FOREWORD

To Our Graduate Students:

This booklet summarizes basic information on regulations, courses, procedures and policies that affect graduate students in physics. It is prepared by our department to aid you and your advisors in planning your program of graduate study and research.

The statements in this booklet are not binding on the University and are therefore subject to change. An attempt has been made, however, to make this summary as accurate as possible. Some details may be altered from time to time as the UMCP Graduate School revises its procedures, but we expect basic features of programs to remain the same. For further information on University regulations, requirements and courses please refer to the University of Maryland Graduate Catalog, www.gradschool.umd.edu/catalog/. Graduate Study in Physics supplements the catalog by including detailed information particularly applicable to graduate students in physics.

You have the basic responsibility for planning and completing your program of graduate study and research. Our faculty will do all they can to aid you, but you must keep abreast of requirements and regulations as they affect you. We believe you will find University of Maryland graduate programs quite flexible; at any point where rules cause hardship, a student may petition for a waiver. However, it is wise to get departmental consent before embarking on any plan that departs from the regulations and recommendations summarized in this booklet.

After reading this booklet thoroughly, retain it for later reference as you choose courses and plan your program. If you have any difficulty interpreting any part of this booklet, ask your advisor for clarification.

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Individuals to Contact for Information</td>
</tr>
<tr>
<td>2.</td>
<td>General Description of Programs</td>
</tr>
<tr>
<td>3.</td>
<td>Assistantships and Fellowships</td>
</tr>
<tr>
<td>4.</td>
<td>The Doctor of Philosophy Program</td>
</tr>
<tr>
<td>5.</td>
<td>The Master of Science Program</td>
</tr>
<tr>
<td>6.</td>
<td>Monitoring Progress</td>
</tr>
<tr>
<td>7.</td>
<td>Required Paperwork</td>
</tr>
<tr>
<td>8.</td>
<td>General Regulations</td>
</tr>
<tr>
<td>9.</td>
<td>Appendices: Graduate Courses in Physics</td>
</tr>
<tr>
<td></td>
<td>Sample First Year Program</td>
</tr>
<tr>
<td></td>
<td>Summary of Deadlines</td>
</tr>
</tbody>
</table>
1. DEPARTMENTAL CONTACTS FOR GRADUATE STUDENTS

<table>
<thead>
<tr>
<th>Name</th>
<th>Title/Position</th>
<th>Office &amp; Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Andrew Baden</td>
<td>Chair of the Physics Department</td>
<td>PSC 0208, x5946</td>
</tr>
<tr>
<td>Dr. Peter Shawhan</td>
<td>Associate Chair for Graduate Education</td>
<td>PSC 2120, x51580</td>
</tr>
<tr>
<td>Dr. Theodore Einstein</td>
<td>Chair of the Graduate Committee</td>
<td>Toll 2310, x56147</td>
</tr>
<tr>
<td>Drs. Hassam, Bedaque, Orozco, Mr. Barker, Mr. Verhaaren</td>
<td>Faculty and student members of the Graduate Committee</td>
<td></td>
</tr>
<tr>
<td>Ms. Donna Hammer</td>
<td>Director of Student and Education Services</td>
<td>Toll 1120, x55958</td>
</tr>
<tr>
<td>Ms. Amy Streets</td>
<td>Academic Program Specialist</td>
<td>Toll 1120E, x55982</td>
</tr>
<tr>
<td>Dr. Douglas Hamilton</td>
<td>Chair of Teaching Assistant Committee</td>
<td>CSS 3201, x56207</td>
</tr>
<tr>
<td>Ms. Lorraine DeSalvo</td>
<td>Director of Administrative Services (TA Assignments)</td>
<td>PSC 0260B, x55948</td>
</tr>
<tr>
<td>Drs. Orozco and Sau</td>
<td>Coordinators of “Foundations and Frontiers” lecture series</td>
<td></td>
</tr>
<tr>
<td>Drs. Appelbaum, Brill, Kirkpatrick</td>
<td>Qualifier committee</td>
<td></td>
</tr>
</tbody>
</table>

2. GENERAL DESCRIPTION OF PROGRAMS

DOCTOR OF PHILOSOPHY

The majority of students are enrolled in the Ph.D. program, which prepares them for careers in teaching and research at the highest levels. This program is very flexible and has a minimum number of required courses to allow students to tailor a program suited to their individual needs. For many students the program can be divided into three phases:

a) A period of one to two years of coursework and study for the qualifying examination. Passing the qualifying examination is the most important hurdle to be completed in this phase. However, it is also a good time to begin looking for a thesis advisor. The sooner you get involved in research, the sooner you will graduate. Try to find a research position for your first summer as well.

b) A transition period, ideally less than one year, where most course and other requirements are completed, a thesis advisor is finalized, support for your studies beyond the first two years is identified, and thesis research is initiated. Admission to candidacy for the Ph.D. degree should be completed in this phase.

c) A period where the student is primarily engaged in thesis research, terminating in the Ph.D.

