

**Continuous Improvement Report
Electrical Engineering
2014-2015 Academic Year**

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A. Data

A.1. Focus Group Summary

(Complete minutes available)

Students requested the following:

- Extend Senior Capstone to three quarters
- More projects, less simulation
- Better advising
- Help with tutoring

A.2. Exit survey Summary

(Raw data available upon request)

The table below shows the results of surveying 29 of the graduates in the EE program some time during their Capstone course in the Spring 2015 quarter. Note that students respond to how well they think EWU honed various skills. Each question relates to one of the (a)-(k) criteria.

Electrical Engineering Student Exit Survey		Exemplary	Satisfactory	Below Average	Unsatisfactory	Not Applicable
Rate how well you think EWU prepared you to apply mathematics, science, engineering concepts, techniques and modern tools in the field of Electrical Engineering						
Overall		11	17			1
Rate your ability to apply knowledge of mathematics, science and engineering		12	16	1		
Rate your ability to design and conduct experiments, as well as to analyze and interpret data		12	16	1		
Rate your ability to design a system, component, or process to meet desired needs within realistic constraints		9	17	3		
Rate your ability to identify, formulate, and solve engineering problems		11	16	2		

Rate your ability to keep up with contemporary issues in the field			11	17		1	
Rate your ability to use the techniques, skills, and modern engineering tools in Electrical Engineering			11	15	2		1
Rate how well you think EWU prepared you to develop social and leadership skills such as effective communication skills, team work skills and independent learning ability							
Overall			16	12			1
Rate your ability to function effectively in teams			15	13	1		
Rate your ability to maintain an ethically rigorous record			20	9			
Rate your ability to communicate effectively			19	7	2	1	
Rate your ability to learn independently			12	15	2		
Rate how well you think you understand the impact of professionalism, ethical responsibility, and social, economic, technical and global implications of their engineering contributions			13	11	4		1
Rate your recognition of the need to engage in lifelong learning			22	7			
Rate how well you think EWU prepared you to enter the workforce			8	21			

A.3. Performance Indicators Evaluation Data

According to our assessment plan, in AY 2014-15 we only perform course assessment of outcomes (f), (g), and (h). This data is presented below.

Outcome (f): *An understanding of professional and ethical responsibility.*

Performance Indicator	Unsatisfactory-1	Below Average-2	Satisfactory-3	Exemplary-4
Students must demonstrate practical knowledge of engineering ethics.	Student scored lower than 60% on the NSSPE ethics quiz.	Student scored at least 60% but less than 80% on the NSSPE ethics quiz.	Student scored at least 80% but less than 97% on the NSSPE ethics quiz.	Student scored greater than 97% on the ethics quiz.
Students must be able to list the requirements for obtaining the FE.	Student did not know anything about the FE.	Student knew what the FE is but was uncertain about the exact requirements and procedures for obtaining the FE.	Student knew what the FE is and what the exact requirements and procedures for obtaining the FE.	Student was in the process of completing or had actually completed the FE.
Students must be able to list the requirements for obtaining the PE license.	Student did not know anything about the PE.	Student knew what the PE is but was uncertain about the exact requirements and procedures for obtaining the PE.	Student knew what the PE is and what the exact requirements and procedures for obtaining the PE.	Student had made a plan for obtaining his/her PE for after they graduate.

PI #1: Students must demonstrate practical knowledge of engineering ethics.

- i. Ethics test in capstone course (EENG 490).

Data #i: The following is a series of questions pertaining to the NSPE code of ethics. Please indicate whether the statements are true or false on the separate answer sheet. (questions not shown here) (EENG 490)

PI#1						
Data		Unsatisfactory	Below Average	Satisfactory	Exemplary	Total
i	No of Students	3	7	13	8	31
	Percentage	10%	23%	42%	26%	100%
Achievement Metric		10%	23%	42%	26%	100%

PI #2: Students must be able to list the requirements for obtaining the FE.

- i. Assignment in capstone (EENG 490).

