Contents

1 Welcome to Madison

Welcome to the UW-Madison Department of Physics! We have a long history of providing our students with a great educational experience. That experience will increase your understanding of the physical universe and provide you with the foundation for your research work and your future career. Expect hard work that pays big dividends.

If you have concerns about your studies in the department, you should discuss them with your advisor, the Director of Graduate Studies, the faculty members in charge of the courses you are interested in, or the Department Chair. Other graduate students are also a great source of information about the department.

Apart from purely academic matters, we are interested in your personal well-being. If there is anything you think we can help with, ask the Department Chair (chair@physics.wisc.edu), Associate Chair, or another faculty member, the Director of Graduate Studies (Jeff Schmidt, dgs@physics.wisc.edu), the Director of Instructional Labs (Jim Reardon, jcreardon@wisc.edu), and/or the Graduate Student Coordinator.

1.1 The City of Madison

Madison is a city of approximately 252,000 people. Madison is home to a regional airport (airport code: MSN) which provides service to many U.S. metropolitan areas daily. In addition, shuttle bus service is available to both Milwaukee's General Mitchell International Airport and Chicago's O'Hare International Airport.

The Chazen Museum of Art is one of the finest college galleries in the country and has recently undergone an extensive expansion. The museum houses the famous collection of Japanese prints left to the University by J.H. Van Vleck, Nobel Laureate in Physics (he grew up in Madison and was a UW-Madison undergraduate). There are at least a dozen organizations that produce live theater, dance, symphony, and opera in Madison. Madison is home to 150 parks, including the University of Wisconsin Arboretum, which is open year-round to visitors wishing to explore its 1,200 acres of natural forests, prairie and orchards.

Madison also provides extensive opportunities for the sports enthusiast. The city is home to three lakes which provide opportunities for a wide variety of water sports. There are 150 miles of bike trails, 100 miles of cross-country ski trails and 40 outdoor skating rinks. The UW-Madison campus is home to several recreation facilities including the Nielsen Tennis Stadium (12 indoor courts), the Natatorium, and the McClain Sports Center.

Visit the following web sites for more information:

- The Greater Madison Convention and Visitor Bureau: https://www.visitmadison.com.
- The University of Wisconsin-Madison: https://www.wisc.edu/student-life.
- Official City of Madison Web Site: https://www.cityofmadison.com.

1.2 The Department

The physics department occupies all of Chamberlin Hall and a portion of Sterling Hall, located in the central campus area. The Physics Library, which is located on the fourth floor of Chamberlin Hall, is large and convenient to use. It has electronic access to databases and an extensive collection of texts and monographs. We also encourage you to consult our highly skilled librarian, Kerry Kresse, and her staff, who are happy to help you find resource materials.

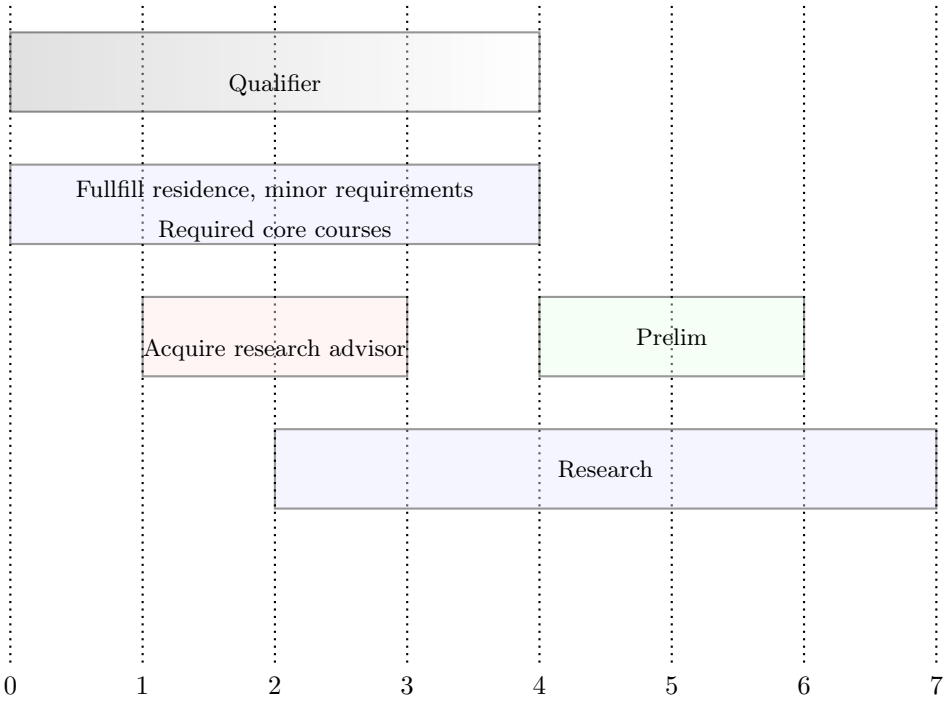
The Department maintains a fine instrument and machine shop and an electronics shop staffed by skilled electronics technicians. There is, in addition, a student-staff machine shop open to graduate students and supervised by an experienced machinist who assists and instructs shop users. Many research programs in physics use the Physical Sciences Laboratory (PSL), an advanced UW facility located approximately twelve miles from campus.