These divisions are not rigid and, in particular, students are urged to participate in research as early in their careers as possible.
Concerning the graduate courses offered in physics, these can be divided into four main categories (1) core courses in general physics; (2) advanced general interest courses; (3) advanced specialized courses.

**CORE COURSES**

These include:

- PHYS 601 – Theoretical Dynamics
- PHYS 603 – Methods of Statistical Physics
- PHYS 604 – Methods of Mathematical Physics
- PHYS 606 – Electrodynamics
- PHYS 622 – Introduction to Quantum Mechanics I
- PHYS 623 – Introduction to Quantum Mechanics II

and one or both of:

- PHYS 624 – Advanced Quantum Mechanics
- PHYS 625 – Many-Body Quantum Mechanics.

No one of these courses is specifically required, but most are generally taken to provide a thorough background in general physics. Competence in all except PHYS 624 and 625 is usually necessary to pass the Ph.D. Qualifying Examination. PHYS 601, 603, 604, 606, 622 and 623 therefore constitute a typical first-year schedule for well-prepared students intending to take the qualifying examination for a Ph.D. degree in physics.

**ADVANCED GENERAL INTEREST COURSES**

These include PHYS 615 - Nonlinear Dynamics of Extended Systems, PHYS 675 - Theory of Relativity: Survey, PHYS 715 - Chaotic Dynamics, PHYS 704 - Statistical Mechanics, PHYS 731 - Solid State Physics: Survey, PHYS 741 - Nuclear Physics: Survey, PHYS 751 - Elementary Particle Physics I: Survey, PHYS 761 - Plasma Physics I: Survey, PHYS 771 - Cosmic Ray Physics: Survey. These general interest courses have no specialized prerequisites and can provide a background in fields in which the student may not intend to do dissertation or thesis work.

**ADVANCED SPECIALIZED COURSES:** These are offered in every area of current departmental research interest. Examples are PHYS 752 and 851 in elementary particle theory, PHYS 842 in experimental nuclear physics, and PHYS 832 in condensed matter physics. There are also many seminar courses, which feature lectures by visiting scientists; numerous special topics courses are also offered. Students generally concentrate on these after their first full year in the physics program.

Students are reminded that graduate courses are far more demanding than undergraduate courses; about ten credit hours per semester are normally considered a full load.

Detailed requirements for the Ph.D. are given in Section 4.

**MASTER OF SCIENCE**

The department offers both a thesis and non-thesis MS degree option, with the latter being more popular. Some students receive a MS degree en route to the Ph.D., some choose to complete their study at that level even though enrolled in the Ph.D. program, and some have the MS as their goal. The MS program is somewhat less flexible than the Ph.D. with respect to course requirements but generally requires a demonstration of a mastery of basic graduate level physics and some involvement in research or scholarly activity. Either option can generally be completed in approximately two years of full time work. The MS program is more manageable for part-time students. Detailed requirements for both MS options are given in Section 5.
3. GRADUATE ASSISTANTSHIPS, FELLOWSHIPS
AND OTHER FINANCIAL ASSISTANCE

There are numerous graduate teaching and research assistantships available to graduate students in physics. Entering graduate students are usually awarded teaching assistantships; they aid in recitations and laboratories, help grade homework, quizzes and examinations, confer individually with students in their classes who are having trouble, and perform other departmental duties. All assistants must spend approximately twenty hours per week on their assigned duties. Students interested in teaching as a career can arrange to have a broad variety of teaching experiences during their careers as teaching assistants.

Teaching assistantships are awarded for at most one year at a time. Because their number is limited, competition for them can be considerable. The Assistantship Committee regularly reviews assistants' records for renewal consideration. In addition to satisfactory performance in their teaching responsibilities, assistants are expected to show satisfactory academic progress appropriate to their level of study. During the first year or two of graduate study this is normally measured by course grades, and the assistant wishing a renewal is required to enroll each semester for at least six credits of work leading to his or her degree under the Regular (A through F) grading option. A more advanced student may demonstrate satisfactory progress by passing the Qualifying Examination, or by beginning dissertation research. Failure to show good progress may result in loss of the assistantship. Likewise, failure to perform the teaching functions satisfactorily may result in loss of the assistantship.

First priority in the assigning of teaching assistantship positions is to new students and others who have not yet passed the Qualifying Examination but are otherwise making satisfactory progress. For students with satisfactory teaching records who have passed the Ph.D. Qualifying Examination, the Department will try to provide a teaching assistantship for one or two semesters, during which it is assumed the student is actively looking for a research advisor. Priority is given to the one student per faculty member that receives that faculty member's endorsement. Assistantships for such students are very limited in number.

