

## Program-Level Assessment: Annual Report

Program Name (no acronyms): Computer Engineering

Department: School of Engineering

Degree or Certificate Level: Undergraduate

College/School: Parks College of Engineering, Aviation and Technology

Date (Month/Year): 08/2021

Assessment Contact: Dr. Kyle Mitchell

In what year was the data upon which this report is based collected? AY 20/21

In what year was the program's assessment plan most recently reviewed/updated? Major Update Presently In progress

### 1. Student Learning Outcomes

Which of the program's student learning outcomes were assessed in this annual assessment cycle? (Please list the full, complete learning outcome statements and not just numbers, e.g., Outcomes 1 and 2.)

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

Historic Outcomes

g - an ability to communicate effectively

f - an understanding of professional and ethical responsibility

h - the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

j - a knowledge of contemporary issues

### 2. Assessment Methods: Artifacts of Student Learning

Which artifacts of student learning were used to determine if students achieved the outcome(s)? Please describe and identify the course(s) in which these artifacts were collected. Clarify if any such courses were offered a) online, b) at the Madrid campus, or c) at any other off-campus location.

3 - ECE 3090, battery experiment technical report  
ECE 4800, Final Design Report and Poster Presentation

4 - ECE 1001, Current Trends in Battery Technology Paper  
ECE 4800, Final Design Report

All classes assessed were taught in a Hybrid Flex modality.

### 3. Assessment Methods: Evaluation Process

What process was used to evaluate the artifacts of student learning, and by whom? Please identify the tools(s) (e.g., a rubric) used in the process and **include them in/with this report document** (do not just refer to the assessment plan).

Each of the artifacts were assessed by three faculty members from the program. These assessments were collated and presented to the entire program faculty. The recommendations from these three assessments were discussed by the full program faculty and program improvements developed.

For details on assessment material, rubrics and process see attached document starting on page 4.

#### 4. Data/Results

What were the results of the assessment of the learning outcome(s)? Please be specific. Does achievement differ by teaching modality (e.g., online vs. face-to-face) or on-ground location (e.g., STL campus, Madrid campus, other off-campus site)?

There is no difference in teaching modality as the majority of these classes only have one section.

For data see results pages – Starting on Page 11.

We assessed a total of 10 samples from 5 assignments of outcome 3. Approximately half of these samples did not meet expectations.

We assessed a total of 18 samples from 5 assignments of outcome 4. Approximately 2/3 of these samples did not meet expectations.

#### 5. Findings: Interpretations & Conclusions

What have you learned from these results? What does the data tell you?

For findings see results pages – Starting on Page 11.

#### 6. Closing the Loop: Dissemination and Use of Current Assessment Findings

A. When and how did your program faculty share and discuss these results and findings from this cycle of assessment?

In a meeting on August 18, the results of the assessment activities were discussed. The recommendations were used to determine actions.

To see the determined actions please see attached – Starting on Page 15

B. How specifically have you decided to use these findings to improve teaching and learning in your program? For example, perhaps you've initiated one or more of the following:

Changes to the Curriculum or Pedagogies

- Course content
- Teaching techniques
- Improvements in technology
- Prerequisites

- Course sequence
- New courses
- Deletion of courses
- Changes in frequency or scheduling of course offerings

Changes to the Assessment Plan

- Student learning outcomes
- Artifacts of student learning
- Evaluation process

- Evaluation tools (e.g., rubrics)
- Data collection methods
- Frequency of data collection

Please describe the actions you are taking as a result of these findings.

To see the determined actions please see attached – Starting on Page 15

If no changes are being made, please explain why.

#### 7. Closing the Loop: Review of Previous Assessment Findings and Changes

A. What is at least one change your program has implemented in recent years as a result of assessment data?

When reviewing outcome b.2 in AY20 a decision was made to; modify the experiment to have the students assess if they have recorded bad data, discuss how they arrived at this assessment and discuss what should be done about it.

This is a change in the specific request for the data analysis section of the experiment report. This change will cause students to perform additional analysis on the quality of the data they have recorded. This additional analysis should better demonstrate mastery of analyzing and interpreting data.

