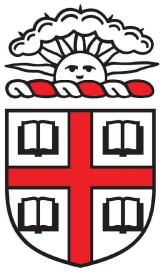

BROWN
Department of Physics

HANDBOOK ON THE MASTER'S PROGRAM IN PHYSICS AT BROWN

This handbook is addressed to all current and incoming ScM students in Physics. It is to be used as a planning guide and a reference resource throughout their ScM study. Pertinent University web resources, including the Graduate School Handbook should be regarded as the primary references for degree requirements and options.

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A. INTRODUCTION

The Brown Physics graduate program provides students with focused training and an opportunity to perform independent research in some of the most current areas of Physics. The aim of the Master's Degree Program in Physics is to train professional physicists, providing them with a mastery of the fundamental principles, facts and methods of the discipline and the opportunity to participate in original research. It certifies a command of certain intellectual tools of broad validity and Physics' modes of thought.

The Physics Master's program is suitable as both a means for professional development and preparation for further graduate study. The program offers enough flexibility to allow for completion of the degree in two, three, or four semesters of fulltime enrollment, depending on a student's background and preferences. For students who are eligible for part time status, the program can also be earned over a longer span of time. Physics Master's students are self-funded, tuition is billed per course and reflects the number of courses taken each semester. Currently, there is no departmental funding to support Master's students. The department regularly informs and advises students of fellowship opportunities as they arise.

Students admitted into the Master's program cannot automatically transition to the PhD program (see Section F below). Each program requires individual admission.

In this program, students develop a solid and broad base of Physics knowledge through the core curriculum and departmental colloquia. Upper level courses and topical research seminar series subsequently provide more specialized exposure. Coursework constitutes the bulk of the program with participation in original research strongly encouraged.

B. DIGEST OF PROGRAM AND REQUIREMENTS

The requirement for an ScM degree in Physics consists of successfully completing a total of eight graduate level courses: four of the six core courses and four additional graduate courses in Physics or related fields. If a Master's thesis is included in the degree plan, up to two of the eight required courses can be Research in Physics (PHYS2980/2981), in which the student performs an original investigation under the sponsorship of a faculty member (research supervisor) leading to a Master's thesis.

The program's standard structure is two courses per semester, over four semesters (2-2-2-2), this is considered full-time enrollment. However, it is a flexible program allowing for completion of the degree in two, three, or four semesters. This flexibility allows students to enroll in different course progression combinations such as 3-3-2 or 4-4. It is important to note that deviation from the standard structure must be pre-approved by the Director of the Master Program (DMP). Deviation from the standard course structure will impact both time to completion and tuition cost, as well as producing visa implications for international students. Students should be sure to seek approval well in advance from the DMP when deviating from the standard program structure.

In the 2-2-2-2 standard course structure, the first year is spent on coursework and acclimating to the Department. If a thesis or a future PhD program is being considered, time may also be spent investigating areas of research and prospective research advisors. In the second year courses and, if applicable, research projects should be completed - possibly leading to ScM thesis.

Academic Standing

A student's academic standing will be evaluated as *Good Standing* if he/she passes the required courses (for MS students this means that grade C or higher is obtained in an approved 2000-level course). It is expected that all core courses will be taught and taken in the grading option of *ABC/NC*. For any student who passes a core course with a grade of *S*, the instructor must fill out an evaluation form, which includes an equivalent *ABC* letter grade. An academic standing of *Satisfactory* indicates the student has encountered some difficulty in the program. A student may be placed on *Warning* for poor course performance in a required course, which results in a grade of *NC*. Receipt of a second *NC* grade may result in the student being advised to leave the program. The student may be permitted to provide the program director with a viable plan for correcting the issues contributing to the failure, and for re-establishing performance, which will lead to success. A student who receives three grades of *NC* in required courses will be withdrawn from the program. In all cases, the student will be given written notification of academic standing with clear criteria for regaining good standing and the consequences of not meeting the criteria.

The Director of the Master's Program (DMP) will review a student's course grade records to evaluate a student's performance. If it is determined a student is not performing satisfactorily in courses, they will be notified in writing and offered advising support. Students should also review the Graduate School Handbook, which contains comprehensive information about the academic code and academic standing.

