UNIVERSITY OF DENVER
DEPARTMENT OF PHYSICS AND ASTRONOMY

GENERAL INFORMATION FOR GRADUATE STUDENTS IN PHYSICS AND ASTRONOMY

The Department of Physics and Astronomy has compiled the following information to guide you through the process of earning graduate degrees in physics. The information given in this document may be changed at any time. If you have any questions, you should consult your advisor.

I. BULLETIN

The University of Denver Graduate Bulletin contains detailed information about the requirements for graduate degrees. The Office of Graduate Studies has the most current version: http://bulletin.du.edu/graduate/

You should read carefully the relevant parts and thoroughly acquaint yourself with the procedures and requirements pertaining to the degree you seek. Your advisor will assist you in every way; however, it is your responsibility to make sure that all the requirements are met in timely fashion.

II. ADVISING

It is to your advantage to complete course work and general examinations as early as possible. Moreover, selecting a research area for your Thesis/Dissertation soon after commencing your graduate studies will speed up your progress toward obtaining your degree. To assist you in these decisions, the department has established the following advising resources.

A. INITIAL ADVISOR

Your initial advisor will be Dr. Davor Balzar (303.871.2137, Davor.Balzar@du.edu).

You must see your advisor each quarter before registration to plan the courses that you need to take. If you wish to add or drop any of these courses for any reason, you must get your advisor’s signature. Your advisor can help you better if he or she is knowledgeable about your goals, your work, and the progress you are making in your degree program.

B. INTRODUCTION TO RESEARCH

During your first year, you will register in a 3-course sequence, Introduction to Research (PHYS 4001-3). This sequence is designed to provide incoming graduate students with the basic tools to conduct independent research and practice your oral and written communication skills. In the fall (PHYS 4001), by the end of the second week of classes, you will be required to choose a faculty member to work on your first research project. This faculty member may not necessarily be your final dissertation research advisor as described below.

C. RESEARCH ADVISOR

The department encourages you to select a thesis or dissertation research advisor as soon as possible, unless you are seeking an M.A. degree without thesis. You should plan to see several faculty members and find a professor who will agree to accept you to do research in a mutually agreeable area. This faculty member will then become your advisor. (An M.A. student may remain with his or her initial advisor.) You and your advisor must then form a Dissertation Committee (for Ph.D. students) or Master’s Committee (for M.S. students) who will guide you through the completion of your remaining degree requirements.
### III. REGISTRATION

You are normally required to register for a full load (8 quarter hours) every quarter, in consultation with your advisor.

### IV. DEPARTMENTAL EXAMINATIONS

#### A. COMPREHENSIVE EXAMINATION

All graduate students are required to take the graduate Comprehensive Examination in their second year. Incoming graduate students with graduate credit that has been transferred from another institution may petition the Graduate Committee to take the Comprehensive Examination during their first year as a graduate student. The Examination has two components, written and oral. Further guidelines are as follows:

I. **Choosing the Topic:**
   The Examination topic is proposed by the student and must be approved by the Graduate Committee. The topic for the exam is clearly distinct from that of the primary research of the student. The topic proposal consists of a one-paragraph overview of the topic that briefly describes its importance to Physics and Astronomy and the elements of core graduate-level topics that it entails. Before the final submission of the topic, consultation with the Graduate Committee Chair and the research advisor, to guide the choice of the topic, is strongly advised. The deadline for submission of the topic proposal is the end of the 6th week of classes in Autumn Quarter.

II. **Written Component: Submitting the Outline of the Paper**
   Once the topic proposal has been approved, the student prepares an outline of the written component consisting of a brief description of its main sections, including appropriate sources and references. This outline must be submitted not later than February 1st. The corresponding Examination Committee provides feedback to the student on the proposed outline as a way of guiding the student toward the completion of the final paper.

III. **Written Component: Submitting the Final Paper**
   For the completion of the written component of this Examination, the student prepares a paper of >2500 words in length, due by March 31st. The paper should describe in detail the key elements of the proposal and include rigorous mathematical derivations at the core graduate level. The paper should clearly address one or two key elements of the topic in depth, as opposed to a broad literature overview of all aspects of the chosen topic. All revisions of the written component must be completed by the end of April. Upon approval of the written component, the oral component may be scheduled.

IV. **Oral Component:**
   The oral component is based on the written component, but also addresses related topics of the student’s graduate core curriculum. It consists of a ~30 minute presentation on the topic by the student, followed by questions from the committee. The oral component must be completed by the end of May.

V. **Possible Outcomes:**
   The possible outcomes of the Comprehensive Examination, as decided by the Comprehensive Examination Committee, are: Pass at Ph.D. level, Pass at M.S. level, or Fail. The outcome of the Examination is provided to the student.

If the outcome of the Examination is not satisfactory, a second and final attempt can be undertaken. This would normally take place during the following year’s Examination sequence. Administration of the Examination at an earlier date is possible if extenuating circumstances exist and if approved by the Graduate Committee.
B. **Dissertation Research Proposal**

Students who hold the Preliminary Ph.D. Candidacy (after passing the Comprehensive Examination at the Ph.D. level) are required to give an Oral Dissertation Research Proposal presentation on his or her proposed Dissertation research in front of the Dissertation Committee, to assess if the proposed research is appropriate to grant a Ph.D. degree when completed as proposed.

This Examination is based on the content of the proposed Dissertation research of the Candidate. At the presentation, the Dissertation Committee may ask any questions, particularly those relating to the proposed Dissertation research area of the candidate.

This Examination is administered by the Dissertation Committee at least one year prior to the expected term of graduation. However, it is recommended to have this Examination done as soon as the outline of the research is formulated by the Candidate and his or her Research Advisor, and preliminary results have been obtained.

