ECE Program Assessment Report

Name of the program: BS in Electrical and Computer Engineering
Year: Academic year 2016/2017
Date: February 15, 2017
Faculty Participant: Steven Billis

Introduction:

Our undergraduate (ECE) program has gone through many successful ABET reaccreditations. The assessment process in place for the program to ensure continuous improvement is based on a process which includes direct and indirect assessment measures. Our direct method is based on Faculty Course Assessment Reports (FCARs) which are submitted by the faculty for each course they teach in the fall and spring semesters. The faculty originally developed a cyclical model of assessment in which we assess a different set of Student Outcomes (SOs) each year. This generated less data each semester for evaluation and these outcomes will be reassessed every three years, with the entire set of SOs completed on a six-year cycle. However, the faculty were not happy with this assessment model because some faculty were overburdened with assessment activities while others were not. We decided that we would assess all 11 SOs each semester.

The ABET SOs a to k are:

a. An ability to apply knowledge of mathematics, science, and engineering.
b. An ability to design and conduct experiments, as well as to analyze and interpret data.
c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d. An ability to function effectively in a team.
e. An ability to identify, formulate and/or solve engineering problems.
f. An understanding of professional and ethical responsibility.
g. An ability to communicate effectively.
h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
i. A recognition of the need for, and an ability to engage in, life-long learning.
j. A knowledge of contemporary issues.
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practices.

In order to ensure that students achieve the SOs, the curriculum is structured such that key concepts are introduced, developed, and reinforced throughout a student’s time in the program. A matrix is developed to illustrate the relationship between courses in the program and SOs and in particular which Course-specific Learning Outcomes (CLOs) are “strongly linked” to those SOs.

1. Which program learning outcomes have been assessed for the fall 2016 fall semester?

During the fall 2016 semester we assessed all ABET SOs:
2. What measuring instruments were used for the assessment? (attach the criteria, or rubrics used)

The assessment process in place for the program to ensure continuous improvement is based on a process which includes direct and indirect assessment measures. Our direct method is based on Faculty Course Assessment Reports (FCARs) which are submitted by the faculty for each course they teach in the fall and spring semesters.

The EGMU rubric that we used is:

<table>
<thead>
<tr>
<th>EGMU</th>
<th>Rubric</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-Excellent</td>
<td>☐ Fully demonstrates/accomplishes the attributes and behavior in the rubric</td>
<td>3</td>
</tr>
<tr>
<td>G-Good</td>
<td>☐ Mostly demonstrates/accomplishes the attributes and behavior in the rubric</td>
<td>2</td>
</tr>
<tr>
<td>M-Minimal</td>
<td>☐ Minimally demonstrates/accomplishes the attributes and behavior in the rubric</td>
<td>1</td>
</tr>
<tr>
<td>U-Unsatisfactory</td>
<td>☐ Does not demonstrate/accomplish the attributes and behavior in the rubric</td>
<td>0</td>
</tr>
</tbody>
</table>

The performance indicators for the Electrical and Computer Engineering ABET SOs “with EGMU =3 are:

a: an ability to apply knowledge of mathematics, science, and engineering (an EGMU score of 3)

Combines mathematical as well as scientific principles to formulate models of systems relevant to electrical and computer engineering

Applies concepts of integro-differential calculus, linear algebra, probability, statistics, and discrete math to solve electrical and computer engineering problems

Demonstrates an understanding the engineering interpretation of mathematical and scientific operations
Recognizes there is a limitation between a system mathematical model and physical reality
Is able to execute calculations correctly by hand as well as by using mathematical software

b: an ability to design and conduct experiments, as well as to analyze and interpret data (an EGMU score of 3)

   Observes laboratory safety procedures
   Is able to gather data to confirm a stated objective (i.e. theoretical result)
   Carefully documents data collected
   Is able to implement experimental procedures, operate instrumentation and analyze and interpret data using appropriate theory when required
   Is able to design appropriate experimental procedures when necessary
   Is aware of measurement error and can account for it

c: an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (an EGMU score of 3)

