Academic Degree Programs Assessment

Guidelines and Template

Submitted to the University Assessment Panel

AY 2020-2021

College of Liberal Arts and Sciences

Department of Physics

Bachelor of Science

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Submitted to the University Assessment Panel by:

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1. Introduction

The physics department has been a unit within the university since before WWII. Physics was originally located in Davis Hall and moved to Faraday in 1964 and La Tourette (then Faraday West) in 1995. The Department has a long time emphasis in condensed matter physics, initiated a high energy physics group in 1986 in response to the commissioning of the Tevatron at Fermilab and established a beam physics program at the turn of the century. In the 1990's NIU began an active involvement with the new Advanced Photon Source at Argonne National Laboratory, and became one of the founding members of the consortium of advanced radiation sources (CARS). The PhD program in physics began in 2000. The department currently has around 50 students in the undergraduate program and approximately the same number of students in the M.S. and Ph.D. programs combined.

The discipline of physics examines the fundamental properties of the physical world; space, time, matter, and energy, and applies analytic reasoning towards an understanding of the laws of nature which govern these phenomena. A primary goal of the department, as a discipline within the college of liberal arts and sciences, is to provide an opportunity for students to explore focused study of a single subject; specifically the reach and power of analytic reasoning in science, one of the critical insights which have led to the modern scientific age.

Another central goal of the department is to prepare students for careers after college. Depending on their long-term goals, students have the opportunity to train in one of three emphases; professional physics, physics secondary education, or applied physics. The professional physics emphasis is chiefly designed to train students for further graduate studies in physics or a closely related discipline with the eventual goal of contributing to the creation of new knowledge. Such students are anticipated to eventually work as university faculty, or as scientists in government or industrial research laboratories. The physics secondary education emphasis is intended to lead towards a certification as a high school physics teacher so that students can teach physics in the public schools. The applied physics emphasis trains students in practical applications and problem-solving and prepares students for a broad range of careers in disciplines which require knowledge of physics such as medicine, engineering, chemistry, ecology and the military.

At the graduate level the department trains students in the details of the profession. Students collaborate with faculty in the creation and dissemination of new knowledge. The ultimate goals of our graduate program are to increase our understanding of the world around us, provide technological breakthroughs to improve life, and train a workforce of physical scientists who can serve the state, the nation and society at large.

2. Student Learning Outcomes (SLOs)

The Physics Department provides an opportunity for students to develop analytic reasoning and experimental methods as applied to the study of space, time, matter, and energy. Students can train in professional physics, physics for secondary education, or applied physics. The professional physics emphasis trains students for further graduate studies in physics or a closely related discipline, the secondary education emphasis prepares students for certification as high-school physics teachers, and the applied physics emphasis trains students for careers that require knowledge of physics such as medicine, engineering, business, and the military.

Students will be prepared for success in these endeavors through:

1. Knowledge of the basic principles of physics

2. Familiarity with the use and design of equipment to make physical measurements, and development of the skills and knowledge necessary to aggregate and analyze the data from such measurements.

3. Appropriate attitudes central to the practice of physics, including diligence, tenacity, and an appreciation for the scientific methodology used in posing and solving problems in physics.

3. Program-by-Baccalaureate Student Learning Outcomes Matrix

Program Student Learning Outcome	Baccalaureate Student Learning Outcomes							
	A. Global inter-connections and inter-dependencies	B. Intercultural competencies	C. Analyze human life and natural world inter-connections	D. Critical, creative, and independent thought	E. Communicate clearly and effectively	F. Collaborate with others	G. Quantitative and qualitative reasoning	H. Apply knowledge/ skills creatively
1. Knowledge of the basic principles of Physics	S		S	S			S	S
2. Familiarity with design and use of equipment for physical measurements			S	S	M	S	S	S
3. Appropriate attitudes central to the practice of Physics	M	M	S	S	M	M	S	S
Overall	S	M	S	S	M	S	S	S

Note. Gauge whether each program outcome strongly supports (S), moderately supports (M), or doesn't support (leave blank) each baccalaureate learning outcome