C. COURSES

Degree Requirements

The ScM degree recognizes a significant level of academic achievement beyond an undergraduate degree. A total of 8 credits in 2000 level courses form the main requirement for the ScM degree in Physics. Of the eight required courses, four will be selected from the six core courses of the PhD program (PHYS 2010, 2030, 2040, 2050, 2060, 2140). Four additional credits at the 2000 level are required. These courses are to be selected from the remaining core courses or the large number of other upper level Physics courses. With pre-approval of the DMP, up to two of these additional credits, also at the 2000 level can be taken in another department. Preparation of a Master's thesis is recommended, as it forms an important pillar of professional training.

Students who matriculate without the prerequisite mastery necessary for succeeding in the core courses will be advised to take a mixture of 1000 level and 2000 level courses during their course of study, necessitating a 3 or 4 semester track to completion and additional tuition for the courses.

The six **core courses** are:

Physics 2010	Techniques in Experimental Physics
Physics 2030, 2040	Classical Theoretical Physics I & II
Physics 2050, 2060	Quantum Mechanics
Physics 2140	Statistical Mechanics

The student's own taste and the supervisor's recommendations are both vital guides in their overall course selection. All courses are expected to be from the 2000 level. Since the Department's annual course offerings vary, the students are advised to consult the most current listing of courses. Sometimes special courses can be arranged in response to student requests, given sufficient numbers and sufficient lead-time. Reading courses can be counted towards the advanced course requirement only upon pre-approval by the DMP.

Exceptions

In exceptional cases MS students can take a 1000-level course, but it has to require written permission from (i) MS program director (DMP) and (ii) Instructor of the 1000-level course in question. Instructor's permission is crucial because it is on them to make extra problems and or projects to assure that the class work will be appropriate for a 2000-level course. There are 4 acceptable 1000-level courses that can be considered for credit towards MS degree, under the conditions described above: PHYS 1410 (Quantum mechanics); PHYS 1510 (E&M); PHYS 1530 (Statistical Mechanics), and PHYS 1720 (Mathematical Physics).

If students are interested in taking a course outside of the standard graduate Physics course plan, they must first meet with their advisor to discuss how the course will fit into their study plan and goals in the program. Second, they must submit a written request to the DMP for approval to add the course. The form for course approval and justification can be found at: https://www.brown.edu/academics/physics/current-student-information.

In addition to the sequence of advanced Physics courses, ScM students are highly encouraged to attend additional training and advising activities offered by the program. The various weekly series of topical seminars and departmental colloquia, open to all students and faculty, provide broad perspectives in current Physics research. These additional, non-credit components supplement the Physics ScM program. Regular attendance and participation would be of benefit to the students' professional development.

Individual course registrations are submitted online via the University's Banner registration system.

D. RESEARCH & MASTER'S THESIS

Master's thesis is not a requirement for the ScM degree. However, preparation of a Master's thesis is highly recommended, as it forms an important pillar of professional training by strengthening knowledge and independence in a chosen research field. If a thesis option is chosen, the student will work under the mentorship of a chosen faculty member or team, earning two credits upon completion. To earn the research credit for the Thesis work students must register for PHYS 2981 Research in Physics course.

Participation in research is highly recommended as it helps students to acquire practical knowledge and skills useful for future employment. Not all ScM students will participate in research, the thesis is optional. However, for those considering research in their degree plan, the following should be noted:

Many students enter graduate school without a strong attraction to a specific research field. It is an important goal of the first year of graduate study to evoke such a preference - through courses, by

attending colloquia and seminars, and engaging in informal discussions with faculty and experienced graduate students.

Establishment of a research connection requires concentrated thought and substantial initiative on the part of the individual concerned. Three of the steps involved are:

- learning what kinds of work are going on and, hence, what is available
- estimating what opportunities, duties and daily life might be in those groups of interest
- establishing a personal connection

Interdepartmental research projects are possible. In all stages of the work the supervising faculty has the primary role in evaluating the quality of the research. It is expected that the primary advisor, as well as a secondary advisor, will evaluate both the intellectual depth and breadth of a Physics ScM thesis.