**B.** How has this change/have these changes been assessed?

The new version of outcome b.2 is not scheduled to be re-assessed until May 2022.

**C.** What were the findings of the assessment?

**D.** How do you plan to (continue to) use this information moving forward?

As we continue to execute our assessment plan we will continue to use the prescribed assignment for outcomes 3 and 4 to gather data on the students' ability to engage in lifelong learning. The hope is that in May 2024 we will see improvement and continue to deliver the course with the implemented change, otherwise we will look at the evidence and see if there evidence this has helped at all and suggest further changes in this and other courses.

**IMPORTANT: Please submit any assessment tools (e.g., rubrics) with this report as separate attachments or copied and pasted into this Word document. Please do not just refer to the assessment plan; the report should serve as a stand-alone document.**

(3) an ability to communicate effectively with a range of audiences

Historical Outcomes:

- (g) an ability to communicate effectively

TABLE 10 Student Outcome (3) assessment indicators and descriptions.

Indicator	Course	Assessment Description
1. Ability to write a technical report that details a design including the constraints, solution, performance results and conclusions.	ECE3090	The battery experiment technical report.
	ECE4800/ ECE4810	The PDR, CDR, and/or FDR technical reports.
2. Ability to communicate, in written and/or verbal forms, with non-technical people such as vendors, lawyers, non-technical supervisors, etc.	ECE4800/ ECE4810	Exhibit through a poster presentation given to the public at large at a year-end conference.
3. Ability to write and deliver an effective technical presentation.	ECE3090	The battery experiment presentations.
	ECE4800/ ECE4810	The PDR, CDR, and/or FDR presentations.

This outcome refers to an ability to communicate in a variety of forms and to a variety of people. The phrase “variety of people” can refer to technical people such as peer students and instructors. It can also refer to non-technical people such as vendors, lawyers, etc.

For example, students communicate with one another in team meetings carried out as part of the ECE3090 and ECE4800/ECE4810 courses.

Indicator #1: This refers to an ability to write a technical report to peers and faculty. The technical report is to be written with an appropriate format, with appropriate section headings, and with appropriate writing in each section.

- ECE3090: Student are required to measure the internal resistance of a battery. Besides submitting the experiment document and the experiment report, students are also to turn in a design report that describes details of the experimental design development. *Students will demonstrate an ability to write a technical report as evidenced by a report detailing their design process for the battery experiment.*
- ECE4800/ECE4810: Students are required to write a Preliminary Design Review (PDR) report, a Critical Design Review (CDR) report, and a Final Design Review (FDR) report. These reports collectively contain all the details of the engineering design work carried out as part of the culminating senior design experience. *Students will demonstrate an ability to write a technical report as evidenced by the PDR, CDR or FDR.*

Indicator #2: This refers to an ability to communicate, in written and verbal form, to non-technical people. Each year, all senior design student groups across the University present their projects at a University sponsored symposium targeting both technical and non-technical people

- ECE4800/ECE4810: Students are required to publish their projects at a University symposium through a poster presentation which targets both technical and non-technical people. *Students will demonstrate an ability to communicate, in written form, to non-technical people as evidenced in the poster presentations.*

Indicator #3: This refers to an ability to write and deliver an effective presentation. An effective presentation is evaluated in three main areas: (1) the presentation visual style, (2) the presentation technical content, and (3) the presentation speaker delivery.

- ECE3090: *Student will demonstrate an ability to write and deliver an effective presentation as evidenced by the presentation written and delivered as part of the battery experiment.*

- ECE4800/ECE4810: *Students will demonstrate an ability to write and deliver an effective presentation as evidenced by the presentation written and delivered for the PDR, CDR, or FDR.*

The assessment rubrics are given in the following table

TABLE 11 Assessment rubrics for Student Outcome (3).