4. Curriculum Map

Professional Physics Emphasis

Course	1. Knowledge of the basic principles of Physics	2. Familiarity with the design and use of equipment for physical measurements	3. Appropriate attitudes central to the practice of Physics
PHYS 253	B	B	B
PHYS 273	B	D	D
PHYS 283	B	D	D
PHYS 300	D		D
PHYS 320	D		D
PHYS 370	D		D
PHYS 374	D	P	D
PHYS 375	D	P	D
PHYS 383	P		D
PHYS 460	P		P
PHYS 498	P		P

Applied Physics Emphasis

	1. Knowledge of the basic principles of Physics	2. Familiarity with the design and use of equipment for physical measurements	3. Appropriate attitudes central to the practice of Physics
PHYS 253	B	B	B
PHYS 273	B	D	D
PHYS 283	B	D	D
PHYS 300	D		D
PHYS 320	D		D
PHYS 370	D		D
PHYS 374	D	P	D
PHYS 375	D	P	D
PHYS 383	P		D
PHYS 498	P		P

Secondary School Teaching Emphasis

Course	1. Knowledge of the basic principles of Physics	2. Familiarity with the design and use of equipment for physical measurements	3. Appropriate attitudes central to the practice of Physics
PHYS 253	B	B	B
PHYS 273	B	D	D
PHYS 283	B	D	D
PHYS 300	D		D
PHYS 320	D		D
PHYS 367	D		D
PHYS 370	D		D

Course	1. Knowledge of the basic principles of Physics	2. Familiarity with the design and use of equipment for physical measurements	3. Appropriate attitudes central to the practice of Physics
PHYS 374	D	P	D
PHYS 383	P		D
PHYS 414X			
PHYS 416		P	P
PHYS 498	P		P

5. Assessment Methods

The following chart lists the methods to be used, as well as a description of each method, a timeline for implementation, the person responsible, and the objectives each method addresses.

Method	Description	Student Level Target	Program Level Target	Timeline	Person Responsible	Objectives Addressed
Entry and Exit Exams in First-Year Physics	A subject content test is administered to students in each of the first two semesters of the intro physics sequence both before and after the course.	Students taking first year physics should show a normalized gain of at least 15%. Graduating senior should show a normalized gain of at least 50% relative to incoming freshmen.	Average score for students taking first year physics should show a normalized gain of at least 15%. Average score for graduating senior should show a normalized gain of at least 50% relative to incoming freshmen.	Each year	Chair of undergraduate committee.	1

Method	Description	Student Level Target	Program Level Target	Timeline	Person Responsible	Objectives Addressed
Observation during intermediate laboratory course	The instructor for the intermediate laboratory course (PHYS 374) makes observations on the student's laboratory skills and attitudes and compiles a report.	Students in PHYS 374 should obtain a minimum average score of 70% on the evaluation rubric for laboratory skills.	Average student score in PHYS 374 should be 70% on the evaluation rubric for laboratory skills.	Each year	Instructor for Intermediate Laboratory	2,3
Senior Capstone Course	Students prepare a 10-minute talk and approximately 5- page paper on a research topic in physics. Students meet with the undergraduate committee for an exit interview. The Capstone also includes a comprehensive subject exam based on the physics GRE.	Students should be evaluated to score 75% or better on physics competency by faculty and alumni evaluating the senior capstone presentations.	Average student score should be 75% or better on physics competency	Each semester	Chair of undergraduate committee, undergraduate committee and faculty as a whole.	1,2,3
Survey of Alumni and Employers	Alumni and employer surveys on the effectiveness of the preparation of graduates.		Insight into how well the program prepares graduates for their professional needs and how the curriculum could be improved.	Every second year	Assistant Chair	1,2,3

ASSESSMENT METHODS-BY-OUTCOMES MATRIX

	Entry and Exit Exams	**Lab Observation**	**Senior Capstone**	**Alumni and Employer Survey**
1. Knowledge	X		X	X
2. Experimental ability		X	X	X
3. Attitudes		X	X	X