   Is able to use engineering, computer, and mathematical principles to develop alternative designs taking into consideration economic, health, safety, social, and environmental issues, codes of practice, and applicable laws.

d: an ability to function on multi-disciplinary teams (an EGMU score of 3)

   Is prepared for group meetings with clearly formulated ideas and contributes a fair share to the project workload
   Shares credit for success and accountability for team results
   Shares information and provides assistance to/with others
   Is able to assume a designated role in the group
   Values alternative perspectives and encourages participation among all team members
   Remains non-judgmental when disagreeing with others/seeks conflict resolution
e: an ability to identify, formulate, and solve engineering problems (an EGMU score of 3)

Can relate theoretical concepts to practical problem solving and demonstrates creative synthesis and defense for the solution (solution is correct and checked in other ways when it can be)

Uses appropriate resources to locate information needed to solve problems
Effectively integrates new information with previous knowledge

f: an understanding of professional and ethical responsibility (an EGMU score of 3)

Student is familiar with the IEEE and ACM Code of Ethics and the NYIT Students' Code of Conduct

Takes personal responsibility for his/her actions

Is punctual, professional, and collegial

Attends classes regularly

Evaluates and judges a situation using facts and a professional code of ethics

Uses personal value system to support actions, but understands the importance of using professional ethical standards for corporate decisions

g: an ability to communicate effectively

Written (an EGMU score of 3)

Articulates ideas clearly and concisely

Organizes written materials in a logical sequence (paragraphs, subheading, etc.) to facilitate the reader's comprehension

Uses graphs, tables, and diagrams to support, interpret, and assess information in the proper format

Written work is presented neatly and professionally, conforms to the prescribed format (if any), and grammar and spelling are correct

Oral (an EGMU score of 3)
Presentation has enough detail appropriate and technical content for the time constraint and the audience

Presents well mechanically: makes eye contact, can be easily heard, speaks comfortably with minimal prompts (notecards), does not block screen, no distracting nervous habits

Uses proper American English and visual aids effectively

Has a professional appearance

Listens carefully and responds to questions appropriately

h: the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (an EGMU score of 3)

Is familiar with the current trends in the engineering disciplines and the historical aspects of engineering solutions and their impacts

Is able to evaluate political solutions, or scenarios using a series of different measures - e.g., economic, quality of life; number of individuals affected; political ramifications; etc.

Can demonstrate a personal perspective on the importance of engineering in today's world

i. a recognition of the need for, and an ability to engage in life-long learning (an EGMU score of 3)

Demonstrates an understanding of the need for and the ability to learn independently (i.e. goes beyond what is required in completing an assignment; brings information from outside sources into assignments; etc.)

Participates and takes a leadership role in professional and technical societies available to the student body

j: a knowledge of contemporary issues (an EGMU score of 3)

Has knowledge of current events in society as well as the engineering discipline

Able to discuss, summarize, and defend major political issues at national, state and local levels:

k: an ability to use the techniques, skills, and modern engineering tools necessary for
engineering practice (an EGMU score of 3)

Uses computer-based and other resources effectively in assignments/projects Maintains current, state-of-the-art abilities in PC use

Is able to learn and implement process simulation software

The FCAR has a section which provides for student comments using the Student Evaluations conducted by the administration for every course offered during the semester. This constitutes an indirect measure for assessment.

3. What were the important findings? How well students achieved the targeted learning outcomes?

The department has determined that the minimum level of quality that it felt was necessary in order to produce graduates that will ultimately achieve our Program Educational Objectives is an EGMU score of 1.5 for each Student Outcome This score of 1.5 was chosen by the department because in the EGMU scoring it falls midway between the Minimal and Good indicators and therefore represents what a student would need in order to satisfy the requirements for graduation. (If each of the EGMU scores is adjusted to correspond to the grade points associated with A, B, C, D, a 1.5 is a C.) The department also uses E&G / All Percentage: This single number indicates for a student outcome, program-wide, what percentage of all scores were E or G. This number is used as a benchmark to study the percentage of individual scores falling above Minimal or Unsatisfactory. The benchmark for this value is 60%.

