Physics and Engineering
PLO 1: Fundamental Principles

Program Learning Outcome: Students will develop an understanding of the fundamental principles of physics.

Measure: Major Field Achievement Test in Physics taken by seniors in the capstone course PHY475.

Criteria for success: At least 50% of students will score more than the 40th percentile on the MFAT in Physics.

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:

	2007	2008	2009*	2012	2013	2014	2015
N of Students	5	6	9	7	7	6	8
Above 40th	80%	57%	56%	71%	57%	33%	50%
Score Average	160±25	147±10	141±9	148±13	148±15	139±9	144±6
Lower Division	58±26	48±13	41±11	50±15	48±16	43±11	46±8
Upper Division	60±20	46±13	42±10	44±10	46±12	36±13	43±9
Achieved Criteria	yes	yes	yes	yes	yes	no	yes

*Data was not collected during the 2009-10 or 2010-11 academic years.

Additional Data: In a 2015 survey of graduating seniors, students all (8/8) rated themselves as either high satisfactory or outstanding in having achieved this learning outcome. (Though this may be more a measure of self-confidence.)

Conclusions Drawn from Data:
Generally students are just meeting the criteria established. Students are typically measured at the end of their senior year. This data suggests that the "typical student" is unable to recall ideas at the time they are taking the exam that we hope they would have.

There is a tendency for averages to be changed significantly by a few individuals, so these averages should be perhaps viewed cautiously. Often students who have reviewed material before the MFAT exam do significantly better. This occurs primarily from students who take the physics GRE, and to a lesser degree individuals who severed as TAs. However, the population doing these activities might naturally score higher on the MFAT.

We are in process of evaluating whether the criteria of success is appropriate (perhaps setting different criteria for the two programs, or including additional data such as the breakdown of material provided by the MFAT, or the department average as a whole.)

Brief interviews with students indicated that we may not be preparing the students to take this kind of exam very well (i.e. they almost never see multiple choice, and rarely problems that they are not completely working out.)

Changes to be Made Based on Data:
The MFAT exam itself has more of a focus on material typically through the first 2-3 years in the curriculum. In 2015 there were changes made to the content of the Senior Lab course. In particular, the two advanced lab rotations more intentionally started with fundamental principles and then built on this material. Additionally, one class session of "big ideas" was added. To a small extent this exposes all students to some level of review.

We also have not had a system in place to guarantee that all our majors have taken the MFAT. Beginning 2014-15 the exam will be embedded into a required upper division class for seniors.

Rubric Used: None