Ind	Rubric		
	1 = Does not meet Expectations	2 = Meets expectations	3 = Exceeds expectations
ECE3090			
1	There is evidence that the technical report for the development of the battery experiment exhibits one or fewer of the following three: (a) has at most very few grammatical or spelling mistakes and the meaning of sentences are mostly clear, (b) is mostly well organized with clear and appropriately defined sections and with mostly appropriate material in each section (c) contains mostly correct technical content, has appropriate conclusions, and it fully complete.	There is evidence that the technical report for the development of the battery experiment exhibits 2 of the following three: (a) has at most very few grammatical or spelling mistakes and the meaning of sentences are mostly clear, (b) is mostly well organized with clear and appropriately defined sections and with mostly appropriate material in each section (c) contains mostly correct technical content, has appropriate conclusions, and it fully complete.	There is evidence that the technical report for the development of the battery experiment exhibits all three of the following: (a) has at most very few grammatical or spelling mistakes and the meaning of sentences are mostly clear, (b) is mostly well organized with clear and appropriately defined sections and with mostly appropriate material in each section (c) contains mostly correct technical content, has appropriate conclusions, and it fully complete.
3	There is evidence that the technical presentation exhibits one or fewer of the following: (a) is mostly well organized by containing a logical thought progression by beginning with a title slides, outlines/goals, design definition, followed by appropriately sequenced technical details, and ends with a summary/conclusions, (b) contains appropriate design technical details such as a well conceived design solution, sufficient technical details to assess the feasibility of the solution, and containing critical issues, (c) the speakers spoke clearly, chose effective words, demonstrated a command of the technical material, and answered questions effectively and clearly.	There is evidence that the technical presentation exhibits 2 of the following: (a) is mostly well organized by containing a logical thought progression by beginning with a title slides, outlines/goals, design definition, followed by appropriately sequenced technical details, and ends with a summary/conclusions, (b) contains appropriate design technical details such as a well conceived design solution, sufficient technical details to assess the feasibility of the solution, and containing critical issues, (c) the speakers spoke clearly, chose effective words, demonstrated a command of the technical material, and answered questions effectively and clearly.	There is evidence that the technical presentation exhibits all three of the following: (a) is mostly well organized by containing a logical thought progression by beginning with a title slides, outlines/goals, design definition, followed by appropriately sequenced technical details, and ends with a summary/conclusions, (b) contains appropriate design technical details such as a well conceived design solution, sufficient technical details to assess the feasibility of the solution, and containing critical issues, (c) the speakers spoke clearly, chose effective words, demonstrated a command of the technical material, and answered questions effectively and clearly.
ECE4800/4810			

1	<p>There is evidence that the PDR, CDR, and/or FDR technical report exhibits one or fewer of the following three:</p> <p>(a) has at most very few grammatical or spelling mistakes and the meaning of sentences are mostly clear,</p> <p>(b) is mostly well organized with clear and appropriately defined sections and with mostly appropriate material in each section</p> <p>(c) contains mostly correct technical content, has appropriate conclusions, and it fully complete.</p>	<p>There is evidence that the PDR, CDR, and/or FDR technical report exhibits 2 of the following three:</p> <p>(a) has at most very few grammatical or spelling mistakes and the meaning of sentences are mostly clear,</p> <p>(b) is mostly well organized with clear and appropriately defined sections and with mostly appropriate material in each section</p> <p>(c) contains mostly correct technical content, has appropriate conclusions, and it fully complete.</p>	<p>There is evidence that the PDR, CDR and/or FDR technical report exhibits all three of the following:</p> <p>(a) has at most very few grammatical or spelling mistakes and the meaning of sentences are mostly clear,</p> <p>(b) is mostly well organized with clear and appropriately defined sections and with mostly appropriate material in each section</p> <p>(c) contains mostly correct technical content, has appropriate conclusions, and it fully complete.</p>
2	<p>There is evidence that the poster presentation is not appropriate for communicating with non-technical people by exhibiting no more than one of the following:</p> <p>(a) The presentation contains mostly broad design details such as constraints, solution structure, assumptions, performance parameters, and conclusions,</p> <p>(b) Non-technical words are chosen as much as possible or highly technical words are explained,</p> <p>(c) highly technical concepts are presented in non-technical and simplified terms,</p> <p>(d) Conclusions are easily understood by non-technical people</p>	<p>There is evidence that the poster presentation is appropriate for communicating with non-technical people by exhibiting 2 or 3 of the following:</p> <p>(a) The presentation contains mostly broad design details such as constraints, solution structure, assumptions, performance parameters, and conclusions,</p> <p>(b) Non-technical words are chosen as much as possible or highly technical words are explained,</p> <p>(c) highly technical concepts are presented in non-technical and simplified terms,</p> <p>(d) Conclusions are easily understood by non-technical people</p>	<p>There is evidence that the poster presentation is appropriate for communicating with non-technical people by exhibiting all 4 of the following:</p> <p>(a) The presentation contains mostly broad design details such as constraints, solution structure, assumptions, performance parameters, and conclusions,</p> <p>(b) Non-technical words are chosen as much as possible or highly technical words are explained,</p> <p>(c) highly technical concepts are presented in non-technical and simplified terms,</p> <p>(d) Conclusions are easily understood by non-technical people</p>