Several computers are available for general computing, and a number of smaller machines are used for on-line control of experiments and for data collection. The Division of Information Technology (DoIT) has a large professional staff which assists users, provides contract programming services and offers a wide variety of microcomputing courses. The Microcomputer Instructional Lab contains IBM and Macintosh microcomputers, popular software, laser printers and graphic scanners. Use of the lab is free for UW-Madison students, faculty and staff.

2 The steps to the Ph.D.

Let's get down to business. In summary, the steps to the Ph.D. are:

- 1. Pass the Departmental Qualifying Examination
- 2. Acquire a research advisor and start research
- 3. Complete the required course work and a minor program
- 4. Pass the Preliminary Examination
- 5. Complete thesis research and present dissertation (the thesis defense)
- 6. Deposit dissertation with the Graduate School.



Ideal plan of progress, semester 0 to 7

These steps are described in detail below. Please make note of those items in the description that are your responsibility, and make sure that you are fully aware of deadlines and requirements. The Graduate School posts many deadlines online (https://grad.wisc.edu/deadlines/).

The Ph.D. is at its core a research degree. The degree requires substantial original research, presented in the form of a dissertation. The path to the Ph.D. consists of two stages. In the first (pre-dissertator) stage, the student passes the department's Qualifying Examination, completes required coursework, and starts research with their research advisor in preparation for the Preliminary Examination. Once the student completes all departmental and Graduate School requirements and passes the Preliminary Examination, the student has achieved dissertator status. In this stage of the program, the student focuses on their thesis research, and completes their dissertation. The student defends the dissertation in the thesis defense. The student then deposits the dissertation with the Graduate School, which is the final step to the degree.

The requirements for the Ph.D. are in accordance with the department's learning goals of the program, as listed in detail at http://guide.wisc.edu/graduate/physics/physics-phd/. Each of these requirements will now be described in detail.

2.1 Qualifying Examination

The qualifying exam is designed to assess students' understanding of core topics in physics at the undergraduate level. The exam provides students with an opportunity to solidify their knowledge of advanced undergraduate coursework, which helps to ensure students have a strong foundation in physics that is needed for advances in original research. We believe that the students we admit to the Ph.D. program are capable of passing the qualifying exam.

The qualifying exam is a written exam that is offered twice a year (September and January). This exam is separated into four sections: Classical Mechanics (CM), Electricity and Magnetism (EM), Statistical Mechanics (SM), and Quantum Mechanics (QM). Each exam section can be passed independently of the others. All physics Ph.D. students will have four opportunities to pass the written exam at the Ph.D. level. These attempts are to take place within the first two years in the program. All entering Ph.D. students are required to take the exam in their first semester in the program. Physics graduate students that pass all sections of the written exam at the Ph.D. level are automatically qualified to continue in the Ph.D. program.

In the case that a student does not pass all four sections of the written exam after the four attempts, the next step is that the student has the option to request an appeal. The appeal will be made to an appeals committee. The appeals committee decision will be based on a thorough evaluation of the student's progress to date in the Ph.D. program, including coursework, qualifying exam score history, and research work. If the appeals committee decision is positive, the student has passed the Qualifying Exam requirement in the department, as required for good standing and satisfactory progress toward the Ph.D.

We encourage students to consult with their advisor/mentor and the Director of Graduate Studies following the initial assessment, and to take advantage of available department resources, including course options and organized qualifying exam review sessions. An archive of previous exams is available at https://abadonna.physics.wisc.edu/QualPrep. We can also provide other exam prep materials; please feel free to contact the Director of Graduate Studies if you wish to access these materials.

Further details are in Appendix A, and online at https://www.physics.wisc.edu/academics/gradstudents/qualifying-exams.

2.2 Research advisor (and research, more generally)

The responsibility to acquire (choose and be accepted by) a research advisor is entirely with the student, who should visit professors doing research in the areas of the student's interest. Acceptance for Ph.D. research by a professor depends on the professor's appraisal of the student's potential for research and on the ability of the professor to accept a student at that time. Please note that while all incoming students are assigned a temporary advisor to help oversee their progress in the first few semesters in the program, the temporary advisor is not automatically the research advisor unless there is a clear and concrete understanding between both the student and the advisor that the student has already been accepted by that professor into their group.

