

## End of Year Assessment Report for Programs

Program: Physics

Semester/year: Spring 2019

Contact Person: Dr. Hyung Choi

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### Program Mission Statement

Physics Program strives to provide students with quality education in physics in a caring Christian environment.

### Program Objectives

At the close of their degree, students should be able to:

1. explain various concepts in Physics (Knowledge) (SLO 2)
2. comprehend key principles and theories in Physics (Comprehension) (SLO 2)
3. work on exercises and solve problems using laws and principles of Physics (Application) (SLO 2)
4. know how to use lab equipment and theories in labs and able to perform experiments and analyze their results and communicate findings. (Analysis) (SLO 3, 4)
5. demonstrate the understanding of contemporary and unresolved issues in Physics (Synthesis) (SLO 2)
6. be able to solve (or make progress on) complex or unresolved physics problems. (Advanced Comprehension) (SLO 2)
7. appreciate God's creation and consider one's career calling though physics (Evaluation) (SLO 1, 6)

### Assessment Methods and Benchmarks – SPRING SEMESTER

Program Objective	Introducing	Developing	Mastering
PO1. explain various concepts in Physics (Knowledge) (SLO 2)	<i>PHYS 200- Not taught this semester</i>	<i>PHYS 220 - Not taught this semester</i>	<i>PHYS 324</i>
	Benchmark: >=75%	Benchmark: >=75%	Benchmark: >=75%
PO2. comprehend key principles and theories in Physics (Comprehension) (SLO 2)	<i>PHYS 200 or 210</i>	<i>PHYS 220 - Not taught this semester</i>	<i>PHYS 324</i>
	Benchmark: >=75%	Benchmark: >=75%	Benchmark: >=75%
PO3. work on exercises and solve problems using laws and principles of Physics (Application) (SLO 2)	<i>PHYS 200 or 210</i>	<i>PHYS 220 - Not taught this semester</i>	<i>PHYS 324</i>
	Benchmark: >=75%	Benchmark: >=75%	Benchmark: >=75%
PO4. know how to use lab equipment and theories in labs and able to perform experiments	<i>PHYS 200 or 210</i>	<i>PHYS 220 - Not taught this semester</i>	<i>PHYS 403</i>
	Benchmark: >=75%	Benchmark: >=75%	Benchmark: >=75%

and analyze their results and communicate findings. (Analysis) (SLO 3, 4)			
PO5. demonstrate the understanding of contemporary and unresolved issues in Physics (Synthesis) (SLO 2)	<i>Not Applicable</i>	<i>Not Applicable</i>	<i>PHYS 324</i>
	N/A	N/A	Benchmark: $\geq 75\%$
PO6. be able to solve (or make progress on) complex or unresolved physics problems. (Advanced Comprehension) (SLO 2)	<i>Not Applicable</i>	<i>Not Applicable</i>	<i>PHYS 399</i>
	N/A	N/A	Benchmark: $\geq 75\%$
PO7 appreciate God's creation and consider one's career calling though physics (Evaluation) (SLO 1, 6)	<i>Not Applicable</i>	<i>PHYS 220 - Not taught this semester</i>	<i>PHYS 399 or 409</i>
	N/A	Benchmark: $\geq 75\%$	Benchmark: $\geq 75\%$

### Assessment Findings – SPRING SEMESTER

PO1.

- A. Introducing: PHYS 200 - Not taught this semester
- B. Developing: PHYS 220 - Not taught this semester
- C. Mastering: PHYS 324 – Benchmarked by 75% of Midterm Exam: 8 students (100%) met the objective.

PO2.

- A. Introducing: PHYS 210 – Measured by Exams: 12 students (50%) met the objective, 12 students (50%) did not meet the objective
- B. Developing: PHYS 220 - Not taught this semester
- C. Mastering: PHYS 324 - Benchmarked by 75% of Midterm Exam: 8 students (100%) met the objective.

PO3.

- A. Introducing: PHYS 210 – Assessed by WebAssign Assignment: 22 students (92%) met the objective, 2 students (8%) did not meet the objective.
- B. Developing: PHYS 220 - Not taught this semester
- C. Mastering: PHYS 324 - Benchmarked by 75% of Midterm Exam: 8 students (100%) met the objective.

PO4.

- A. Introducing: PHYS 210 – Assessed by Lab Reports: 24 students (100%) met the objective.
- B. Developing: PHYS 220 - Not taught this semester
- C. Mastering: PHYS 403 - Benchmarked by 75% of Lab work: 8 students (100%) met the objective.

PO5.

- A. Introducing: Not applicable
- B. Developing: Not applicable
- C. Mastering: PHYS 324 - Benchmarked by 75% of Final Exam: 8 students (100%) met the objective

PO6.

- A. Introducing: Not applicable
- B. Developing: Not applicable
- C. Mastering: PHYS 399 – Class work involved many unsolved problems. 5 out of 5 (100%) students met the objective.

