

Physics and Engineering PLO 3: Experimental

Program Learning Outcome: Students will design and conduct experiments or complete engineering design projects as well as analyze and interpret data.

Measure: Two assignments from PHY475: lab rotation one highlighting analysis and Senior Lab final project highlighting design.

Criteria for success: At least 75% of students will achieve an average score of 2.5 or higher on criteria described in experimental rubric.

Aligned with DQP Learning Areas:

1. Specialized Knowledge
2. Broad Integrative Knowledge
3. Intellectual Skill/Core Competencies
4. Applied and Collaborative Learning
5. Civic and Global Learning

Longitudinal Data:

	2012-13	2013-14	2014-15
N of Students	8	8	8
% above 2.5 met criteria	75% yes	- no	88% yes

In 2013-14 students did not complete an individual project, but rather reported on a particular topic, but did participate in lab rotations.

Additional Data: In a 2015 survey of graduating seniors, students generally (7/8) rated themselves as either high satisfactory or outstanding in having achieved this learning outcome. Several comments indicated that more upper-division experience in this would be helpful.

Conclusions Drawn from Data: Students are observed to be strong at certain features on the rubric (error analysis, reach appropriate conclusions) while typically weaker in others (developing procedures independently). Perhaps not surprisingly, students are strongest in aspects that they have practiced the most.

Changes to be Made Based on Data: Upon establishing this learning outcome and developing the rubric the department recognized that we did not provide many opportunities for students to develop their own procedures (many procedures were described for them.) Creating an advanced lab was an important step in accomplishing this.

PHY475 has improved students abilities, but a stronger thread through the curriculum appears necessary. Building a more scaffolded approach, where they practice an increasing amount of independence would be helpful. In viewing our curriculum in program review, this will be one area that will be considered.

Additionally, components that the department felt were important to develop in the project should be more explicitly described to the students. The variety of the projects carried out by the students sometimes didn't allow for each piece to be clearly demonstrated. Next year, projects should have built into them a way for students to demonstrate each component that the department determines are important.

Rubric Used: Physics and Engineering Experimental Rubric

Physics and Engineering Experimental Rubric

	Outstanding	High satisfactory	Low Satisfactory	Unsatisfactory
Develop adequate physics/engineering background to carry out novel experiments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Establish and communicate the purpose of an experiment or project	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Operate and troubleshoot complex physical apparatus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Devise a procedure for achieving the goals of the experiment or project	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Carry through error analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reach appropriate conclusions from data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Explain, follow and ensure lab safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>