3	<p>There is evidence that the technical presentation exhibits one or fewer of the following:</p> <p>(a) is mostly well organized by containing a logical thought progression by beginning with a title slides, outlines/goals, design definition, followed by appropriately sequenced technical details, and ends with a summary/conclusions,</p> <p>(b) contains appropriate design technical details such as a well conceived design solution, sufficient technical details to assess the feasibility of the solution, and containing critical issues,</p> <p>(c) the speakers spoke clearly, chose effective words, demonstrated a command of the technical material, and answered questions effectively and clearly.</p>	<p>There is evidence that the technical presentation exhibits 2 of the following:</p> <p>(a) is mostly well organized by containing a logical thought progression by beginning with a title slides, outlines/goals, design definition, followed by appropriately sequenced technical details, and ends with a summary/conclusions,</p> <p>(b) contains appropriate design technical details such as a well conceived design solution, sufficient technical details to assess the feasibility of the solution, and containing critical issues,</p> <p>(c) the speakers spoke clearly, chose effective words, demonstrated a command of the technical material, and answered questions effectively and clearly.</p>	<p>There is evidence that the technical presentation exhibits all three of the following:</p> <p>(a) is mostly well organized by containing a logical thought progression by beginning with a title slides, outlines/goals, design definition, followed by appropriately sequenced technical details, and ends with a summary/conclusions,</p> <p>(b) contains appropriate design technical details such as a well conceived design solution, sufficient technical details to assess the feasibility of the solution, and containing critical issues,</p> <p>(c) the speakers spoke clearly, chose effective words, demonstrated a command of the technical material, and answered questions effectively and clearly.</p>
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(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

Historical Outcomes:

- (f) an understanding of professional and ethical responsibility
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (j) a knowledge of contemporary issues

TABLE 12 Student Outcome (4) assessment indicators and descriptions.

Indicator	Course	Assessment Description
ECE4800/4810		
1. Ability to understand professional ethical responsibility	ECE4800/ ECE4810	Written analysis of Ethical case studies case study
2. Ability to understand the environmental impact of an engineering design.	ECE4800/ ECE4810	Write a PDR, CDR, and/or FDR reports.
3. Ability to understand the economic impact of an engineering design.	ECE4800/ ECE4810	Write a PDR, CDR, and/or FDR reports.
4. Ability to identify current trends in professionally-related industries.	ECE1001	Summarize a technical paper involving current trends in battery technology.
	ECE4800/ ECE4810	Exhibit through technical details found in the Project Notebook, technical reports, or technical presentations.

This outcome refers to an awareness and understanding of professional and ethical responsibilities as they relate to the field of Computer Engineering and to professional engineers in general. There are two primary sources for guidelines that pertain to these:

- The National Society of Professional Engineers (NSPE)  
<https://www.nspe.org/resources/ethics/code-ethics>
- The Institute of Electrical and Electronics Engineers (IEEE)  
<https://www.ieee.org/about/corporate/governance/p7-8.html>

Students are made aware of the NSPE code of ethics in the senior design course ECE4800/ECE4810.