Enrollment in a Research Course

Students may choose to enroll in the PHYS 2980 or PHYS 2981: Research in Physics courses where they can gain experimental or theoretical research experience under the supervision of a faculty advisor. Students enrolled in the course are required to submit a written report summarizing their work at the end of the semester to their research advisors and the DMP for approval before credit can be granted.

Submitting a Master's Thesis

The thesis is submitted to the research advisor, DMP, and ScM Program Coordinator. DMP examines the work and approves the thesis for the credit. Students have an option to present their research in a 10 min oral presentation - organized at the end of the School year. The oral presentation is optional and all ScM students can participate, regardless if they prepared the thesis or not.

E. ADVISING & COMMUNICATION

The Department traditionally has a relaxed and informal, yet respectful, interaction among its faculty members and graduate students. We count this tradition as one of our most valuable assets and consciously seek to preserve it. To preserve this tradition while ensuring sufficient mentoring, we rely on student initiative and participation. In addition to classroom contact and office hour visits; seminars, and colloquia also provide convenient occasions for students to become acquainted with faculty members.

The formal mechanism for faculty advising is as follows: one faculty member is designated as the Director of the Master's Program (or DMP). The DMP is the primary advisor responsible for program decisions, and communications with the School of Professional Studies (SPS). Additional faculty members are designated each year as Master's student advisors. Each incoming student will meet with the DMP or one of the faculty advisors to review the student's preparation and goals, discuss the choice of the first year course program, and recommend a tentative degree plan and course progression. The DMP will continue to advise the student on his/her progress throughout the period of study by:

- maintaining an open line of communication with the faculty as a whole on matters of general or individual concern
- being available for individual advising, as needed or requested
- monitoring each student's progress within the graduate program.

A member of the departmental administrative staff serves in the role of ScM Program Coordinator. The ScM Program Coordinator is available to assist students with all administrative matters. S/he is the first point of contact for most academic matters. All communications/forms should be cc'd to the ScM Program Coordinator to ensure an accurate student file. The ScM Program Coordinator regularly sends

out information pertinent to the student's academic progress including

- fellowship opportunities and available travel funding as they arise
- professional development opportunities and sessions as scheduled

Grievances

It is our hope that a student does not encounter difficulties with members of the department or university. When a difficulty does arise it is important to know how it is handled. See the webpage describing the process for Grievances in detail on the Graduate School's website. A synopsis is included here - all students do have the right to a fair and prompt hearing of grievances after the following steps have been followed:

- The first step is always to try to resolve an issue directly with the person(s) involved.
- Talk with the Chair of the department and/or the Director of Master's Study (DMP)
    - The DMP can put a student in contact with other resources within the department, e.g. the Diversity Officer.

If it is an issue outside of the department, the Dean of the School of Professional Studies will be consulted.

F. PROFESSIONAL DEVELOPMENT

The Physics Master's program_trains students as professional physicists to either continue in further graduate study or pursue careers in industry. There are many university and departmental resources to enhance a student's success on the future path they embark upon.

The University provides a multitude of resources for professional development, including:

- Sheridan Center for Advanced Teaching and Learning
- CareerLab
- Writing Center

Students are also encouraged to participate in various activities and programs campus-wide, especially when deemed suitable to their professional development.

Preparation for Industry

The skills learned in the program will prepare students for a variety of industry positions. Faculty endeavor to maintain industry contacts to be able to connect students with them. To best impress those hiring in industry, students are encouraged to maximize the resources available. Including:

- Networking with faculty, other students and visitors.
- Attending the networking and recruiting events both on campus and outside of Brown that students are regularly informed of by the department.
- Taking advantage of opportunities to make a favorable impression upon faculty - i.e. discussing research interests with faculty, possibly getting involved with faculty guided research as volunteers.

Preparation for a PhD Program

Many students intend to apply to a PhD program after completing the ScM. These students are advised to:

- Excel in their coursework
- Apply to many PhD programs at a wide range of Universities. PhD admission is highly competitive
- Take advantage of opportunities to make a favorable impression upon faculty - i.e. discussing research interests with faculty, possibly getting involved with faculty guided research as

volunteers

Students admitted into the Master's program cannot automatically transition to the PhD program, all students must submit an application and are considered equally with all applications submitted.

