# 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

Doctor of Philosophy (Ph.D.)

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Submitted to the University Assessment Panel by:

Vishnu V. Zutshi

## 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)

Graduates of the program will be prepared for successful professional careers in physics by:

1. Advanced knowledge of physics principles beyond that associated with a master's degree.
2. Familiarity with the use of complex experimental or theoretical techniques to pose and solve problems related to those principles.
3. Graduates will have conducted independent research at the forefront of a chosen subfield of physics.

**3. Program-by-Baccalaureate Student Learning Outcomes Matrix**

This third section of the assessment plan is an alignment of your degree program student learning outcomes with the university baccalaureate student learning outcomes. **This applies only to undergraduate degree programs.**

**4. Curriculum Map**

| Course | 1. Advanced knowledge of Physics principles | 2. Familiarity with use of complex theoretical and experimental techniques | 3. Independent research at the forefront of chosen sub-field |
|---|---|---|---|
| PHYS 600 | P | P | |
| PHYS 660 | P | P | |
| PHYS 661 | P | P | |
| PHYS 663 | P | P | |
| PHYS 670 | P | P | |
| PHYS 671 | P | P | |
| PHYS 799 | P | 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/Target | Student Level Target | Program Level Target | Timeline | Person Responsible | Objectives Addressed |
|---|---|---|---|---|---|---|
| Results of PhD. Candidacy exam. | The graduate curriculum committee records the pass rates on the PhD candidacy exam. | The student's attempting the qualifier should get 50% or more on 4 exams covering senior undergraduate physics (Classical Mechanics, Electricity & Magnetism, Quantum Mechanics, Statistical & Modern Physics) | The department's goal is that 50% of students who attempt the PhD proficiency exam pass. | Each year | Assistant chair. | 1 |
| Survey of publications by graduating students | Survey of publications by graduating students. | Students should aim to have their original research published in a scientific journal. | The department's goal is that all students will have published in a refereed scientific journal within one year of graduating. | At graduation | Graduate curriculum committee. | 1,2,3 |
| External | A selection of PhD theses are sent out | | At least 75% of | Biannually. | Assistant | 1,2,3 |

| Method | Description/Target | Student Level Target | Program Level Target | Timeline | Person Responsible | Objectives Addressed |
|---|---|---|---|---|---|---|
| evaluation of theses | for external review. | | the PhD dissertations sent out for review, should be deemed of high quality by external reviewers. | | chair. | |
| Survey of alumni | Alumni will be surveyed on how well the program prepares graduates, how well it meets their professional needs, and how the curriculum could be improved. | | Insight into how well the program prepares graduates for their professional needs and how the curriculum could be improved. | Biannually. | Assistant chair. | 1,2,3 |

**ASSESSMENT METHODS-BY-OUTCOMES MATRIX**

| | **Entry Exams** | **Candidacy Exam** | **Publications** | **Thesis** | **Alumni and Employer Survey** |
|---|---|---|---|---|---|
| 1. Knowledge | X | X | X | X | X |
| 2. Experimental ability | | | X | X | X |
| 3. Independent research | | | X | X | X |