An example of an ethical dilemma problem is the case involving Revlon and Logisticon. Logisticon was a small company that sold inventory software to Revlon. Revlon started using the software and quickly became very reliant upon it. Payment for the software was due but Revlon refused to pay for the inventory software claiming the software never worked properly. Logisticon hacked into Revlon’s computers one night and “repossessed” the software without Revlon’s knowledge. Logisticon not only issued a command that stopped the software from running, but they scrambled Revlon’s computerized information about shipments/inventories. The result forced Revlon to shut down their 2 largest distribution centers (Phoenix, Edison NJ) and forced them to send 400 Revlon workers home for 3 days. Although Revlon was still able to ship products from Jacksonville FL and Oxford NC, they were unable to ship products from the North East US and Western US. Logisticon called their actions repossession, but Revlon called Logisticon’s actions commercial terrorism. The questions are:

- Were Logisticon’s actions to shut down the software ethical? Take a position and justify it using the NSPE code of ethics.
- Were Logisticon’s actions to scramble Revlon’s inventory ethical? Take a position and justify it using the NSPE code of ethics.
- Were Revlon’s action not to pay ethical? Take a position and justify it using the NSPE code of ethics.

Indicator #1: These questions are evaluated in the context of the NSPE and IEEE code of ethics.



- ECE4800/ECE4810: *Student will demonstrate an understanding of professional and ethical responsibility as evidenced by a written response to a position paper on an ethical case study.*

This outcome refers to an ability to understand the impact of engineering solutions in a broader context.

Indicator #2: This indicator refers to an ability to understand the environmental impact of an engineering design.

- ECE4800/ECE4810: *Students will demonstrate an ability to understand the environmental impact of an engineering design as evidenced in the project notebooks, technical reports, or technical presentations.*

Indicator #3: This indicator refers to an ability to understand the economic impact of an engineering design

ECE4800/ECE4810: *Students will demonstrate an ability to understand the economic impact of an engineering design as evidenced in the project notebooks, technical reports, or technical presentations.*

This outcome refers to an ability to identify and converse about contemporary issues, such as battery technology for the electric car industry, renewable energy resources and their impact on the environment, or cybersecurity in a world heavily reliant on the internet.

Indicator #4: This indicator refers to an ability to identify current trends in professionally-related industries. These industries might involve battery technology, motor technology, speaker technology, etc.

- ECE1001: *Students will demonstrate an ability to identify current trends in battery technology and motor technology as evidenced by a brief synopsis of a technical paper involving each.*

ECE4800/ECE4810: *Students will demonstrate an ability to identify current trends in professionally-related industries as evidenced in the project notebooks, technical reports, or technical presentations.*

The assessment rubrics are given in the following table

TABLE 13 Assessment rubrics for Student Outcome (4).

		<b>Rubric</b>		
<b>Ind</b>	<b>1 = Does not meet Expectations</b>	<b>2 = Meets expectations</b>	<b>3 = Exceeds expectations</b>	
ECE1001				
4	There is little or no evidence where current trends in a professionally-related industry have been identified.	There is evidence of one example where current trends in a professionally-related industry has been identified.	There is evidence of multiple examples where current trends in a professionally-related industry have been identified.	
ECE4800/4810				
1	There is little or no evidence that any position regarding an ethical dilemma has been articulated nor that the position is defended with any reference to the NSPE code of ethics.	There is evidence that a somewhat clear position regarding an ethical dilemma has been articulated and that the position is defended with one direct or indirect reference to the NSPE code of ethics.	There is evidence that a clear position regarding an ethical dilemma has been articulated and that the position is defended with at least one direct reference and one indirect reference to the NSPE code of ethics.	
2	There is little or no evidence that the environmental impact of a design is considered.	There is evidence that one aspect of the environmental impact of a design is considered in the design solution.	There is evidence that multiple aspects of the environmental impact of a design are considered in the design solution.	

3	There is little or no evidence that the economic impact of a design is considered.	There is evidence that one aspect of the economic impact of a design is considered in the design solution.	There is evidence that multiple aspects of the economic impact of a design are considered in the design solution.
4	There is little or no evidence where current trends in a professionally-related industry have been identified.	There is evidence of one example where current trends in a professionally-related industry has been identified.	There is evidence of multiple examples where current trends in a professionally-related industry have been identified.

TABLE 36 Assessment for Student Outcome (3).

