Graduate Learning Goals and Assessing Outcomes in the Graduate Program in Physics

The Physics Graduate Program in the School of Physics and Astronomy has approximately 60 faculty members, some of whom are also members of the Astrophysics Graduate Program. In addition, some faculty from other graduate programs with complementary research interests are also members of the physics graduate faculty, allowing them to advise and support students enrolled in the physics program. The Physics Graduate Program has about 150 students. Faculty research interests include biophysics, condensed matter physics, high energy physics, nuclear physics, astrophysics and cosmology, space physics, and physics education. Incoming and first year students are offered summer fellowships to pursue research opportunities with a potential faculty adviser. Students intending to earn a terminal MS degree typically follow the Plan A (thesis) or Plan B (project) options since this gives them experience carrying out research and writing a scientific manuscript. Students following the PhD path typically earn a Plan C (course work) MS degree along the way. The Plan C requires more course work, a higher GPA, and passing the graduate written exam. Students who apply for a terminal MS degree are usually not offered financial support. Students in the PhD track are supported financially through a combination of teaching assistantships, research assistantships, and fellowships, assuming good progress towards the degree.

The outcomes and assessments have been and continue to be discussed in committee meetings, faculty meetings, and informally between faculty members. Apart perhaps from a few specifics, these practices are common to graduate physics programs in research universities throughout the country.

Outcomes

The outcomes expected by the physics graduate faculty include:

- Understanding and ability to solve problems in the fundamental areas of physics, including classical mechanics, quantum mechanics, electricity and magnetism, and thermal and statistical physics at the graduate level.
- The ability to carry out original research in their chosen field of specialization.
- The ability to write scientific papers and to publish original manuscripts in refereed physics journals or other appropriate venues, such as technical notes and conference proceedings.
- The ability to communicate the results of their research verbally by presentations in seminars and in conferences and workshops within their field.
- Pedagogical knowledge of physics education and the practical use of it in the classroom and in the instructional laboratory.
- Learning what it means to be ethical in teaching and in research.
Assessments

✓ Success in course work.
✓ Teaching evaluations (when student is a teaching assistant).
✓ Preliminary written examination.
✓ Preliminary oral examination.
✓ Annual progress report, written by the student and followed by comments from the adviser.
✓ Participation in seminars. Students are required to present at least one research seminar, oftentimes more than one depending on the research group.
✓ Oral and/or poster presentations at conferences and workshops.
✓ Research publications submitted to professional physics journals.
✓ Oral dissertation defense.
✓ Dissertation.

Goals for improvement of the program

✓ Increase awareness of advanced topics that students would like to take and offer the corresponding courses. Adjust and update continually.
✓ Encourage faculty advisers to begin supporting their students on research grants sooner in their graduate career.
✓ Improve tracking of where our graduates go after earning the degree.

Summary

The overall outcome of a student completing the physics graduate program is expected to be a professional scientist who can think creatively and independently, generate new ideas, solve difficult problems, and communicate their findings and knowledge in both written and verbal formats. Such a person should be able to contribute to society no matter whether their career is in academia, the public or private sectors, or in non-profit organizations.