To aid you in the choice of a field of research and of a research advisor, Physics 701, the weekly "Introductory Seminar," is held in the fall semester. In this course, seminars, professors from each of the research groups describe their research, show their laboratories, and discuss matters of general interest to graduate students. First-year students are asked to enroll in Physics 701 and attend these seminars.

Graduate students should begin research work as early as possible. Ideally students are encouraged to make arrangements with a professor to start research work by the end of the second semester. The following summer is the ideal time to do research unencumbered by course work or teaching. It is also very important to determine summer funding support options as soon as possible. We hope that you will have begun a trial project with an advisor or at least made the necessary introductions and have at least one solid prospect by the beginning of the third semester. We do have people on staff to help you with this. The Graduate School also has some guidelines https://grad.wisc.edu/documents/advisor/.

2.3 Coursework

The Ph.D. degree includes a number of coursework and credit requirements. The Ph.D. degree itself requires 51 credits in total. One of the requirements for achieving dissertator status is to satisfy the Graduate School requirement of 32 graduate-equivalent credits. This is achieved via the core course sequence (below), the minor program (below), and a combination of other coursework and Physics 990 (research). The question of whether a specific course can be used to satisfy the graduate-equivalent credit requirement can be checked via the university's Course Guide. Details regarding the credit requirements can also be found at https://grad.wisc.edu/current-students/doctoral-guide/.

Prior to reaching dissertator status, students holding regular half-time teaching or project assistantship positions are expected to register for at least six credits (three courses are encouraged after the first semester to ensure that you are on track to satisfying the Graduate School credit and residence requirements). In order to accumulate the 32 credits needed for the residence credit requirement students are advised to take eight credits per semester on average for their first two years.

Students holding research assistantships or who have fellowships are required to carry at least eight credits (this can be partly or entirely Physics 990) each semester until dissertator status is achieved. Students are also expected to take a least one physics course per semester until dissertator status is achieved (exceptions to this rule in unusual cases can be granted by the Director of Graduate Studies). Those who have achieved dissertator status must register for three credits (typically Physics 990, but they can be upper level courses related to research with advisor approval) each semester. To remain in good academic standing in accordance with Graduate School policy, a student must maintain a B average in course work (https://grad.wisc.edu/documents/gpa-requirement).

2.3.1 Core sequence

All Ph.D. candidates must take the core course sequence in physics: Physics 711 (Dynamics), 715 (Statistical Mechanics), 721 (Electrodynamics) and 731 and 732 (Quantum Mechanics), or have course waiver or test-out forms on file. Students must achieve a grade of B or better in each core course, or repeat these courses until a B grade is achieved.

Most entering students take two of these core courses in the fall semester and two in the spring semester. Students should complete the core courses by the end of their fourth semester in the program (exceptions to this general rule can be granted by the Director of Graduate Studies). Students are strongly encouraged to attend their courses, as attendance is often correlated with success in coursework. Further suggestions can be found in Appendix B.

Students who believe that they have done graduate-level work in one or more of the core course subjects prior to their arrival in Madison may be eligible for course waivers, or they may decide to try to test out of these subjects. The details of these procedures are described below. To ensure that students are on track with their course requirements, students should bring these issues to the Director of Graduate Studies within the first month of enrollment in the program, as described below.

Waivers of core courses can be granted for credits earned at other universities in equivalent graduate-level courses, pending approval by the Director of Graduate Studies. Students who believe that they qualify for a waiver of the course requirement for a core course based on prior graduate course work should request consideration for a waiver within the first month that they are enrolled in the program.

Students who believe that they have had graduate level work in a subject or subjects comparable to what is covered in the core courses, but who do not clearly qualify for a waiver of any specific course requirements, have the option of trying to test out of the course. This typically requires (at minimum) passing the final exam for the course at a level that would clearly lead to a grade of B or better in the course. Requests to test out of core courses should be made to the Director of Graduate Studies during the first month in the graduate program in physics. The testing is to be completed during the student's first semester in the graduate program.