Students who have decided upon their fields of research are usually considered for research assistantships. These assistantships are supported by research contracts and are contingent on the availability of research funds. Students on research assistantships generally spend part or all of their research time on their own thesis research.

A limited number of fellowships are available to outstanding students. Students who apply for assistantships will automatically be considered for these fellowships. Well-qualified students are also encouraged to apply directly for the many non-university fellowships sponsored by such agencies as the National Science Foundation.

All full-time physics students with teaching or research assistantships are required to register for two to ten credits each semester (excluding the summer). These credits may include research, seminars, audited and reading courses, or whatever is necessary to reflect accurately your full-time involvement.

ENGLISH REQUIREMENTS OF FOREIGN TEACHING ASSISTANTS

No foreign graduate student (except as noted below) is to begin teaching assistant classroom responsibilities until he or she undergoes an English evaluation by the Maryland English Institute (MEI). All such students must participate in the entire MEI evaluation program.

If the evaluation so determines, the student must enroll in UMEI 005 (Advanced English as a Foreign Language), UMEI 006 (English Pronunciation) or UMEI 008 (Advanced Oral Communication Skills) as specified by the MEI. Any physics graduate teaching assistant evaluated as needing either UMEI 005 or 006 who does not enroll in and attend the required course will lose his or her teaching assistantship.

The only foreign physics TA's exempt from the MEI evaluation are those from the United Kingdom, Ireland, English-speaking Canada, Australia, New Zealand and the Commonwealth Caribbean.
4. THE DOCTOR OF PHILOSOPHY PROGRAM

REQUIREMENTS

1. Competence in basic physics as evidenced by passing a written qualifying examination. In case of marginal performance on the written exam the student may be invited to take an oral examination (see below for additional comments).

2. For theory students, passing PHYS 624 or 625 with a grade of B or better.

3. Complete the zero-credit "Foundations and Frontiers of Physics" Research Seminar before the end of the third semester.

4. Making a satisfactory Preliminary Research Presentation, to be approved by two faculty members, at least one of whom must be a tenure track member of the physics program. With a view towards prompting early, frequent contacts between the student and the research advisor, the Presentation is normally scheduled to take place before August 31 for a student who passed the qualifier the previous August, and before January 31 for a student who passed the qualifier the previous January. Delays require the approval of the Associate Chair for Graduate Education.

5. Advancement to candidacy before the end of the fourth year. This requires, in addition to the fulfillment of requirements 1, 2, 3 and 4, the completion of a scholarly paper approved by two faculty members, one of whom must be a tenure track member of the physics program.

6. Passing (with a grade of B or better) two advanced courses outside the student's field of specialization, at least one of which must be a Physics course at the 700 level or above or be PHYS 675 or PHYS 615.

7. Taking at least 2 credits of seminar, at least 12 credits of dissertation research, and presenting and successfully defending an original dissertation.

8. Maintenance of an overall grade point average of 3.00 or above, as calculated by the Graduate School.

9. Please note that currently the graduate school requires a successful completion of the Ph.D. within 9 years.

10. Please see http://www.gradschool.umd.edu/catalog/ for details of University-related requirements.

AMPLIFYING REMARKS

THE PH.D. QUALIFYING EXAMINATION

The written examination will consist of two parts: one concentrating on Classical Physics (including Special Relativity) and one concentrating on Quantum Physics. Each part consists of five problems and students are required to answer four out of five questions. The problems are generally at the level of the core graduate courses. Both parts are offered twice a year - once in late August, once in late January - and both parts must be passed, with the following stipulations:

1. A student may take one or both parts at any offering. The student will pass or fail each part attempted separately. Whether or not the student passes depends not only on their performance on the exam but also depends on their performance in their course work.
2. Students are required to make their first official attempt at the written examination within one year after matriculation in the Ph.D. Program (August of their second year for students matriculating in August, January of their second year for students matriculating in January) and are required to complete all attempts within one year (two additional offerings) of their first attempt (see below for exceptions).

3. The department also allows each student to do one (and only one) “free try” before their first official attempt. Students who matriculate in August are normally invited to do their “free try” in January. The student can attempt either one part or both. If the student passes either part, then they do not have to take that part again; if they pass both parts, then they have satisfied the Qualifying Exam requirement. On the other hand, if the student fails either or both parts on the “free try”, it does not count against their limit of three official attempts (see above).

Especially well-prepared incoming students who have already taken multiple graduate-level courses can contact the Associate Chair for Graduate Education to request permission to take the Qualifying Exam as soon as they matriculate (i.e., in August for students matriculating in August).

4. If a student’s performance on the written examination is marginal (one or both parts) he/she may be granted an oral examination. Oral exams will only be offered in cases where the student is positioned to pass the entire written examination, i.e., both parts. In particular, students who have not yet passed one part of the written examination will not be given an oral examination for marginal performance on the other part. The Oral Exam Committee will determine pass or fail for the entire Qualifying Examination and will consider the student’s overall record in making this judgment.

