Alternative & Renewable Energy Systems (BT) Canino School of Engineering Technology 2017Assessment Report

- Curriculum Coordinator: Kibria Roman
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SUNY CANTON

What was assessed? Student learning outcomes list:

- *PSLO 3 -* Experimental processes
  - An ability to conduct, analyze and interpret experiments, and apply experimental results to improve processes.

- *PSLO 4 -* Design Systems
  - An ability to apply creativity in the design of systems, components, or processes.

What was assessed? Student learning outcomes list:

- *PSLO 6 - ID,* Analyze and Solve
  - An ability to identify, analyze and solve technical problems.

- *PSLO 7 -* Communication
  - An ability to communicate effectively through written, oral, and graphic methods related to renewable energy systems.

What was assessed? Student learning outcomes list:

- ***ISLO 1 - Communication Skills (Oral and Written)***
  - The category of communication skills requires students to demonstrate competency in both oral and written expression, including a basic understanding of discourse contexts and appropriate use of style and necessary writing technologies.
  - Oral
    - Students demonstrate or share knowledge to foster understanding, or to promote change in the listeners' attitudes, values, beliefs, or behaviors through a prepared, purposeful, communicative act.
  - Written
    - Students develop and express ideas in writing. This written communication typically involves learning to work in many genres and styles. It can also involve working with many different writing technologies, and mixing texts, data, and images.

What was assessed? Student learning outcomes list:

- ***ISLO 2 - Critical Thinking Skills***
  - The category of critical thinking requires students to demonstrate competency in formulating conclusions as a result of exploration, evaluation, and analysis. Students will explore, evaluate, and analyze objects, subjects, and phenomena.
  - Critical Analysis
    - Students demonstrate the ability to explore issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion.
  - Inquiry and Analysis
    - Students demonstrate the ability to organize complex topics to gain a better understanding of them (inquiry) while documenting and analyzing results as informed conclusions/judgments (analysis).
  - Problem Solving
    - Students design, evaluate, and possibly implement strategies to answer an open-ended question or achieve a desired goal.

Where were outcomes assessed?

- *PSLO 3- Experimental processes*

  AREA 320, AREA 370

- *PSLO 4 - Design Systems*

  MECH 477

- *PSLO 6 - ID, Analyze and Solve*

  AREA 321

- *PSLO 7 - Communication*

  MECH242, MECH 477

Where were outcomes assessed?

- *ISLO 1 - Communication Skills (Oral and Written)*
  - *MECH242, MECH477*
- *ISLO 2 - Critical Thinking Skills*
  - *AREA 320, AREA 310, MECH 242, MECH 342*

How was the assessment accomplished?

- Student work assessed:
  - Quizzes
  - Midterm and final exams
  - Oral presentations
  - Group projects
  - Term papers

- Measurement strategy:
  - Applicable rubrics used for oral presentations, term papers and group projects
  - % of questions answered correctly on quizzes and midterm/final exams
- Sample size:
  - All students who take the designated assessed courses, see attachment for N for each course

Assessment results: What have the data told us?

- **PSLO 3 – Experimental processes**
  - **AREA320(F17**), *Students demonstrate an understanding of* experimental methodology, including statistics, error analysis, and uncertainty propagation.
  - *70% of students demonstrate 70% competence*
  - *This will be evaluated in two sections: a)statistical analysis b) Uncertainty and error propagation.*

  FINDINGS:
  - *Statistical analysis: 100% of students achieved greater than 80% competence.*
  - *Uncertainty and error propagation:* 100% students got 70% or higher

Assessment results: What have the data told us?

- ***PSLO 3 – Experimental processes***
  - ***AREA320(F17)*** *) Describe the principles used to make common physical measurements.*
  - *70% of students demonstrate 70% competence*
  - *This will be evaluated in three sections: a) Flow measurement b) Pressure and velocity measurement c) Temperature measurement.*

  FINDINGS:
  - *Flow measurement:* 100% students got 95% or higher
  - *Pressure and velocity measurement :* 100% students got 85% or higher
  - *Temperature measurement:* 100% students got 92% or higher.

Assessment results: What have the data told us?

- **PSLO 3 – Experimental processes**
  - *AREA370(S17), a)* Explore wind turbine parameters (e.g., Drag force, wind power, statistical parameters, air velocity, power curves). *b) Analyze solar photovoltaic energy module. c)* Explore different types of electrical energy storage module
  - *70% of students demonstrate 70% competence.*

  FINDINGS:
  - Wind turbine parameters: 75% students scored 85% or higher.
  - Solar PV: 100% students scored 85% or higher.
  - Battery Modules: 100% students scored 70% or higher.

Assessment results: What have the data told us?

- *PSLO 4 -* **Design Systems**
  - *MECH477(S17), Project design and implementation, The section in the final presentation rubric containing project design and implementation will be assessed. Each group will score 70% or higher*

  FINDINGS:
  - *20% of groups scored 70% or higher, NOT MET*

Assessment results: What have the data told us?

