

Degree Level Expectations - Physics, Engineering Physics and Astronomy (Ph.D.)

Graduates of the Ph.D. will be able to: use advanced knowledge and investigative technical skills of physics to complete independent inquiry and research resulting in the creation of new knowledge within one of the Program's areas of specialization (Astronomy and Astrophysics, Particle Astrophysics, Condensed Matter and Optics, Medical Physics and Engineering & Applied Physics).

DLE	Learning Outcomes	Relevant Courses, Academic Requirements	Indicators of Achievement
Depth & breadth of knowledge	Apply knowledge of physics and the quantitative and critical skills of a physicist to find, identify, assess, investigate, interpret and solve complex, open-ended problems of a physical science nature.	Additional course as appropriate, with two mandatory fields (Electromagnetism; advanced Quantum Mechanics) represented. Submission of annual progress report. Annual meetings with designated supervisory committee. Thesis which must be defended orally.	Successful completion of candidacy exam on basis of proposal. Successful completion of the PH.D. thesis.
Research & Scholarship	Formulate testable scientific/engineering hypotheses, indicating the awareness of the current problems and situated within the body of knowledge of a field of physics or applied physics or applied physics, and leading to the creation of new knowledge.	Candidacy exam which includes thesis proposal plus demonstrated ability to carry out independent critical analysis of scientific literature. Thesis Submission of annual progress reports.	Successful completion of candidacy exam. Successful completion and defense of thesis.
Level of application of knowledge	Develop, undertake and adjust as necessary, a research implementation plan, using the appropriate literature, possibly using and/or developing laboratory and/or computational techniques as required, leading to the	Thesis which includes a literature review.	Successful completion of the thesis.

	<p>creation of new knowledge.</p> <p>Demonstrate the ability to place their scholarship into the broader knowledge of their field, including the historical context as appropriate.</p>		
Level of communication skills	<p>Communicate effectively orally and in writing to both a technical and non-technical audience, a range of disciplinary knowledge, especially that created during the research undertaken, ensuring a quality to satisfy peer review and merit publication in the leading journals in the field.</p>	<p>Annual progress reports.</p> <p>PHYS 901 graduate colloquium series.</p> <p>PhD thesis; oral defense of thesis.</p> <p>Normally includes a Teaching Assistantship.</p> <p>Opportunities for presentations within research group/ department / wide scientific community.</p>	<p>Successful completion of all requirements for the PH.D.</p> <p>May include a presentation of research in a public forum.</p> <p>May include publication of research, independent study projects.</p> <p>Publication of salient research results.</p>
Autonomy & professional capacity	<p>Evaluate/ assess their contributions to the generation of new knowledge, the implications and societal context of that knowledge, while recognizing the limitations and uncertainties of interpretations and conclusions.</p>	<p>AODA 800 (Accessible Customer Service Training Module – SGS).</p> <p>SGS and departmental training opportunities.</p> <p>Opportunities for mentoring of grads and undergrads, engaging in collaborative research.</p> <p>Opportunities to serve on departmental / university committees.</p>	<p>Successful completion of departmental / SGS training activities during Orientation Week.</p> <p>Submission of applications for funding, scholarships.</p> <p>Participation in teaching, supervision, mentorship activities.</p> <p>Development of academic/ professional networks.</p>

			Opportunities to make presentations at a scientific conference.
Awareness of limits of knowledge	Demonstrate professional awareness of the complexity and limitations of knowledge, methods, data and interpretations.	<p>Oral defense of thesis.</p> <p>Opportunity to discuss limitations of results, errors in research design/ measurement / interpretation, societal context.</p>	Successful completion of thesis which includes a review of the literature, and oral defense before interdisciplinary panel.