Ind	Artifact Value	Material Assessed	Observations	Recommendations
ECE3090				
1	1. 1 2	Battery experiment report	1. The report has no visuals, schematics, tables, plots and the like. There is no procedure section. I do not know what battery they measured or what R value they obtained.  2. Their use of references is not correct, rather than referring to material they are describing the papers. They also have no visuals. They discuss a set of equations, but do not present them. Again there are no results  -----	It appears the assignment as assigned did not produce the results we said we were going to look for. The assignment needs to be changed or a new indicator needs to be chosen.  ----- 1& 2. A circuit diagram and relevant equations in the solution section would make technical explanations clear.
	2. 1 2			
	3. Only two artifacts collected			
3	1. 2 3	Battery experiment presentation	1. There presented circuit does not show how (where) current was measured. I do not understand (A frequency that would short the circuit). They spoke over a lot of experimental/math details without visuals. They measured their wires, but did they measure the resistance of their setup without batteries?  2. They spoke to, but did not investigate variation in experiment setup.  -----	The students should be introduced to how measurement and measurement tools (bread boards) introduce error into systems.  -----
	2. 3 3			
	3. Only two artifacts collected			

TABLE 37 Assessment for Student Outcome (3).

Ind	Value	Material Assessed	Observations	Recommendations
ECE4800/4810				
1	1. 1 3	FDR Technical Analysis Section	1. For being a final design report, this document is lacking all design details.  2. Consumer constraints were presented, but engineering constraints were not. Their technical presentation is very light and buried in a lot of nontechnical material  3. COTS datasheets are not technical details. The part of this project that is "deisgn" has no technical detail. Their testing flow chart is interesting, except they lack any detail of where to look if they are not successful.	Spoke with Gary and maybe the deliverables document can be changed into an Engineering Specifications with go/no go measurements  -----
	2. 2 3			
	3. 1 3			

			There is no engineering presentation in this material -----	
2	1. 1 N/A	Poster Presentation	<p>1. They showed the poster and abstract show for too little time to be readable. The students' voices were not really understandable.</p> <p>The presentation gained neither technical detail or sales pitch statements, I am not sure this poster is appropriate for either technical or non-technical audiences.</p> <p>2. Their presentation was not quite targeted to a technical or non-technical audience. They spoke to tests and results which non-technical people would not care about. They did not speak to "design" which technical people would care about.</p> <p>-----</p>	<p>I wonder what exact instructions the students have been given about what the target audience is and how to format a presentation for that audience.</p> <p>I think all material gathered need to be accompanied by the assignment the students were actually given.</p> <p>-----</p> <p>Assessment Description: Exhibit through a poster presentation given to the public at large at a year-end conference.</p> <p>Only the course instructor can evaluate this indicator.</p>
	2. 2 N/A			
	3. Only two samples were submitted			
3	1. N/A	May not have these	<p>-----</p> <p>Zoom presentations.</p>	
	2. 2			
	3. 3			

TABLE 39 Assessment for Student Outcome (4).

Ind	Value	Material Assessed	Observations	Recommendations
ECE1001				
1	1. 3 3 Blank	ECE 1001 Battery Paper Summar y	1. The grammar and structure is a little off, but they did highlight trends in automotive battery use	Make sure the students know this is to be a "paper", Subject supporting material, conclusion and the like.  Should we have them look for articles that include more parts of outcome four. ----- No Recommendations ----- May need more instructions and sample paper to follow.
	2. 3 3 Blank		2. The grammar and structure is off, but they did high-light current difficulties and possible solution to lithium battery design and manufacture	
	3. 1 1 Blank		3. This writing is short enough so as to not convey much information. The information conveyed is random disconnected bits ----- No Observations ----- Considering students being freshman, they have done a good job.	

TABLE 40 Assessment for Student Outcome (4).

