Requirements for the Ph.D. degree
Students pursuing a Ph.D. in Physics and Astronomy are required to pass the set of core courses (PHYS 5021, 5041, 6001, 6011, 6021, and 6031, see below) with a B (3.0) average. First- and second-year graduate students consult with assigned advisors to determine a program of study. Typically a student would take all the core courses in their first year, and would do so in the following order:

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>PHYS 5021 Quantum Mechanics 1</td>
<td>PHYS 6021 Quantum Mechanics 2</td>
</tr>
<tr>
<td>PHYS 5041 Mathematical Methods</td>
<td>PHYS 6031 Electrodynamics</td>
</tr>
<tr>
<td>PHYS 6001 Mechanics</td>
<td>PHYS 6011 Statistical Mechanics 1</td>
</tr>
</tbody>
</table>

In addition to these core courses, Ph.D. students must take a graduate-level laboratory course (ASTR 5271, PHYS 5701, PHYS 6701, PHYS 6741, or PHYS 6751), a computers-in-physics course (PHYS 5071), and four courses chosen from the following list: ASTR 5201, ASTR 5202, PHYS 5061, PHYS 5301, and non-core courses at the 6000- or 7000-level (excluding research courses PHYS 6940, PHYS 6950). At least one of these four courses must be in an area outside the student's area of research specialization. Students will typically complete the course-work requirement of the Ph.D. degree by the end of their third year in the program. This can be achieved by taking one-two of the required classes per semester throughout the second and third year of study.

Courses or Labs offered by other departments may substitute for a limited number of these requirements with the approval of the student's advisor and the Graduate Chair. Course requirements may be waived with adequate evidence of equivalent work at other institutions.

General Requirements
Participation in the weekly colloquium, PHYS 891, is required of all graduate students. Participation in one of the area-specific seminar series and in special topics courses is encouraged.

Qualification for Ph.D. Candidacy
At the end of a student's first year of graduate study, his/her suitability for Ph.D. candidacy will be evaluated by the full Physics & Astronomy faculty. This evaluation will be based primarily on the student's GPA in the six core courses (see above). As a general guide, a core-course GPA of 3.3 or higher might qualify the student to proceed to research work directed towards a PhD dissertation. However, additional considerations, such as performance as a teaching and/or research assistant will also be taken into account when the faculty assesses the student's readiness for PhD candidacy. Students who are fulfilling the minimum requirement of a GPA above 3.0 for remaining in the graduate program, but are not recommended for Ph.D. candidacy by
the faculty, will be asked to complete a research project with a faculty member and obtain an M.S. degree by thesis (see guidelines under M.S. degree in Physics and Astronomy) within one year. If they complete this M.S. they will be reconsidered for Ph.D. candidacy by the full faculty.

**Dissertation Prospectus and Formation of the Dissertation Committee**

After achieving Ph.D. candidacy, students form a Dissertation Committee in consultation with their research advisor. Students must prepare a Dissertation Prospectus for approval by this committee within eighteen months of being admitted to candidacy. The Prospectus is typically 10-20 pages long. It should be produced in consultation with the student’s research advisor, but must be written by the student him/herself. The Prospectus should justify the proposed Dissertation in the context of related scholarly activities, outline the shape of the research that will ultimately form the student’s Ph.D. work, and demonstrate its feasibility. Therefore the document should: (a) contain some discussion of relevant literature; (b) provide a summary of any research results the student has already obtained which are part of his/her Ph.D. work; (c) lay out plans for the research that will form the rest of the Dissertation; and (d) describe an approximate timeline for completion of the Ph.D.

The student will defend the Dissertation Prospectus before their Dissertation Committee after that Committee has had at least one week to consider the document. At that time the Committee will raise with the student any questions or concerns that they may have. The Committee may then either approve the Prospectus, or, if they have substantial concerns, ask the student—in consultation with his/her advisor—to revise the document and re-submit it for the Committee’s later consideration and approval. The final dissertation need not exactly follow the plans laid out in the Prospectus, but once the Prospectus is approved the student's Dissertation Committee must be informed if research directions change substantially. The Graduate Chair may also convene the Dissertation Committee for advice should problems arise.

**Dissertation Defense**

The remainder of the Ph.D. program consists of research, advanced coursework, and other studies relevant to the Dissertation. Upon completion of the Dissertation, the student gives a public presentation of the findings. Requirements for the Ph.D. are completed following the successful defense of the Dissertation before the Dissertation Committee, and the submission of the approved dissertation document to the College of Arts and Sciences.