Data #i: Write an essay on how you can obtain an FE license. (EENG 490)

PI#2						
Data		Unsatisfactory	Below Average	Satisfactory	Exemplary	Total
i	No of Students	3	5	16	7	31
	Percentage	10%	16%	52%	23%	100%
Achievement Metric		10%	16%	52%	23%	100%

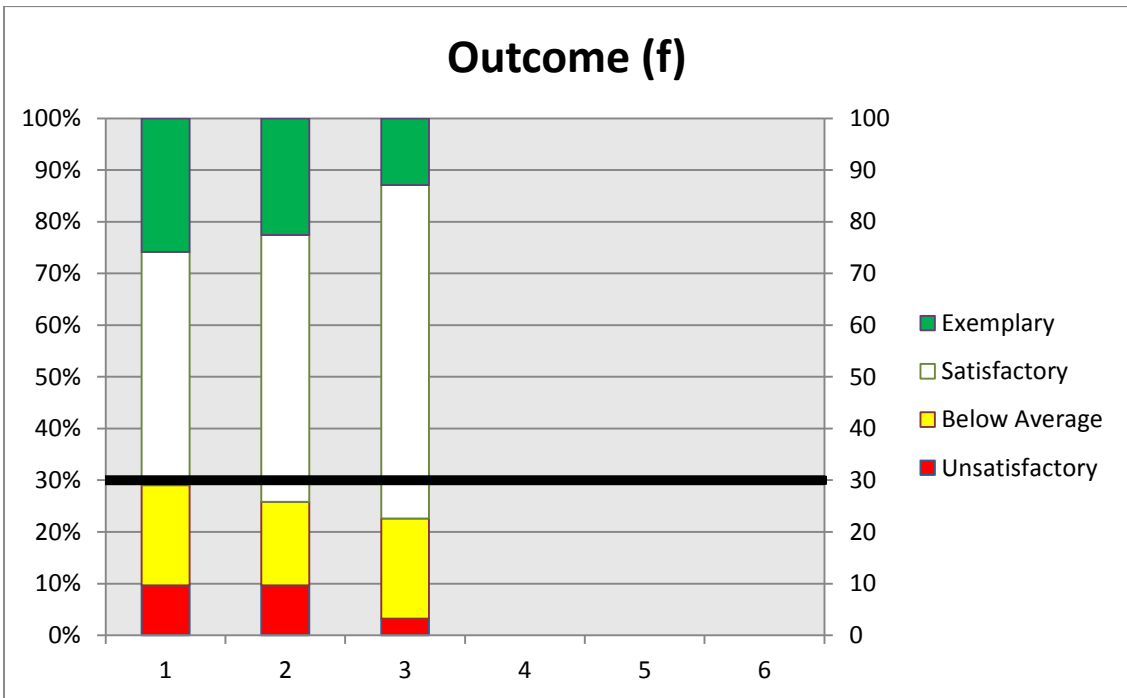
PI #3: Students must be able to list the requirements for obtaining the PE license.

- i. Assignment in capstone (EENG 490).

Data #i: Write an essay on how you can obtain a PE license. (EENG 490)

PI#3						
Data		Unsatisfactory	Below Average	Satisfactory	Exemplary	Total
i	No of Students	1	6	20	4	31
	Percentage	3%	19%	65%	13%	100%
Achievement Metric		3%	19%	65%	13%	100%

Summary Graph for Outcome (f)



Outcome (g): *An ability to communicate effectively.*

Performance Indicator	Unsatisfactory -1	Below Average-2	Satisfactory-3	Exemplary-4
Student must be able to report findings through a written lab report.	Student failed to summarize findings, had an incomplete report, had an excessive number of spelling and/or grammatical mistakes, and used language that was many times incomprehensible.	Student summarized findings and had a complete report, but had several spelling and/or grammatical mistakes, and used language that was many times incomprehensible	Student summarized findings and had a complete report, but had a few spelling and/or grammatical mistakes.	Student summarized findings and had a complete report, used clear and concise language.
Student must be able to describe a circuit/code/algorithm design through a project report.	Student was unable to describe the circuit/code / algorithm design.	Student was able to list and identify the various circuit/code/algorithm elements, but unable to explain its workings.	Student was able to correctly identify the various circuit/code / algorithm elements, and to describe most of the circuit/code/algorithm design techniques used.	Student was able to describe the circuit/code / algorithm design process, as well as explain why the circuit/code/algorithm behaves the way it does.
Student must be able to prepare presentation slides and employ them to do an oral presentation.	Student presented cluttered slides, with no visual aids, and did not present the material clearly.	Student presented uncluttered slides, but with no visual aids, and did not present the material clearly.	Student presented professional, uncluttered slides, with adequate visual and written content, but did not present the material clearly.	Student presented professional, uncluttered slides, with adequate visual and written content, as well as presented the material in a clear and composed manner.