Ind	Value	Material Assessed	Observations	Recommendations
ECE4800/4810				
1	1. 3 3 3	ECE 4800 Ethics Paper	These look good -----	-----  We may increase the number of cases to more than 5 ethics cases to allow greater flexibility.
	2. 3 3 3		No Observations -----	
	3. 3 3 3		Based on the cases presented and analyzed by students, I would recommend continuing this practice.	
2	1. 1 N/A 3	ECE 4800 Section on Commer cial	1. The group presented a strong argument for the benefits and acknowledged the drawbacks, but overall their cost benefit analysis was one sided.	Can we change something in the curriculum to get them to do this without specific direction. ----- No Recommendations -----
	2. 1 N/A 3			

	3. 1 N/A 3	Application	<p>2. They also presented a one sided benefit analysis.</p> <p>3. They made a strong argument for the need of their product, but there are no environmental impact statements (as related to nature)</p> <p>There were societal impact statements, but no environ-mental</p> <p>No one did a life cycle cost analysis of their design</p> <p>-----</p> <p>The table of contents in the FDRs do not include this indicator.</p> <p>-----</p> <p>In the Final Design Review report students show a clear understanding of engineering product and practice. Continue to emphasis environmental impact of engineering on our world.</p>	No further recommendations are needed.
3	1. 2 3 3	ECE 4800 Section on Commer cial Applicat ion	1. They present numbers in different sections of the document but do not draw a strong economic impact conclusion	It would appear that for indicators 2 and 3 we need to better instruct the students what is expected in this portion of this report.
	2. 1 3 3		2. There are statements that a market exists, but there is no economic impact analysis	
	3. 1 3 3		3. They drew a good argument for the need, but there is no economic impact statements.	
			No Observations	No further action is needed.
			It is clear from the report that students are aware of economic impact of engineering.	
4	1. 2 N/A 2	ECE 4800 Section on Com- mercial Appli- cation	1. They have identified a clear need and use case, there is no discussion of related development or supporting development	No Observations
	2. 3 N/A 2		2. They have identified other designs that are attempts in different domains to solve the same issue.	Assessment Description: Exhibit through technical details found in the Pro-ject Notebook, technical reports, or technical presentations.
	3. 2 N/A 2		3. They have identified a clear need and use case, there is no discussion of related development or supporting development	Only the course instructor can evaluate this indicator. Only the FDRs are provided for the other evaluators.
			No Observations	Continue to emphasis the need to understand and update the current trends in industry. Provide guidance on what to look for and emphasis in their reports and presentations.
			It is clear from students' notebooks, PDR, CDR, and FDR, as well as oral presentations students have clear understanding of current trends in industries.	

TABLE 38 Improvement Plans for Student Outcome (3).

<b>Ind</b>	<b>Observations Drawn From Course / Indicator</b>	<b>Improvements</b>
1	ECE 3090 Battery Report Format -----	It appears the assignment as assigned did not produce the results we said we were going to look for. The rubric needs to be changed to reflect the content of the report. ----- Identify where specifically we are going to look for these and modify the rubric to better define what is expected.
2	ECE 4810 Poster	Put together a public description (8th grade level news release), press release, for the website. Can they separate their market analysis out into a separate document. This document needs to be targeted to a different audience.
3	ECE 3090 Battery Experiment presentation -----	The statement of make sure you take enough data can be augmented with calculate the confidence interval to see if the students see they may not have taken enough data, this requires making sure probably and Junior Design are sequenced correctly. ----- This needs to specify these are oral - See if we can have the ECE 4810 students can record and upload a practice of their poster presentation. Put format requirements document together, Dress up, take it serious, stand in front of poster, ask if you need help with camera and sound. Put together studio and assign time slots.  Identify where specifically we are going to look for these and modify the rubric to better define what is expected.

TABLE 41 Improvement Plans for Student Outcome (4).

<b>Ind</b>	<b>Observations Drawn From Course / Indicator</b>	<b>Improvements</b>
1	ECE 4800 Ethics Paper	No Suggested improvements, beyond those from EE
2	ECE 4800 FDR	Can we have the students in Junior design ECE 3090 go through an exercise where they consider life cycle costs and economic impact and can we capture a work product based on this?
3	ECE 4800 FDR	No guidance beyond that suggested in EE
4	ECE 1001 Battery Paper ----- ECE 4800 FDR	No guidance beyond that suggested in EE ----- No guidance beyond that suggested in EE