To assist in preparing students for either future graduate study or a career in industry, the department holds in-house career development workshops for students, for example workshops for writing a strong personal statement and CV. A personal statement and/or CV that will impress, is essential for students moving forward.

G. STUDENT SUPPORT & RESOURCES

In addition to the resources for teaching and professional development, there are many wellness and enrichment University resources available for graduate students. Faculty, deans, administrators, and even your cohorts are devoted to helping you during your graduate school experience. However, it is up to you to take the first step and reach out to these resources! It is especially important to reach out when your academic progress is in peril. Below is a listing of some of the resources available, a comprehensive listing can be found on the Graduate School's resources and School of Professional Studies (SPS) webpage.

- Student Accessibility Services (SAS) - coordinates and facilitates services for students with physical, psychological, and learning disabilities·
- Counseling and Psychological Services (CAPS) - free, confidential counseling for Brown students is offered Mondays through Fridays during the academic year at the Counseling and Psychological Services office in J. Walter Wilson·
- Associate Dean of Student Affairs, Alicia LaPolla- alicia_lapolla@brown.edu- handles all Master Student medical leave requests and any student support services for Master students. Office is located in 225 Dyer St., 401-863-6351

A student should inform the DMP and the department if they have a disability or other condition that might require accommodations or modification of any of the program or course procedures. As part of this process a student should register with Student Accessibility Services (SAS). SAS will provide the students with an academic accommodation letter to be given to instructors.

Diversity and Inclusion Initiatives - The graduate school and the department are engaged in the work of creating a more diverse and inclusive academic community. The 4th floor of the Graduate Center can provide assistance with recording a lived or chosen name change into the University's systems.
The DMP can direct students to the department's representative of the Diversity and Inclusion Action Plan (DIAP) as a resource for questions or concerns.

Leave of Absence - If a student feels a leave of absence is necessary during their course of study, the department follows the rule outlined in the graduate school's handbook. For a **medical leave** of absence, students should contact Student Support Services (Graduate Center, 4th floor), and Associate Dean for Student Affairs, Alicia LaPolla. All other leaves (**personal, professional development, family, childbirth, and academic - probationary**) require the student to fill out the SPS and Graduate School's leave of absence form, and have it signed by the Department chair and program director before sending it to the Graduate School. All forms should be cc'd to the Student Affairs and Program Manager to ensure it is included in the student's record.

H. INTERNATIONAL STUDENTS

The following University offices and programs are devoted to supporting the unique needs of international students at Brown:

- Office of International Student and Scholar Services (OISSS)
- Global Brown Center for International Students
- Center for Language Studies
- The Writing Center
- English For International Teaching Assistants
- Social Security & Tax Information

Fluency in English is an important skill for physicists and professionals. The Department encourages students whose native language is not English to take advantage of the opportunities and assistance provided by the above offices and organizations.

Immigration documents require international students to be enrolled full-time, for the ScM program this is at least two courses per semester.

I. ADDITIONAL SUPPORT & RESOURCES FOR GRADUATE STUDENTS

- Sc.M. Program Handbook
- Sc.M. Course Permission Form
- Information for Current Physics Graduate Students
- HealthyBrown: Covid-19 Updates & Resources
- Office of Student Support Services
- Global Brown Center
- Registrar's Office
- Graduate Student Union
- Counseling and Psychological Services (CAPS)
- Health Services
- Student and Employee Accessibility Services
- CareerLAB
- Sheridan Center for Teaching and Learning
- Writing Center
- University Library
- Mentoring Resources
- Graduate School Associate Dean of Student Support
- Office of International Student and Scholar Services (OISSS)
- Global Brown Center for International Students
- Office of Institutional Equity & Diversity
- Brown Center for Students of Color
- LGBTQ Center
- Office of Military-Affiliated Students
- Undocumented, First-Generation College, and Low-Income Student Center
- Writing Support: English Language Support Program
- Food Insecurity Resources & Support