5. If a student has failed at all allowed attempts at the written examination he/she may petition the Graduate Committee for an appeal oral examination within two weeks of receiving his/her scores. The Committee will only grant an appeal oral in cases where it believes the student’s overall record (including the performance on the written examination) warrants obtaining the additional information the oral examination will provide. If an appeal oral is granted the Graduate Committee will make the final decision on pass or fail evaluating input from the Oral Exam Committee and the student’s overall record.

A student admitted to the Physics Program with a weak background in undergraduate physics may petition the Associate Chair for Graduate Education to extend his or her deadline. In such a case, the Associate Chair for Graduate Education will set a definite final date by which the first attempt must be made, but the delay may not be longer than a year, and may be automatically shortened if the student enrolls in PHYS 622. The deadline for this student's first try will be the final date set by the Associate Chair for Graduate Education, one year after PHYS 622 is first taken, or two years after the student first enrolls in the physics graduate program, whichever comes first.

For bona-fide part-time students, deadlines for the Qualifying Examination are generally extended one year beyond those for normally qualified full-time students. You are classified as full-time according to the way you are originally admitted (as indicated on your application for admission.) If you wish to change your classification, you should apply to the Associate Chair for Graduate Education, who, if he approves the change in classification, will determine the appropriate time limits for taking the Qualifying Examination and finishing degree work. You must be a full-time student to receive an assistantship.

Copies of past exams can be found on the department web site, under “academics” followed by “graduate students”.

COURSE WORK

A possible program for a well-prepared Ph.D. student is as follows:

<table>
<thead>
<tr>
<th>Courses involved in the Qualifying Examination (PHYS 601, 603, 604, 606, 622, 623)</th>
<th>20 credit hours</th>
</tr>
</thead>
</table>

6
Advanced physics not in major specialty 6 credit hours
Courses in major specialty 9 credit hours
Seminars 2 credit hours
Dissertation research 12 credit hours
Total 52/53

All students doing theoretical research for the Ph.D. degree are required to take a semester of advanced quantum mechanics (either PHYS 624 - Advanced Quantum Mechanics or PHYS 625 - Many-Body Quantum Mechanics.) Other students working for the Ph.D. degree often take one of these courses also.

Note that the number of courses taken will depend upon you and your advisor. If you have exceptional preparation, you may skip some of the courses in the first two categories. Or, if your undergraduate preparation is weak, you may need some advanced undergraduate courses to round out your preparation before undertaking the above program. Also, you may well elect to sample several fields of physics. Consequently, your total credit hours may vary considerably in either direction from the example given above.

DEPARTMENTAL RESEARCH SEMINAR

The department will be offering a once a week seminar (Foundations and Frontiers of Physics) for graduate students at which faculty will be summarizing the status of research in forefront areas of physics. Students will be notified of the time and location of these seminars. Attendance at (most of) these seminars is required to satisfy this degree requirement, and attendance will be recorded. However, these seminars are intended to be relaxed, interesting, and helpful to students by giving them a broad picture of real physics research.

PRELIMINARY RESEARCH PRESENTATION

The purpose of this requirement is to move students into research more quickly and to give students experience in presenting their work in standard "seminar" format. The topic of the presentation is to be agreed on between the student and advisor and would typically be a summary of the status of research in a particular area, a description of research the student has done, or a combination of both. This would also be an appropriate means for the student to propose and defend a thesis topic. Consistent with the goal of training students to give standard seminars, the preferred presentation would be approximately one hour in length before a reasonable audience. Two faculty must approve the presentation at least one of which is a tenure track member of the physics department.

THE SCHOLARLY PAPER

Scholarly writing ability is defined as the ability to present in a clearly organized paper, with proper scholarly documentation, evidence of original research and/or critical analysis and/or evaluation. The paper must be written independently of and in excess of course requirements. However, special problems and/or independent study courses may be used to complete this paper. Some examples of an acceptable paper include:

1. a substantial extension of a paper prepared for a graduate-level course or seminar;
2. a survey of the current state of research in a particular field;
3. a careful discussion of your proposed dissertation research;
4. a report on research you have conducted;
5. a published scientific paper.

Often this paper will be the first work done with your advisor after you have passed the Qualifying Examination. The paper will be read and evaluated for both style and content by your advisor and one other faculty member of your choosing, these two being the two faculty members who will approve and sign your application for candidacy. At least one faculty member must be a tenure track member of the physics program.

ADVANCED COURSES

Advanced courses are generally defined as those outside the "core" graduate courses in a particular department. In Physics this includes those courses described in Section 1 as Advanced General Interest Courses and Advanced and Specialized Courses. (For the purpose of this requirement, either PHYS 615 or PHYS 675 will be considered a "Physics course at the 700 level or above" and PHYS 624 or PHYS 625 will be considered outside the “core” for students not pursuing research in these areas.) These two courses must not have a direct bearing on the student's thesis research area, as the intent of the requirement is to broaden a student's education. The ideal courses would be Advanced General Interest Courses in areas completely outside one's thesis area (a plasma course for a condensed matter student for example).