- **PSLO 6 - ID, Analyze and Solve**
  - **AREA 321 (S17**), a) Determine angles to locate the sun based on location, time, and date, b) calculate incident radiation for a flat or sloped surface, c) evaluate the performance of flat – plate and other solar collectors, d) estimate hourly and annual energy output of solar collectors.
  - 70% of students demonstrate 70% competence.

  FINDINGS:
  - a) Solar angle: 71% achieved 80%
  - b) Incident radiation: 71% achieved 80%
  - c)Solar collector: 71% achieved 80%
  - d) Energy storage: 71% achieved 80%

Assessment results: What have the data told us?

- ***PSLO 7 - Communication***
  - *MECH242(F17), Pneumatic Test Stand, AACU Written Communications. Students will work in teams of 4-5 to conduct an experiment and collect data. The data will be analyzed and a technical report written to industrial accepted standards by each student. The AACU Rubric will be used to evaluate. 70% of students will achieve 2 or higher on the AACU Rubric.*

  FINDINGS:

  - *Average Score: 4.07*
  - *Students seemed generally comfortable with producing a good written lab report that was free of grammatical errors. They also demonstrated good usage of Excel for data collection and graphing. This is not surprising as many prior assignments in this class have been focused on critical writing and use of Excel.*

Assessment results: What have the data told us?

- ***PSLO 7 - Communication***

  - ***MECH477(S17)***, *The section of the classroom presentation skills in the students final presentation will be assessed. Each group will score 70% or higher on the classroom presentation skills sections in their final presentation.*

  FINDINGS:

  - *80% of groups scored 70% or higher presentation skills. Target Achievement:* ***Met***

Assessment results: What have the data told us?

- ***ISLO 1 - Communication Skills (Oral or Written)***

  – *MECH477(S17), The section of the classroom presentation skills in the students final presentation will be assessed. Each group will score 70% or higher on the classroom presentation skills sections in their final presentation.*

  FINDINGS:

  – *80% of groups scored 70% or higher presentation skills. Target Achievement: **Met***

Assessment results: What have the data told us?

- ***ISLO 1 - Communication Skills (Oral or Written)***

  - *MECH242(F17), Pneumatic Test Stand, AACU Written Communications. Students will work in teams of 4-5 to conduct an experiment and collect data. The data will be analyzed and a technical report written to industrial accepted standards by each student. The AACU Rubric will be used to evaluate. 70% of students will achieve 2 or higher on the AACU Rubric.*

  FINDINGS:

  - *Average Score: 4.07*

  - *Students seemed generally comfortable with producing a good written lab report that was free of grammatical errors. They also demonstrated good usage of Excel for data collection and graphing. This is not surprising as many prior assignments in this class have been focused on critical writing and use of Excel.*

Assessment results: What have the data told us?

- ***ISLO 2 - Critical Thinking Skills***
  - ***AREA 320 (F17***), *Evaluate the WT performance and analyze the effects of different variables on WT, 70% of students score 70% or higher.*

  FINDINGS: *100% scored 85% or higher on the final rubric. Target Achievement:* ***Exceeded***

  - ***AREA 310 (F17***), *Demonstrate recommended applications of various commercially available bio-fuels energy technologies, 80% of students score 80% or higher.*

  FINDINGS: *87% scored 80% or higher. Target Achievement:* ***Met***

Assessment results: What have the data told us?

- **ISLO 2 - Critical Thinking Skills**
  - **MECH242(F17)**, *Group sizes of 2-4 students will collectively design and select components required for a hydraulic log splitter. 70% of the students will score 2 or higher on the AACU Rubric for Critical Thinking.*

  FINDINGS: *Overall Student Average: 2.81, Project Average (%): 70%*

  Percentage of students with higher than 2.0 Average AACU overall Rubric Value: 93%. Target: **MET**

Data-driven decisions: How the program has or plans to "close the loop" based on these results.

- Continue to revise the course curriculum to better align with the program's objectives according to the SLO outcomes

- Continue to revise the related courses to better align with the student learning outcomes

- Advise students in the program to seek for additional instructional support when needed, e.g. tutoring.

- Same as MET

Data-driven decisions: How the program has or plans to "close the loop" based on these results.

- Continue to map courses and outcomes in Taskstream so the software can assist with this process better

- Raise the standard and expectations from semester 1 across all faculty to hold students accountable for late assignments...(meet deadlines) - same as MET

Data-driven decisions: How the program has or plans to "close the loop" based on these results.

- 3rd semester students (MECH242 assessment comments) are lacking in mathematical analytical capability stems from weak foundational learning in the student's respective engineering classes. I would suggest that students be instructed on the use of fundamental equations and to use mathematics as a means of exploring engineering problems in a more critical fashion – rather than just using an equation because they've been told to. This could be best implemented through the use of Project Based Learning (PBL) in foundational courses like statics, strengths of materials, intro to circuits, etc... Evaluation of this would link the following courses for in-depth analysis and potential for impacting change at this junction:

  ENGS101, MECH121, CONS172, PHYS121,122, 125, 126, MATH123, MATH161 - same as MET

Data-driven decisions: How the program has or plans to "close the loop" based on these results.

- Increase the number of power point presentations students make prior to MECH477. Skills are still weak by the time they get to 8th semester. - same as MET

What resources were used or have been requested to close the loop?