PO7.

- A. Introducing: Not applicable
- B. Developing: PHYS 220 – Not taught this semester.
- C. Mastering: PHYS 399 or 409 – Final paper/project. 5 out of 5 (100%) students have met the objective.

### **Analysis of Assessment Findings – SPRING SEMESTER**

In the spring semester, we have covered the less number of objectives than we had in the fall semester. Except for the Introducing level of Program Objective 2, the most of the objectives are well met. In PHYS 210 where we have the larger number of students that include non-physics/engineering major, we still have a high rate of homework and lab scores. Most of students' comments were either satisfactory or excellent.

For PHYS 324, Overall Summative Rating (OSR) that represents the combined responses of students to the four global summative items and is presented to provide an overall index of the class's quality was 4.6/5.0 (based on 50% response) and Challenge and Engagement Index (CEI) that combines student responses to several *IASystem* items relating to how academically challenging students found the course to be and how engaged they were: 6.1/7.0 (based on 50% response). For PHYS 399, OSR 4.2 and CEI 5.2. There was no student assessment reported for PHYS 403.

### **Sharing and Discussion of Assessment Findings – SPRING SEMESTER**

PHYS 102: Compared to last year, the only modification to the course is: added one more experiment on the series-parallel circuit for electricity topic. Overall, all students in my class are non-science major students, and many of them are in sports team or choir group. Many students keeps notifying instructor their excused absences, so the attendance was not good during the entire semester. Also, the course evaluation is extremely low this time (2/12, or 17%) and there is no valuable information provided.

In comparison with the previous course, the instructor tried to make the lectures more interactive with students. There are only 2 students in this class were relatively active.

PHYS 210: The instructor once again modified the on-line homework deadlines and established limits on late submissions. This resulted in a much higher homework average. The average point totals for the 26 students that finished the course was 90.0 %. This included the two failing students that posted 14% and 4.3%. Pulling those scores gives an average of 96.8%. The course also added a new lab and modified two others.

PHYS 324: We had two polarized student groups: one physics majors, the other engineering majors (or those who wanted to major in engineering but changed the major to physics). Due to this, Dr. Choi had to spend significant time for introductory materials for the other group. They have followed well, but as a result, I was not able to make the course more challenging to the rest of the students.

PHYS 399: All five students in the class were honors students who were graduate-school bound. This course realistically exposed them to what they would learn in graduate schools. The only problem was that, for some students – especially rising juniors -- the math was too hard. Some math was more advanced than undergraduate level so I could not assign enough exercise problems. If I ever run this course again, I should have had assigned more readings instead.

PHYS 403: This is the first time that Dr. Zhao taught this advance physics lab course. He designed the entire class based on our physics equipment status and the concurrent hot topics in science. Overall, the teaching experience was successful, and all the 3 students (1 senior and 2 juniors) worked together for each of the assigned projects and they finished the reports nicely. However, the nanotechnology part could be bigger if we have a functional SEM/STM microscope. Based on a few lab-prep chatting with the students, they mentioned that they did apply some knowledge they learned before into practical applications.

### **Use of Assessment Findings for Program Improvement (Action Plan) – SPRING SEMSTER**

PHYS 210: We will be using the new edition of the text: Physics for Scientists and Engineers. This will involve updating lectures, which will give additional chances to improve on the lectures. The instructor plans to introduce a new lab on the diffraction grating, drop one that doesn't really fit with the new edition of the text, and modify all the labs to work with the new Pasco interfaces that will be installed this summer.

PHYS 324 & PHYS 399: Students needed more exercise and homework problems to reinforce what they are learning in the class. Students need more readings.

PHYS 403: The instructor hopes to purchase an STM microscope if possible. We added some optics equipment including a He-Ne laser this year.

### **Full Year Reflection – FALL/INTERTERM/SPRING TERMS**

For physics majors, we believe that we have provided them with good courses that they would really need as the majority of them are preparing to get to graduate schools. However, we will need to think through how we should help those students who are changing majors from engineering to physics for the “wrong” reason. There were two students who were originally engineering students but needed to take PHYS 324 Quantum Mechanics course: one to switch to physics because this dual degree student was unable to go to either Wash U or UIUC due to a low GPA, but was able to graduate with physics degree because GU requires only GPA 2.0 for graduation. Another student wanted to have a double major. These two students (who ended up B and A-) needed a special care with more introductory materials. Hence significant time is spent otherwise used for more advanced topics for the original physics majors who tend to go to graduate schools. We will continue to have this issue as we try to expand the engineering program. We should find a way to accommodate the needs for both groups.

### **Supporting Documents**

The FCARs for the following courses are used in the analyses above: FCAR for PHYS 102, PHYS 210, PHYS 399, and PHYS 403 for Spring 2019 are available upon request along with the Fall FCARs listed in ESAR. Monthly departmental meeting minutes are also available upon request.