After successfully passing this Examination, the student is advanced to the Final Ph.D. Candidacy. The Office of Graduate Studies must receive the Dissertation Oral Defense Committee Recommendation Form within 30 calendar days from the Examination date.

C. **M.S. Thesis and Ph.D. Dissertation Defense**

This is an Oral Examination, In the front of the Dissertation or Master’s Committee. The examination is chaired by a faculty member outside of the Department of Physics and Astronomy. The Committee decides whether the Thesis or Dissertation is acceptable as submitted or if it requires revisions. The Graduate Bulletin can be consulted for further details.

V. **Degree Requirements**

**Ph.D. Degree**

Ph.D. degree in physics prepares students for careers across a spectrum of scientific pursuits. At the conclusion of your degree, you'll be equipped with the experience and knowledge necessary to build a career in the advancement of scientific knowledge or education at the highest levels, which can open doors to careers in research and development in academia, government, and private industry.

Our department offers research opportunities in theoretical, experimental and computational astronomy and astrophysics, biophysics, and condensed matter and materials physics. Ph.D. candidates in the program will work closely with faculty advisors to create a path of study that culminates in a dissertation defense based on independent research of a publishable quality.

**Coursework Requirements**

Both 4000- and 3000-graduate level courses may be applied toward the degree, with the approval of the Graduate Committee or the Dissertation Committee.

<table>
<thead>
<tr>
<th>Graduate Core Courses</th>
<th>19-23</th>
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<tr>
<td>Physics &amp; Astronomy Graduate Core Courses are the following 8 courses (19-23 qtr hrs) that all students are expected to take during the first two years in the program:</td>
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<tr>
<td>PHYS 4611 Adv Electricity &amp; Magnetism I</td>
<td>3</td>
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<tr>
<td>PHYS 4612 Adv Electricity &amp; Magnetism II</td>
<td>3</td>
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<tr>
<td>PHYS 4111 Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 4112 Quantum Mechanics II</td>
<td>3</td>
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</table>
Minimum credits required for degree: 90 of which a minimum of 60 must be in Physics and Astronomy including the Graduate Core Courses, which constitute 19-23 quarter hours.

Non-Course Requirements
- Regular attendance at the Physics and Astronomy colloquia;
- Annual presentation at the Physics and Astronomy colloquia;
- Passing Comprehensive Examination at the Ph.D. level;
- Advancement to Preliminary Candidacy at the Ph.D. level;
- Formation of the Dissertation Committee;
- Passing Oral Dissertation Research Proposal;
- Advancement to Candidacy at the Ph.D. level;
- Dissertation;
- Dissertation Defense. Three departmental faculty members and an Outside Chair are required for the Oral Defense.

Other Degree Requirements
- Good academic standing: a GPA of 3.0 or higher;
- No grades lower than C- are accepted toward the degree;
- No more than one-fourth of the hours accepted toward the degree may be of C+, C, or C- grade;

M.S. DEGREE

Master of Science (M.S.) in Physics prepares the student for a wide variety of jobs in industry, government and educational institutions. Our graduates have obtained industrial or governmental laboratory research positions, entered pre-college or community college teaching, joined planetarium or museum staffs, and become technical representatives of various organizations. With complementary courses in education, M.S. graduates are well qualified to teach at the secondary level. The M.S. in Physics is also a popular course of study and professional improvement for people already working in industry.

Coursework Requirements
Both 4000- and 3000-graduate level courses may be applied toward the degree, with the approval of the Graduate Committee or the Master's Committee.

Graduate Core Courses

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<td>PHYS 4112</td>
<td>Quantum Mechanics II</td>
<td>3</td>
</tr>
</tbody>
</table>
Minimum credits required for the degree: 45 including the Graduate Core Courses, which constitute 19-23 quarter hours

Non-Course Requirements

- Regular attendance at the Physics and Astronomy colloquia;
- Annual presentation at the Physics and Astronomy colloquia;
- Passing Comprehensive Examination at the M.S. level;
- Advancement to M.S. Candidacy;
- Formation of the Master's Committee;
- Thesis;
- Thesis Defense. Two departmental faculty members and an Outside Chair are required for the Oral Defense.

Other Degree Requirements

- Good academic standing: a GPA of 3.0 or higher;
- No grades lower than C- are accepted toward the degree;
- No more than one-fourth of the hours accepted toward the degree may be of C+, C, or C- grade;

M.A. DEGREE

Master of Arts (M.A.) in Physics prepares the student for a wide variety of jobs. The M.A. degree is intended primarily for students who are seeking an advanced degree without a significant research component. For instance, the M.A degree is appropriate for students pursuing careers in pre-college or community college teaching, planetarium or museums, or as technical representatives of various organizations. With complementary courses in education, M.A. graduates are well qualified to teach at the secondary level. The main difference between the M.A. and M.S. degree is that a research thesis is not required for the M.A. degree. However, students pursuing the M.A. degree will get exposed to some research experience through Introduction to Research courses in their first year in the program.

Coursework Requirements

Both 4000- and 3000-graduate level courses may be applied toward the degree, with the approval of the Graduate Committee or the Master's Committee.

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<td>PHYS 4112</td>
<td>Quantum Mechanics II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 4811</td>
<td>Statistical Mechanics I</td>
<td>4</td>
</tr>
</tbody>
</table>
Minimum credits required for degree: 45 including the Graduate Core Courses, which constitute 19-23 quarter hours

Non-course requirements:
- Good academic standing: a GPA of 3.0 or higher;
- No grades lower than C- are accepted toward the degree;
- No more than one-fourth of the hours accepted toward the degree may be of C+, C, or C- grade;
- Regular attendance at the Physics and Astronomy colloquia;

By signing below, I acknowledge that I have read and understood this document.

Signature ___________________________________________ Date ___________________________________________