- MECH242 – Fluid Power Lab needs more hydraulic/pneumatic trainers. Enrollment has increased 3 fold in the program and this equipment needs to be updated. (cost estimated at $15-20K) - same as MET

- I think if we want to explore ABET in near future, ARES electives should be offered by faculty members with relevant educational background.

- We may explore some software for ARES electives. Like Homer Pro for AREA 323.

Attachments: 2017 SLO Findings

PSLO 3– Experimental processes
Assessment Findings Data

PSLO 3 – Experimental processes

An ability to conduct, analyze and interpret experiments, and apply experimental results to improve processes.

	Measures	Not Met		MET		Exceeded		No Findings	
	N	N	%	N	%	N	%	N	%
All Courses	2			1	50	1	50		
AREA 320	1					1	100		
AREA 370	1			1	100				

PSLO 4– Design Systems
Assessment Findings Data

PSLO 4 – Design Systems

An ability to apply creativity in the design of systems, components, or processes.

	Measures	Not Met		MET		Exceeded		No Findings	
	N	N	%	N	%	N	%	N	%
All Courses	1	1	100						
MECH 477	1	1	100						

PSLO 6– ID, Analyze and Solve
Assessment Findings Data

PSLO 6 – ID, Analyze and Solve

An ability to identify, analyze, and solve broadly-defined engineering technology problems

	Measures	Not Met		MET		Exceeded		No Findings	
	N	N	%	N	%	N	%	N	%
All Courses	1			1	100				
AREA 321	1			1	100				

PSLO 7– Communication
Assessment Findings Data

Assessment Results - AACU VALUE Rubric for Communication (Written or Oral)

Subject	Course	Sections Participating	Total Sections	Outcome	
MECH	242	1	1	*Met*	

Overall Findings for Communication

Total Sections Selected for Assessment	1
Total Sections Assessed	1
% Sections Meeting or Exceeding Target (of those assessed)	100%

Recommendations, Reflections, and Notes:

MECH 242: The area that requires the most improvement is in the student's comfortability with using engineering concepts and mathematics to better explore, analyze, and justify their experimental findings. It would seem that this lack of mathematical analytical capability stems from weak foundational learning in the student's respective engineering classes. I would suggest that students be instructed on the use of fundamental equations and to use mathematics as a means of exploring engineering problems in a more critical fashion – rather than just using an equation because they've been told to. This could be best implemented through the use of Project Based Learning (PBL) in foundational courses like statics, strengths of materials, intro to circuits, etc...

ISLO 1 - *Communication Skills (Oral or Written)*
Assessment Findings Data

Assessment Results - AACU VALUE Rubric for Communication (Written or Oral)

Subject	Course	Sections Participating	Total Sections	Outcome	
MECH	242	1	1	*Met*	

Overall Findings for Communication

Total Sections Selected for Assessment		1
Total Sections Assessed		1
% Sections Meeting or Exceeding Target (of those assessed)		100%

Recommendations, Reflections, and Notes:

MECH 242: The area that requires the most improvement is in the student's comfortability with using engineering concepts and mathematics to better explore, analyze, and justify their experimental findings. It would seem that this lack of mathematical analytical capability stems from weak foundational learning in the student's respective engineering classes. I would suggest that students be instructed on the use of fundamental equations and to use mathematics as a means of exploring engineering problems in a more critical fashion – rather than just using an equation because they've been told to. This could be best implemented through the use of Project Based Learning (PBL) in foundational courses like statics, strengths of materials, intro to circuits, etc...

ISLO 2 - Critical Thinking Skills
Assessment Findings Data

Assessment Results - AACU VALUE Rubric for Critical Thinking

Subject	Course	Sections Participating	Total Sections	Outcome	
AREA	320	1	1	*Exceeded*	
AREA	310	1	1	*Outcome "Application of Biofuels" Met*	
ELEC	141	1	1	*No measures or findings entered*	
MECH	242	1	1	*Met*	
MECH	342	1	1	*Not Met*	
Overall Findings for Critical Thinking					
Total Sections Selected for Assessment				5	
Total Sections Assessed				4	
% Sections Meeting or Exceeding Target (of those assessed)				75%	
Recommendations, Reflections, and Notes:					

MECH 242: While I am providing this evaluation in an effort to assess my own class, I cannot understate the profound lack of fundamental understanding of physics and simple statics that was observed within this class. Additionally, the work ethic of the students is profoundly lacking. A great many students came into my class with some expectation that turning in late assignments was fine and also had pre-conceived notions that there would be re-do's on all of the presented material. I don't know where this behavior stems from, but as 2nd year undergraduate students, this is totally unacceptable and needs to be assessed and

AREA 310: The findings entry was very comprehensive here, but there was no mention of the AACU Value rubric or critical thinking. As such, I selected the outcome "Application of Biofuels" as the Course SLO to be aligned with critical thinking for this semester. In the future we'll need to clearly identify the Course SLO and use the AACU rubric or an alternative rubric approved by the ISLO Subcommittee.

MECH 342: Make sure to review assumptions and how important it is to start with the basic equation first then simply it!