DISSERTATION ADVISOR

Students are urged to select a dissertation advisor as early as possible. This should as soon as possible, certainly within one-two semesters after passing the qualifying, and the requirements for the Departmental Research Seminar and the Preliminary Research Presentation have been instituted to speed this process. It is best to find an advisor during your first year.

This advisor must be a "Regular or Associate Member of the Graduate Faculty of the University of Maryland College Park." All College Park Assistant, Associate and Full Professors are eligible, as are many adjunct faculty members and research appointees. An exception to this regulation may be made only if the Chair of the Department of Physics requests, in writing, that the Graduate School accept some other person. Except for very unusual circumstances, this letter of request may be honored only at the beginning of a student’s dissertation research. If your advisor is not a member of the Physics Program, then you should also have a co-advisor in Physics, who should be kept regularly informed of your research progress. It is preferable that this Physics advisor be a Regular Member of the Graduate Faculty, so that he or she may chair your final oral committee. Students and advisors wishing to waive this rule should contact the Associate Chair for Graduate Education.

The dissertation advisor will generally provide support for the student through a research assistantship and availability of funds for this purpose is an important consideration. Only in extremely rare cases will students working on their dissertations be supported on teaching assistantships.

ADMISSION TO CANDIDACY

The department requires that you must be admitted to candidacy within four years of your admission to the doctoral program; otherwise, your admitted status will lapse. You must be admitted to candidacy at least one academic year before you can receive your Ph.D. degree; all requirements for the Ph.D. degree must be completed within four years of admission to candidacy. Requirements for admission to candidacy are given in Section 4.

Once you have been advanced to candidacy, you are required to register in the Graduate School at the beginning of each fall and spring semester. Generally, the Graduate School will automatically register you for 6 credits of PHYS 899, (Doctoral Dissertation Research). If you are not involved with the university in any way please consult the
Associate Chair for Graduate Education. Graduate TAs and RAs must be full-time students, as defined in the Graduate School Catalog. This generally requires that they register for two to ten credits each semester.

**DISSERTATION AND ORAL EXAMINATION**

A basic requirement for the Ph.D. degree is the completion of a satisfactory dissertation involving significant and original research. This dissertation work must represent independent research under approved faculty supervision and must be of the quality normally required for publication in a recognized research journal. Classified research is not acceptable for dissertation work. See the section on "Format and Appearance of Theses and Dissertations" for guidelines on preparing your dissertation.

After you submit your dissertation, a special examination committee will administer your final examination and defense of your dissertation. This committee must have at least five members with a doctoral degree or its equivalent, at least three of whom are Regular Members of the Graduate Faculty of the University of Maryland. One member must be external to our Physics Program; one or more members may be distinguished scholars from other institutions. The majority (typically three out of five) must be tenure-track faculty members in the Physics Program; in cases where it is important to have more than one member external to the Physics Department, three of six will be interpreted as satisfying this requirement. The oral committee chair must be a Regular Member of the Graduate Faculty and would normally be a tenure-track member of the Physics Department. If the dissertation advisor is not eligible to chair the committee, he or she may still be co-chair. In that case the other co-chair must be a tenure-track faculty member in Physics. You must give this examination committee a minimum of ten days in which to review your dissertation.

Doctoral defenses are open to all Members of the Graduate Faculty of UMCP and to others at the discretion of the oral committee chair. Notice of the doctoral defense must be widely published at least five days before the scheduled event. Students are responsible for informing the Physics Graduate Program Secretary of the time and place of the defense.

The oral examination is primarily concerned with the content of your dissertation, but questions on any other subject in physics are considered appropriate.

You should allow a reasonable amount of time between the oral examination and the deadline for graduation for the semester in question, as examining committees frequently require modifications in the dissertation.
5. THE MASTER OF SCIENCE PROGRAM

There are two programs for those who wish to pursue the Master of Science degree in physics: with thesis and without thesis.

THE MASTER'S DEGREE WITHOUT THESIS

A candidate in the non-thesis option must:

1. Successfully complete a minimum of 30 credits, exclusive of any registration for research, with at least 18 at the 600-level or above. At least four courses in the general physics sequence (PHYS 601, 603, 604, 606, 622 and 623) must be included, unless other evidence (such as passing the Qualifying Examination with a superior grade) demonstrates that the material has been mastered. In consultation with the student's advising committee, the remaining courses may be selected from specialized courses in physics or from other fields such as astronomy, mathematics, chemistry, engineering and computer science.