The composite scores and E/G percentages for each of these SOs are displayed in the Table below:

<table>
<thead>
<tr>
<th>Student Outcome</th>
<th>Score</th>
<th>E/G Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>1.95</td>
<td>55%</td>
</tr>
<tr>
<td>b</td>
<td>1.67</td>
<td>66%</td>
</tr>
<tr>
<td>c</td>
<td>1.87</td>
<td>64%</td>
</tr>
<tr>
<td>d</td>
<td>2.25</td>
<td>70%</td>
</tr>
<tr>
<td>e</td>
<td>1.85</td>
<td>63%</td>
</tr>
<tr>
<td>f</td>
<td>2.25</td>
<td>72%</td>
</tr>
<tr>
<td>g</td>
<td>1.78</td>
<td>55%</td>
</tr>
<tr>
<td>h</td>
<td>2.15</td>
<td>78%</td>
</tr>
<tr>
<td>i</td>
<td>1.95</td>
<td>63%</td>
</tr>
<tr>
<td>j</td>
<td>2.12</td>
<td>61%</td>
</tr>
<tr>
<td>k</td>
<td>1.87</td>
<td>68%</td>
</tr>
</tbody>
</table>

4. Select action items the faculty believes may enhance student learning. Decide who will be responsible for the action, and establish a timeline for completion.

All outcomes met our minimum levels of achievement. For continuous improvement with respect to outcome “a” we found that there was significant improvement with their application of the concepts of integro-differential calculus. We had put in place a system with the Registrar's office that students who do not achieve a grade of “B” in MATH 170 and 180 will have to repeat the course. We will continue to monitor student’s registration to
make certain that the MATH 170/180 requirement is being met.

Outcome “d” teamwork has improved substantially from last year’s score as we have put in place the following plan for continuous improvement:

“we will have each team leader submit a written evaluation of each team member’s contribution to the project. This score will be used in the final grade students receive. In addition, students will rotate their roles with various projects so that each student will have an opportunity to be a leader and assign tasks. Project management skills will be emphasized. The faculty teaching the courses linked to SO “d” will be responsible for these actions.”

This has been difficult for the adjunct faculty to implement but the course coordinators have been providing assistance with this mandate.

Outcome “g” communication skills have improved somewhat but we will need to continue to press faculty to grade all work in the labs for technical and communication skills separately.

**Relationship Between Department Courses and Student Outcomes a – k**

Key: 1 = Minor Contribution to Outcome; 2 = Major Contribution to Outcome; * = FCAR

<table>
<thead>
<tr>
<th>Course Title</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>Career Discovery</td>
<td>2</td>
<td>2*</td>
<td>1</td>
<td></td>
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<tr>
<td>Technol. and Global Issues</td>
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<td>2*</td>
<td>2*</td>
<td>2*</td>
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</table>

**Computer Science courses (18 credits)**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
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<tbody>
<tr>
<td>Cptr. Programming I</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>2*</td>
<td></td>
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<tr>
<td>Cptr. Org. &amp;Architecture</td>
<td>2</td>
<td></td>
<td></td>
<td>2*</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Cptr. Programming II</td>
<td>1</td>
<td>2*</td>
<td></td>
<td>2*</td>
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<tr>
<td>Elem. Of Discrete Structures</td>
<td>2*</td>
<td></td>
<td></td>
<td></td>
<td>2*</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Data Structures</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Operating Systems</td>
<td>2</td>
<td></td>
<td>2*</td>
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**Electrical Engineering courses (42 credits)**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fund. Of Digital Logic</td>
<td>2</td>
<td>2*</td>
<td>2</td>
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<td>2</td>
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<tr>
<td>Electrical Circuits I and Eng. Tools</td>
<td>2</td>
<td></td>
<td>2*</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>2*</td>
</tr>
<tr>
<td>Intro. To Electronic Circuits</td>
<td>1</td>
<td>2*</td>
<td></td>
<td>2*</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

We will use the FCARs of the spring 2017 semester for assessment and continuous improvement.