PI #1: Student must be able to report findings through a written lab report.

- i. Lab report from Microelectronics 1 (EENG 330).
- ii. Lab report from Signals & Systems (EENG 321).

Data #i: Lab #2: Lab on I/V characteristics of a diode. Students must investigate the effect of temperature variations on the I/V curve. (EENG 330)

Data #ii: Lab report from Lab Experiment 7: Discrete-Time Signals. (EENG 321)

PI#1						
Data		Unsatisfactory	Below Average	Satisfactory	Exemplary	Total
i	No of Students	2	4	15	1	22
	Percentage	9%	18%	68%	5%	100%
ii	No of Students	2	3	10	1	16
	Percentage	13%	19%	63%	6%	100%
Achievement Metric		11%	18%	65%	5%	100%

PI #2: Student must be able to describe a circuit/code/algorithm design through a project report.

- i. Circuit description of final project from Digital Circuits (EENG 160).
- ii. Circuit/code/algorithm description of final project from Microcontroller Systems (EENG 260).

Data #i: Final Project Report, Design a 2 Bit Calculator which is able to add/Sub, multiply and compare. (EENG 160)

Data #ii: Final Project Report, section on circuit/code description. Project varies based on student's interests, but it must use at least one of the subsystems of the HC11 microcontroller and interface with external circuitry. (EENG 260)

PI#2						
		Unsatisfactory	Below Average	Satisfactory	Exemplary	Total
Data						
i	No of Students	7	6	25	5	43
	Percentage	16%	14%	58%	12%	100%
ii	No of Students	3	6	23	8	40
	Percentage	8%	15%	58%	20%	100%
Achievement Metric		12%	14%	58%	16%	100%

PI #3: Student must be able to prepare presentation slides and employ them to do an oral presentation.

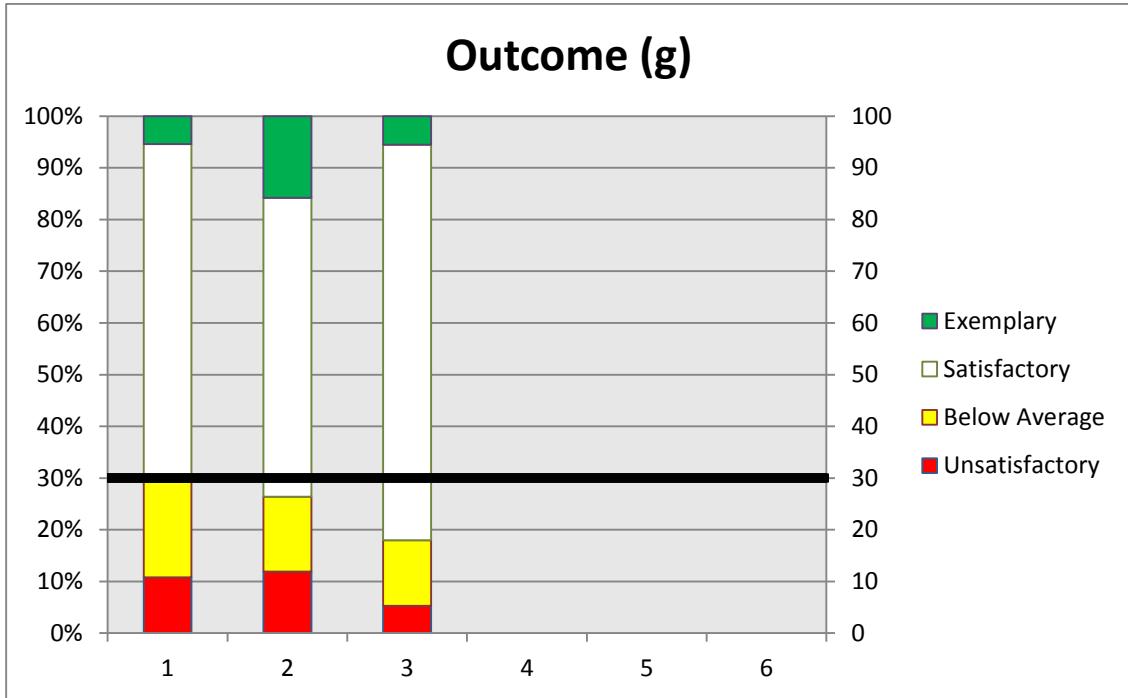
- i. Final project presentation in signals & systems (EENG 321).
- ii. Final project presentation in capstone course (EENG 490).