2. Present one or more scholarly papers written independent of and in addition to course requirements. These papers may be extensions of papers prepared for graduate-level courses or seminars; special problems and/or independent study courses may be used to complete non-thesis papers. These papers should be written in the final semesters of the student's program; they must be read and evaluated by at least two appropriate faculty members. (For additional information about the scholarly paper, see section 4).

3. Pass a final comprehensive examination testing the depth and breadth of his or her knowledge. This is a written examination and for this purpose the student may select whichever section of the Ph.D. Qualifying Examination he or she prefers. The chosen section must be passed at the master's level. A student who has passed the entire Ph.D. Qualifying Examination is considered to have met this requirement.

4. Maintain an overall grade point of 3.00 (B) or above.

THE MASTER'S DEGREE WITH THESIS

A candidate in the thesis option must:

1. Successfully complete a minimum of 30 credits, with at least 18 at the 600-level or above. At least four courses in the general physics sequence (PHYS 601, 603, 604, 606, 622 and 623) must be included, unless other evidence (such as passing the Qualifying Examination with a superior grade) demonstrates that the material has been mastered. Six credits of thesis research (PHYS 799) are required. (Thesis research normally represents about one-third to one-half of a full-time student's time for one year.) Usually the thesis involves an original investigation in pure or applied physics and must demonstrate the student's ability to carry out independent research. See the section in this booklet on "Format and Appearance of Thesis and Dissertations" for guidelines on preparing your thesis.

2. Maintain an overall grade point average of 3.00 (B) or above.

3. Pass an oral examination defending his or her thesis and covering all course material.

A report of the thesis research is not normally published before the submission of the thesis to the Graduate School. If you desire to publish a portion of your thesis work before your submit your thesis, you must append the following footnote to your publication: From a thesis to be submitted to the Graduate School, University of Maryland, by __________ in partial fulfillment of the requirements for the M.S. Degree in Physics.
RESIDENCE REQUIREMENT AND TIME LIMIT

In order to earn a master's degree from the University of Maryland, a student must be in residence for the equivalent of at least two semesters. Under Graduate School regulations, up to six credits of course work taken at other recognized institutions may be applied toward the master's degree, but only when such courses have been taken within five years prior to completion of the student's entire master's program.

There is a five-calendar-year time limit to earn a master's degree. This time limit, measured from the date of the student's first enrollment in Graduate School, applies to both full- and part-time students.

6. MONITORING PROGRESS

The Department and the Graduate School monitors each student's progress at various stages in his or her graduate career. The monitoring program is designed to call attention to problems that may be occurring. Failure to make adequate progress may result in loss of a teaching or research assistantship and dismissal from the graduate program. The conditions listed below may be inappropriate in particular cases and consequently may be appealed to the Graduate Committee, but only after the student and his or her advisor carefully discuss the situation.

PHASE 1 - GRADES

Student grades are monitored by the Department and by the Graduate School, and the Graduate School puts students on probation if their GPA falls below 3.0 (after having taken 9 credits). The Graduate School notifies students, and the Department, of the probation status of students each semester. The severity of the notice is dependent on the number of consecutive semesters the student is on probation. Listed below are the messages students will get from the Graduate School on their grade reports.

<table>
<thead>
<tr>
<th>Consecutive Semesters on Probation</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Warning: Your graduate GPA is below 3.0. Please see your advisor.</td>
</tr>
<tr>
<td>2</td>
<td>Warning: Your graduate GPA continues below 3.0. You must see your Graduate Director</td>
</tr>
<tr>
<td>3</td>
<td>Warning: Your graduate GPA has been below 3.0 for at least 3 consecutive semesters. You will receive a letter from the Graduate School that will explain your options.</td>
</tr>
<tr>
<td>(Or more)</td>
<td></td>
</tr>
</tbody>
</table>

Students who are on probation for the second consecutive semester will receive a letter from the Graduate School reminding them of their probationary status and the need to seek advising. Students who are on probation for the third consecutive semester will receive a letter indicating that the Graduate School will cancel their admission if they do not hear from their departments in writing. Students in the latter two categories must arrange to see the Associate Chair for Graduate Education, and will be notified of this by the Associate Chair.

In addition to the above probation requirements, students who receive a grade of B- or C or less in a core course should repeat the course if possible. Passing the qualifying examination can often substitute for repeating the course, but cannot compensate for an overall GPA of less than 3.0.
PHASE II - ADDITIONAL PRE-CANDIDACY REQUIREMENTS

Ph.D. students who have not attended the Departmental Research Seminar or given their Preliminary Research Presentation within the deadlines will be put on departmental probation and so notified. These students should consult the Associate Chair for Graduate Education.

PHASE III - SELECTION OF DISSERTATION OR THESIS ADVISOR

A Ph.D. student who has not formally "signed up" with a dissertation or thesis advisor within one year of passing the qualifying examination must submit a written progress report to the Graduate Committee. A student who does not have an advisor and who does not submit a satisfactory progress report will be put on probation.

