Operational Plan for Physics Program

Section A

Program Coordinator: Dr. David Probst Ph. D, P.E. **Date:** October 2020

Associated Faculty:

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Welcome to Physics Program

Physics deals with the underlying knowledge and principles of large areas of the natural world -- from the smallest to the largest, from the simplest to the most complex, and from the feeblest to the most energetic objects in the universe. Physics serves as the foundation of all sciences and engineering. Our physics program has a long tradition of producing many excellent scientists, engineers, educators, and entrepreneurs. Equipped with a mechanics lab, an electronics lab, computer labs, a machine shop, a nanotech lab, and an optics and quantum information lab, we offer our students many research opportunities. The Quantum Information Lab at Greenville offers a rare opportunity for undergraduate students to engage in research on quantum information science. The majority of physics graduates move on to the nation's top Physics and Engineering graduate programs such as the University of Illinois Urbana-Champaign, Boston University, and the University of Utah. The Physics program also offers a number of scholarships specifically dedicated to the physics and engineering majors.

Program Mission Statement

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

Programmatic Faith Integration

Physics not only looks into fundamental natural phenomena but also seeks to understand reasons behind those phenomena. As such, physics often touches upon the boundary issues such as the different interpretations of quantum physics, the limits of human knowledge, and worldviews that are larger than the observable world. For anyone seeking deeper truth through modern physics, particularly in quantum mechanics, cosmology and complexity, these boundary issues are unavoidable. The Engineering and Physics Department has three key goals in integrating the discipline and Christian faith. First, we want our students to see the created order beyond materialistic and naturalistic philosophies and to see it in light of a well-informed Christian worldview. Second, we want to help our students to see God's power and to understand the divine nature through the things God has created. Finally, we want to inspire our students to be humble, life-long seekers of God's truth.

Section B

Program/Major Objectives: *Qualities and competencies expected in graduates from this program/major*

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

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

Physics Program Fulfillment of the GU SLOs

Through our physics program, we are enabling the students to fulfill the mission of GU by helping our students to recognize that God has created each of us uniquely with specific talents, interests, and calling.

The majority of the program objectives (POs) #1, 2, 3, and 5 are related to the SLO #2 as students need to master the scientific content of the major, for example, PHYS 200, PHYS 210, PHYS 220 and PHYS 324 are mainly focused on mastering the content of the major. PO #4 addresses SLOs #3 and 4, and it is covered by the lab sessions of PHYS 200, PHYS 210, PHYS 220 and PHYS 324. The PO #6 addresses SLOs #1 and 6, and it is covered by the final exam of PHYS 220. The University's general education requirements mainly deal with POs #1, 3, and 5. Hence the Physics program POs and the general education program fully cover GU's student learning objectives.

Physics Program Connections to Greenville University as a Whole

Physics is a science foundational to all other sciences and engineering. It also provides a basis for forming a scientifically-informed Christian worldview. As such, the discipline is historically strongly related to philosophy and theology. Having a solid physics program is therefore important to authentic Christian Liberal Arts higher education. On the practical level, Physics provides key support for our STEM programs that would be essential to a prosperous future for GU.

The history of excellence in teaching in Physics, well-equipped labs, high-quality summer research, strong support from alumni, and the scholarships designated for Physics and Engineering majors serve as good outreach tools for the University.

Program Learning Objectives	Required Courses / Learning Opportunities											Elective Courses/Learning Opportunities	
	ENGR 101	200 University Physics I	210 University Physics II	220 University Physics III	318 or ENGR 260	311 Electricity and Magnetism	321 Statistical Mechanics	324 Quantum Mechanics	403	405 (BS only).	409	ENGR 401	Other
1		I	*	D	*	*	*	M					
2		I	*	*	*	D	*	M					
3		I	*	*	*	D	*	M		*			
4		I	*	D					M	*			
5			I	D	*		*	M		*			
6	I			D							M		
Key: * = Addressed but not Assessed I = Introduced D = Developed M = Mastered													

Section D

SLO	Program Objective	Level of Mastery (IDM)	Term	Course number	Learning Activity	Benchmark	Assessment method
Year One							
SLO 2	1, 3	I	Fall	200	Exam scores	>75%	Test Score
		D	Fall	220	Exam scores	>75%	Test Score
		M	Spring	324	Exam scores	>75%	Test Score
Year Two							
SLO 2	2	I	Fall	200	Exam scores	>75%	Test Score
		D	Fall	220	Exam scores	>75%	Test Score
		M	Spring	324	Exam scores	>75%	Test Score
Year Three							
SLO 2, 3, 4	4, 5	I	Fall	200	Exam scores	>75%	Test Score
		I	Spring	210	Exam scores	>75%	Test Score
		D	Fall	220	Exam scores	>75%	Test Score
		M	Spring	324	Exam scores	>75%	Test Score
		M	Spring	403	Lab Report	>75%	Rubric
Year Four							
SLO 1, 2, 6	6	I	Fall	ENGR101		>75%	
		D	Fall	220	Essays	>75%	Rubric
		M	Fall or Spring	409	Presentation	>75%	Rubric
Annual Indirect Assessment Methods							

Description of Assessment Processes

Physics department has established the following multilayer formative and summative assessment processes:

1. Monthly Departmental Meeting in which the faculty discusses any issue related to academic and personal wellbeing of the students. (Formative)
2. University-wide early-warning system for individual students. (Formative)
3. University-wide mid-term reviews for individual students. (Formative)
4. Class observations by colleagues (Formative)
5. Class observations by chair/supervisor (Formative)
6. End-of-semester student evaluations IASysterms (Summative)
7. End-of-semester Faculty Course Assessment Reports (FCAR) faculty course evaluation (Summative/Formative)
8. End-of-semester Assessment Report (Summative)
9. End-of-semester Faculty Assessment and Continuous Improvement Team (FACT) meeting in which the faculty convene a two-hour meeting in which all of the outcome data from the program's courses are discussed and decisions are made on how to make improvements.
10. End-of-academic-year Assessment Report (Summative)

11. End-of-academic-year FACT meeting in which all of the outcome data from the program's courses are discussed and decisions are made on how to make improvements. (Summative/Formative). At this meeting, the faculty also review what data should be obtained from what courses for fair assessments. (Summative/Formative)
12. 4-Year Cycle Departmental Review in preparation for HLC review. (Summative)

Assessment Timetable

1. Monthly Departmental Meeting.
2. End-of-semester student evaluations IASysterms: December, May each year
3. FCAR faculty course evaluation: December, May each year
4. End-of-semester Assessment Report: December each year
5. End-of-semester FACT meeting: December each year
6. End-of-academic-year Assessment Report: May each year
7. End-of-academic-year FACT meeting: May each year
8. 4-Year Cycle HLC review: Every four years – follows the University-wide schedule