Data #i: Students worked on term projects of their own choosing. Sample projects include image denoising using a progressive switching median filter, invisible digital watermarking of images, whistle controlled light dimmer, etc. (EENG 321)

Data #ii: Week 4 preliminary design presentations. (EENG 490)

PI#3						
		Unsatisfactory	Below Average	Satisfactory	Exemplary	Total
Data						
i	No of Students	1	4	19	2	26
	Percentage	4%	15%	73%	8%	100%
ii	No of Students	2	3	24	1	30
	Percentage	7%	10%	80%	3%	100%
Achievement Metric		5%	13%	77%	6%	100%

Summary Graph for Outcome (g)



Outcome (h): *The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.*

Performance Indicator	Unsatisfactory-1	Below Average-2	Satisfactory-3	Exemplary-4
Student must be able to analyze the effects a given technology has in society.	Student has no awareness of how the given technology affects society.	Student is aware that the given technology has effects in society.	Student can list the positive and negative effects of the technology in society.	Student can explain the different effects the technology has in society, as well its evaluate the pros and cons.
Students must outline the environmental effects associated with their capstone project.	Student is unable to outline the environmental effects of his/her capstone project.	Student is able to identify some of the environmental effects of his/her capstone project.	Student is able to outline the environmental effects of his/her capstone project, but cannot provide alternatives for improvement.	Student is able to outline the environmental effects of his/her capstone project, as well as providing alternatives for improvement.
Students must outline the economic effects associated with their capstone project.	Student is unable to outline the economic effects of his/her capstone project.	Student is able to identify some of the economic effects of his/her capstone project.	Student is able to outline the economic effects of his/her capstone project, but cannot provide alternatives for improvement.	Student is able to outline the economic effects of his/her capstone project, as well as providing alternatives for improvement.
Students must outline the global effects associated with their capstone project.	Student is unable to outline the global effects of his/her capstone project.	Student is able to identify some of the global effects of his/her capstone project.	Student is able to outline the global effects of his/her capstone project, but cannot provide alternatives for improvement.	Student is able to outline the global effects of his/her capstone project, as well as providing alternatives for improvement.

PI #1: Student must be able to analyze the effects a given technology has in society.
 i. Essay from Technology in World Civilizations (TECH 393).

Data #i: Students are asked to select any technology that interests them and write an essay analyzing the effects on society of that technology. (TECH 393)

PI#1						
		Unsatisfactory	Below Average	Satisfactory	Exemplary	Total
Data						
i	No of Students	3	4	24	6	37
	Percentage	8%	11%	65%	16%	100%
Achievement Metric		8%	11%	65%	16%	100%

PI #2: Students must outline the environmental effects associated with their capstone project.
 i. “Environmental Effects” section in week 8 deliverable in capstone course (EENG 490).

Data #i: Write a paper describing the global, economical, environmental and societal effects of your project. (EENG 490)

PI#2						
		Unsatisfactory	Below Average	Satisfactory	Exemplary	Total
Data						
i	No of Students	3	5	23	0	31
	Percentage	10%	16%	74%	0%	100%
Achievement Metric		10%	16%	74%		100%

PI #3: Students must outline the economic effects associated with their capstone project.

- i. “Economic impact” section in week 8 deliverable in capstone course (EENG 490).

Data #i: Write a paper describing the global, economical, environmental and societal effects of your project. (EENG 490)

PI#3

Data		Unsatisfactory	Below Average	Satisfactory	Exemplary	Total
i	No of Students	1	3	20	7	31
	Percentage	3%	10%	65%	23%	100%

Achievement Metric	3%	10%	65%	23%	100%
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PI #4: Students must outline the global effects associated with their capstone project.

- i. “Global Effects” section in week 8 deliverable in capstone course (EENG 490).