Master's degree students should have chosen a suitable advisor for their thesis (or scholarly paper) within a reasonable time following the qualifying examination (non-thesis option) or completion of the core courses (thesis option). Exact time limits are treated on a case-by-case basis.

PHASE IV - THESIS RESEARCH

Once a student has formally acquired an advisor the department will monitor progress in research by requiring that the student and advisor complete a "Progress Report Form" each year. The purpose of this is to identify problems that are preventing the student from making suitable progress toward completing his/her thesis.
7. REQUIRED PAPERWORK

Unless otherwise noted the following forms can be obtained from the Physics Graduate Program Secretary and returned to that office.

REGISTRATION FORMS

Graduate and undergraduate students register around November for the following spring semester and around April for the following fall semester. During these periods you can pick up a copy of your transcript and your "Graduate Student Schedule Request" form from the Physics Graduate Program Secretary. Unless you are registering for PHYS 799 or PHYS 898 only, this form must be signed by your advisor. All forms are to be returned to the Physics Graduate Program Secretary.

Once you have been admitted to candidacy for the doctoral degree, you must register for every fall and spring semester until you graduate. If, for the semester in question, you are making no demands on University resources, you should consult the Associate Chair for Graduate Education.

PRELIMINARY RESEARCH PRESENTATION

Once you have completed this requirement you must file the form "Ph.D. Program Requirement: Preliminary Research Presentation".

SELECTION OF DISSERTATION OR THESIS ADVISOR

Within one year of passing the qualifying examination, you must select your dissertation or thesis advisor. As soon as you have made your selection, you need to file the "Start of Research" form.

MONITORING PROGRESS

Once you have passed your Ph.D. Qualifying Examination, each year both you and your dissertation advisor are required to complete a "Progress Report Form." These forms are sent out to both students and advisors each summer.

SCHOLARLY PAPER

Once your scholarly paper has been approved, the form "Certification of Completion of Scholarly Paper" is to be submitted, along with a copy of the scholarly paper.

APPLICATION FOR DIPLOMA

Early in the semester (usually within the first ten days) in which you are planning to receive your degree you must submit the form "Application for Diploma (Graduate School)." You can do this in the Physics Student Services Office or at the main desk in the Mitchell Building. You will be billed later for your graduation fee.

If you do not complete all degree requirements in the semester in which you applied for a degree, you must complete another form the following semester (or whenever you do plan to get your degree). You will not be billed a second time.

MASTER'S DEGREE WITH THESIS

Early during the semester in which you plan to receive your master's degree you must file an "Approved Program Form for Master of Science Degree" and the "Nomination of Thesis or Dissertation Committee" form. The deadline is usually within the first month of the semester.
MASTER'S DEGREE WITHOUT THESIS

As indicated in "Master's Degree with Thesis" above, you must file an "Approved Program Form" early during the semester in which you plan to receive your degree. About one month before commencement (again see "Important Dates for Advisors and Students") you must file the "Certification of Completion of Master's Degree without Thesis."

Ph.D. CANDIDACY

You must submit the "Application for Admission to Candidacy" form of the Graduate School, two original copies of the departmental form "Departmental Requirements for Admission to Candidacy", and the "Graduate School Record" form. You must also include your "Certification of Completion of the Scholarly Paper" form.

Ph.D. DEGREE

Within the first several weeks of the semester in which you plan to receive your degree you must submit the "Nomination of Thesis or Dissertation Committee" form. Before the Graduate School deadline you must submit the form "Departmental Requirements for a Doctoral Degree."
8. GENERAL REGULATIONS

GRADERS

Courses graded on the Regular Grading option are assigned grades A-F and I (incomplete). A grade of C or less is unsatisfactory and all programs require an average GPA of 3.0 (B) for a degree. Note that a B- is equivalent to a 2.7 and is thus below the minimum. You must also achieve a 3.0 average for admission to candidacy. If you repeat a course only the most recent grade is used in computing your overall average. A grade of I, which is not removed, counts the same as an F.

Research courses and seminars are generally graded S (satisfactory) or U (unsatisfactory). If a standard A-F grade is assigned to PHYS 799, 898, or 899, this is NOT included in the GPA calculation. Please note that the grad of B- is equivalent to a 2.7, and thus is below 3.0. The Graduate School has a formal probation process for students whose GPA is less than 3.0. This is described in some detail in Section 6, Monitoring Progress, and in the Graduate Catalog.

WITHDRAWAL AND LEAVES OF ABSENCE

For a leave of absence due to medical reasons, childbearing, adoption, or dependent care, please see the requirements specified by the graduate school at their web site: http://www.gradschool.umd.edu/catalog/academic_policies.htm For non-medical reasons, there is no formal "Leave of Absence" provided by the Graduate School. If you feel the need to withdraw for a period, consult the Associate Chair for Graduate Education.

