjects and utilize advanced engineering tools to solve engineering problems.
3. utilize modern engineering tools, conduct experiments and analyze collected data (hands-on).
4. communicate effectively orally and in writing.
5. conduct literature searches and formulate ideas via critical thinking practices.

Table 1 demonstrates how the curriculum supports the stated SLOs.

Table 1 Curriculum Map

Learning Outcome	***ENGR 200 (core)***	***ENGR 201 (core)***	***ECE 224 (core)***	***ECE 100-level Electives***	***ECE 200-level Electives***	***ECE 290***	***Culminating Experience***
1		3	2	2	3	3	3
2		3	3	2	3	2	3
3		3		2	1	1	3
4	3	2			1	3	3
5	3	1	1		1	3	3

3=strong, 2=moderate, 1=possible

Table 2 summarizes the assessment tools utilized to collect data. Direct and indirect assessment tools are also identified.

Table 2 Assessment Tools

Learning Outcome	***Student Course work (direct)***	***Embedded questions (direct)***	***Evaluation of culminating experience (direct)***	***Exit survey (indirect)***	***Hands-on (direct)***	***Alumni Survey (indirect)***
1	X	X	X			X
2	X	X	X	X		X
3			X		X	X
4			X	X		X
5			X			X

Standard: On a scale of 1 (poor) to 5 (excellent), the faculty members consider a rating of 3.75 or higher to be satisfactory. A rating below 2.75 for any of the outcomes requires immediate attention, and a rating between 2.75 and 3.75 requires further observation as a "carry over item" in the next evaluation cycle.

Rubrics for assessing student learning outcomes have been developed and utilized. (Attached)

Time Schedule and Closing the Loop

Table 3 presents the time schedule for administering the assessment tools. It should be noticed that this schedule facilitates collecting a minimal amount of data on all SLOs every year.

Table 3 Time Schedule

Student Course work (direct)	***Embedded questions (direct)***	***Evaluation of culminating experience (direct)***	***Exit survey (indirect)***	***Lab Performance (direct)***	***Alumni Survey (indirect)***
One core course every year	One 200-level elective course every year	Every year	Every year	Every year	Every fourth year 2010 (completed), 2014, 2018

Collected data is to be compiled and analyzed by the faculty every year for continuous monitoring. Rating below 3.75 may require immediate attention and further data gathering before the end of the four-year cycle. A comprehensive review of the program takes place every four years to examine patterns in data and determine action items for program improvement.

Rubric
Application of MATH, SCIENCE, and ENGR Principles
MSE-EE Student Learning Outcome 1

Course#: _____

Evaluate each item on a scale of 1 to 5 (5 is the highest).

Item	Proficiency					
	5	4	3	2	1	N/A
Proper selection of math/science/engr principles	*Selection of math/science/engr principles was well justified and explained*		*Selection of math/science/engr was partially justified*		*Selection of math/science/engr was not justified*	
Application of math/science/engr to problems	*Advanced math/science/engr principles were applied with depth to solve key problems in depth*				*Math/science/engr principles were referred but not applied to solve key problems*	
The effectiveness of applying math/science/engr principles to problems	*Application of Math/science/engr principles was essential to solve key problems*				*Application of Math/science/engr principles was not related to solve key problems*	

Average Score: _____

Evaluator: _____ Date:_____

Rubric
Knowledge in EE Subjects and Engineering Tool Skills
MSE-EE Student Learning Outcome 2

Course#: _____

Evaluate each item on a scale of 1 to 5 (5 is the highest).

Item		Proficiency					
		5	4	3	2	1	N/A
In-depth Knowledge on EE Subjects	*Problem formulation*	*Conduct research to Identify and formulate a problem using mathematical tools and engineering models*					
	Problem solving	*Solve problem mathematically or using engineering tools*					
	Analyzing results	*Analyzing results quantitatively*					
Engineering Tool Skill	*Modeling Tools*	*Fluent*				*Learning*	
	Design Tools	*Fluent*				*Learning*	
	Analysis Tools	*Fluent*				*Learning*	
	Manufacturing Tools	*Fluent*				*Learning*	

Average Score: _____

Evaluator: _____ Date:_____

Rubric
Conduct Experiments and Data Analysis
MSE-EE Student Learning Outcome 3

Course#: _____

Evaluate each item on a scale of 1 to 5 (5 is the highest).

Item		Proficiency					
		5	4	3	2	1	N/A
Experiments and analysis of data	*Predefined Objectives and Goals*	*Understand the objectives and goals of conducting experiments*				*Conduct experiments without goals*	
	Proper Methodology	*Prepare the experiments with equipments and well-thought procedures*				*No preparation*	
	Data analysis	*Data analysis using mathematical tools and engineering modeling*				*No verification of the data from experiments*	

Average Score: _____

Evaluator: _____ Date:_____

Rubric
Technical Communication Skills
MSE-EE Student Learning Outcome 4

Course#: _____

Evaluate each item on a scale of 1 to 5 (5 is the highest).

Item		Proficiency					
		5	4	3	2	1	N/A
Verbal communication	*Delivery*	*Proper choice of verbal language*				*Use of casual, conversational, impolite language*	
	Time	*Effective use of time*				*Untimely delivery (Overtime)*	
	Interaction with Audience	*Eye contacts, Posture, and Q/A*				*Showing nervousness*	
Written Communication	*Grammar*	*Free from grammar errors*				*Need a proof reading.*	
	Technical Writing Style	*Paragraphs were written and organized to support thesis statements.*				*Paragraphs were written without a direction.*	
	Focus and Organization	*Introduction, main body, and conclusions were written coherently to deliver a main theme of the document.*				*Lack of structure and focus*	

Average Score: _____

Evaluator: _____ Date:_____

Rubric
Literature Search and Critical Thinking
MSE-EE Student Learning Outcome 5

Course#: _____

Evaluate each item on a scale of 1 to 5 (5 is the highest).

Item		Proficiency					
		5	4	3	2	1	N/A
Literature Searches	*Relatedness*	*All the cited references were related to the study.*				*Most references were not related to the study.*	
	Sufficiency	*Enough number of major references were cited and studied.*				*The number of references is too small.*	
Critical Thinking	*Formulate*	*Problem formulation was supported by preliminary study and a sequence of logical reasoning.*				*Problem formulation was not justified.*	
	Approach	*The solution of problem was approached scientifically using a sequence of logical steps.*				*No systematic approach.*	
	Correctness	*The correctness of problem solution was verified using scientific method, mathematically or engineering modeling.*				*The correctness of problem was not discussed.*	
	Completeness	*The pros and cons of the problem solution were discussed using well-versed logic and justification.*				*The problem solution was given without reasonable justification.*	

Average Score: _____

Evaluator: _____ Date:_____