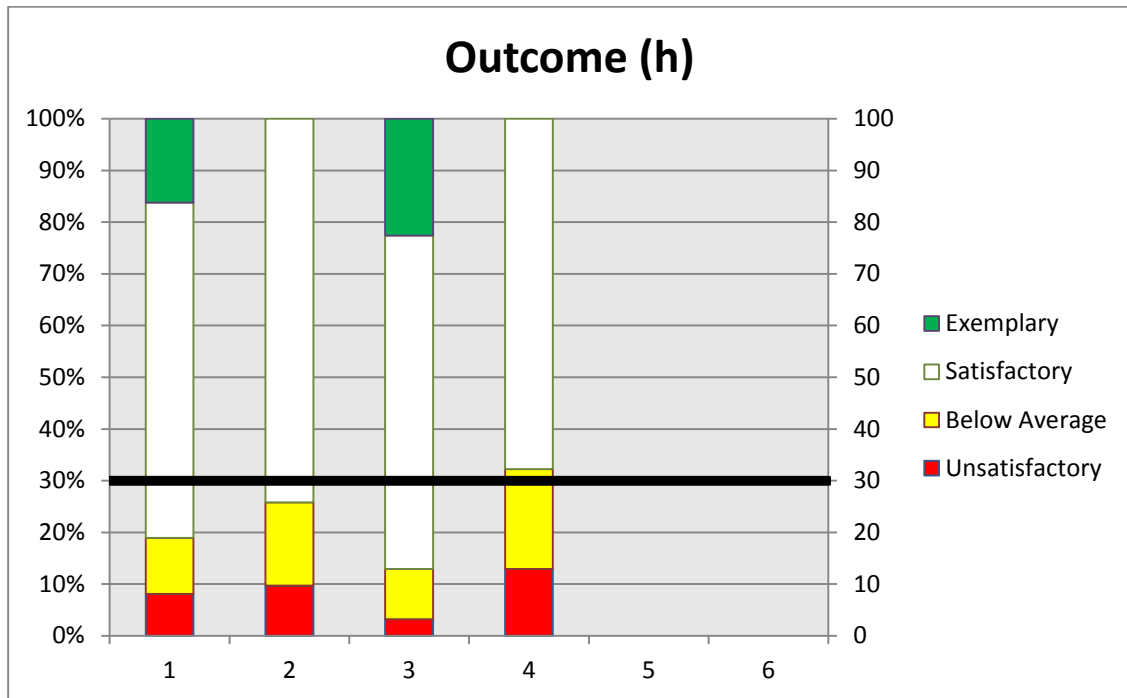
Data #i: Write a paper describing the global, economical, environmental and societal effects of your project. (EENG 490)

PI#4

Data		Unsatisfactory	Below Average	Satisfactory	Exemplary	Total
i	No of Students	4	6	21	0	31
	Percentage	13%	19%	68%	0%	100%

Achievement Metric	13%	19%	68%		100%
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Summary Graph for Outcome (h)



B. Analysis of Data

The exit survey resulted in no red flags. Students seem to be overwhelmingly happy about the instruction they receive at EWU.

The focus group yielded a few interesting observations. Students like hands-on experience and seem to downplay simulation. There is a fair amount of ‘hardware’ in the laboratory, but there also is a healthy complement of software simulation. Students would like to see more of the former and less on the latter. Students would also like more flexibility in course offerings, as sometimes they have to wait a year to retake a class. Students would like Senior Capstone to become a three-quarter sequence. It is worth noting that in 2013 we changed this class from a one-quarter class into two quarters.

The PI data analysis will be split up by outcome:

Outcome (f). Outcome was met.

Outcome (g). Outcome was met.

Outcome (h). Outcome was met.

Outcome (i).

C. Summary of Faculty Discussion

At the quarterly/annual faculty meeting, the following issues were discussed.

Issue #1: Students prefer indulging in a few more hands-on experience. (focus group & exit survey)

- Faculty noted that this was discussed in previous years, and the faculty feel comfortable with the current setup.
- Recommendation: Continue monitoring issue.

Issue #2: Some students are not well prepared in circuits/math to complete senior capstone projects (faculty observation)

- We have observed that there is a variety of skills lacking in senior project (and other classes): circuit design skills, mathematical skills, analytical skills, coding skills. There are a variety of reasons for this, but by and large we need to standardize some portions of circuit design (i.e. among all faculty), software (same), etc.
- Recommendation #1: Put a minimum passing grade of 2.0 to the following classes: EENG 209, EENG 260, EENG 330
- Recommendation #2: Make sure that all sections of all core, basic classes have similar grading (this will be done between faculty when teaching classes).

Issue #6: Capstone should be three quarters (focus group & exit survey)

- Faculty believe this is not an issue yet.

- Recommendation: Continue monitoring issue.

D. Recommended Changes

The faculty has agreed to implement the following programmatic changes in the upcoming academic year, 2013-2014.

- Change #1: Submit CPAC forms to make 2.0 minimum requirement for EENG 209, EENG 260, EENG 330