APPEALS AND GRIEVANCES

If a student would like to appeal a decision affecting his graduate program the recommended course is as follows:

1. First discuss the matter with the person who made the decision. Many problems can be worked out at this stage.

2. If this fails, consult the Associate Chair for Graduate Education and file a written appeal if desired. The Associate Chair for Graduate Education may make a decision on the issue. Any decision of the Associate Chair for Graduate Education can be appealed to the full Graduate Committee and many appeals go directly to the Graduate Committee.

3. Should you wish to appeal outside the department you have two choices. You can appeal to the Office of the Dean of the Graduate School or the Dean's Office of the College of CMPS. In either case, you should consult these offices concerning procedures, as these are currently in a state of flux.

4. Issues pertaining to sexual harassment or violations of the Human Relations Code may also be brought before the campus Office of Human Relations.

FORMAT AND APPEARANCE OF THESES AND DISSERTATIONS

Master's degree candidates must submit one final copy of their thesis to the Graduate School; Ph.D. degree candidates must submit two copies of their dissertation. In addition, each candidate, whether for Master's or Ph.D. degree, must submit two final copies to the Physics Student Services Office.

Students should consult the Graduate School concerning detailed instructions on style, format, physical requirements, copyright and literary rights for theses and dissertations. A copy of these instructions is available in the Physics Student Services Office. It is very important to do this before producing your thesis documents.
GRADUATE COURSES IN PHYSICS: FIRST TWO YEARS

Listed below are the graduate courses in physics that most students would take in their first two years and the semester they are usually offered. Advanced specialized courses, seminars, research courses and courses offered sporadically are not listed. Be sure to check the Graduate Catalog for complete course descriptions and the schedule of classes for exact offerings in every semester.

PHYS
601  (3) Theoretical Dynamics (FALL, SPRING)
603  (3) Methods of Statistical Physics (SPRING)
604  (3) Methods of Mathematical Physics (FALL)
606  (4) Electrodynamics (SPRING)
607  (3) Advanced Classical Physics (FALL-SPORADIC)
615  (3) Nonlinear Dynamics of Extended Systems (SPRING)
622  (4) Introduction to Quantum Mechanics I (FALL, SPRING)
623  (3) Introduction to Quantum Mechanics II (FALL, SPRING)
624  (3) Advanced Quantum Mechanics (FALL)
625  (3) Non-relativistic Quantum Mechanics (SPRING)
675  (3) Theory of Relativity: Survey (FALL)
704  (3) Statistical Mechanics (SPRING)
715  (3) Chaotic Dynamics (SPRING)
721  (3) Atomic and Optical Physics I (FALL)
722  (3) Atomic and Optical Physics II (SPRING)
731  (3) Solid State Physics: Survey (FALL)
741  (3) Nuclear Physics: Survey (FALL)
751  (3) Elementary Particle Physics I: Survey (FALL)
752  (3) Elementary Particle Physics II: Theory (SPRING)
761  (3) Plasma Physics I: Survey (FALL)
762  (3) Plasma Physics II (SPRING)

SAMPLE FIRST YEAR PROGRAM

A well-prepared student would generally take the following program the first year:

<table>
<thead>
<tr>
<th>FALL</th>
<th>SPRING</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 601  (3) - Theoretical Dynamics</td>
<td>PHYS 603  (3) - Statistical Physics</td>
</tr>
<tr>
<td>PHYS 604  (3) - Mathematical Methods</td>
<td>PHYS 606  (4) - Electrodynamics</td>
</tr>
<tr>
<td>PHYS 622  (4) - Quantum Mechanics I</td>
<td>PHYS 623  (3) - Quantum Mechanics II</td>
</tr>
</tbody>
</table>

These courses prepare the student for the qualifying examination in August. Students wishing a slightly lighter load would audit one course, with PHYS 603 being the course most frequently chosen. If a student's background is not sufficient for this program he/she should consult his/her advisor and discuss the course program and the qualifier clock.
## SUMMARY OF DEADLINES FOR FULL TIME STUDENTS

<table>
<thead>
<tr>
<th>Event</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualifying Examination</td>
<td>First Attempt - End of First Year</td>
</tr>
<tr>
<td></td>
<td>Third Attempt - one year after first attempt</td>
</tr>
<tr>
<td>Preliminary Research Presentation</td>
<td>One year after passing qualifying examination</td>
</tr>
<tr>
<td>Ph.D. Candidacy</td>
<td>Four years after entering program (Physics Department)</td>
</tr>
<tr>
<td></td>
<td>Five years after entering Graduate School (Graduate School Rule)</td>
</tr>
<tr>
<td>MS Degree</td>
<td>Five years after entering program</td>
</tr>
<tr>
<td>Ph.D. Degree</td>
<td>Four years after candidacy</td>
</tr>
</tbody>
</table>

Students should consult the Associate Chair for Graduate Education for the Physics Department for any waivers, delays, etc.