2.3.2 Minors

The purpose of the minor is to add breadth to the Ph.D. course of study by broadening students' knowledge of physics or related fields, and/or to support their research and prospective professional activities. There are three options for completing the minor: (i) Option A (external department), which consists of courses in a single department outside of the physics department, (ii) Option B (distributed), which consists of courses in physics and at least one other department, and (iii) Option B (internal distributed), which consists of courses in the physics department outside the student's area of specialization. The detailed requirements for each option are as follows:

- **Option A (External).** The Option A minor consists of coursework in one single department/major outside the physics department and has the name of that department/major (e.g. Astronomy). Please consult the external department for specific credit and course requirements, as many have specific guidelines that are to be followed.
- **Option B (Distributed).** The Option B (Distributed) minor consists of 12 credits, with courses taken in two or more degree-granting departments. The courses taken can be 300 level and above for departments other than physics, and 500 and above for physics. This minor option must incorporate the following: a) at least three credits selected from one or more departments other than physics, with the program directed toward an identified objective as approved by the research advisor and the Director of Graduate Studies, and b) not more than nine credits within the physics department. All physics courses should be outside the student's area of physics specialization. The required physics core courses and Physics 990 are excluded from the minor.
- **Option B (Internal Distributed).** The Option B (Internal Distributed) minor consists of 12 credits in physics at the 500 level or above, with all courses in areas distinct from the student's area of research specialization. Required core courses and their prerequisites are excluded from the minor. Physics 990 is also excluded from the minor. The Option B (Internal Distributed) minor program should be coherent, and cannot include courses in other departments.

A GPA of 3.0 must be maintained in the minor. All courses in external departments must be at the 300 level or above. Ordinarily, only one course (maximum 3 credits) of independent study is allowed (i.e. 699, 799, 999). No more than five credits completed five or more years prior to admission to the Ph.D. program may be used. Courses taken 10 or more years prior to admission to the Ph.D. program may not be used. Courses taken for pass-fail or for audit may not be used. Courses with grades of S (Satisfactory) or C (credit) are acceptable. The Graduate School will not transfer any graduate work done at another institution toward fulfillment of the minor requirements.

To ensure coherence, the student's minor program must be approved by their research advisor and the Director of Graduate Studies, and ultimately it must also be signed by both the research advisor and the Department Chair. If a student chooses Option A (external department), approval and a signature are required from the minor department advisor, who is the faculty delegate that oversees minors in the external department. The minor plan is recorded on the Ph.D. Minor Agreement form. This form also specifies the student's area of specialization within the department. Forms can be obtained from the Director of Graduate Studies.

It is strongly recommended that you formulate your minor plan as soon as possible – preferably well before the time you plan to take Preliminary Exam. If you need help doing so, please consult with your advisor and the Director of Graduate Studies. Minor plans can of course be revised if needed. If you need to revise your minor plan, please consult with your advisor and the Director of Graduate Studies.

The Ph.D. Minor Agreement Form must be completed, signed, and returned to the Graduate School at or before the time the warrant for the Preliminary Exam is requested, which must be at least three weeks before the anticipated date of the Preliminary exam). Further details about the Preliminary Exam and warrants will be discussed below.

The minor requirement in Physics for non-physics graduate students is 12 credits numbered above 300, each passed with a B or better. The program must be approved by the Director of Graduate Studies before it is completed.

2.3.3 Other coursework to consider

Entering graduate students should check that their undergraduate work was equivalent to a complete physics major. Students without the experience of a senior advanced laboratory course should consider Physics 507. Physics 623 (Electronic Aids to Measurement) and 625 (Applied Optics) are important for an understanding of experiments in most research areas and should be taken as soon as possible. The remaining 500 and 600 level courses in the student's area of interest should also be taken as early as possible. In particular, those interested in plasma physics should begin the sequence of plasma courses with Physics 525 (Introduction to Plasmas).

We encourage graduate students to attend the weekly colloquium. We also suggest that students regularly attend the seminar series in their areas(s) of interest.

2.4 Preliminary Examination

The Preliminary Examination must be passed for admission to candidacy (dissertator status) for the Ph.D. It should be taken no later than the end of the fifth semester in the program or approval for an extension (by semester) from the Department Chair is needed. If the Preliminary Examination is failed the first time, it may be repeated once before the end of the sixth semester. Exceptions may be granted under unusual circumstances by the Department Chair, in consultation with the Director of Graduate Studies and the Associate Chair.

The Preliminary Exam is intended to test whether the student has mastered the physics and technology necessary for research in the proposed general area of study, and to assess whether the student is on track to satisfying the department's learning goals for the Ph.D. degree (for details, see http://guide.wisc.edu/graduate/physics/physics-phd/). The exam requires that a warrant be issued for it (https://grad.wisc.edu/documents/warrants/), so plan accordingly (you should allow for at least a month for this planning). The Preliminary Exam is held before the student's Preliminary Exam committee, which at minimum consists of three members: the student's research advisor (who serves as the chair of the committee), one faculty representative from the departmental Prelim Exam Committee, and one additional committee member that is typically chosen by the student and/or their advisor. The third committee member is typically a UW-Madison faculty either in physics or another related department.

The exam format can vary slightly depending on the research advisor and research group, but it typically begins with a one-hour talk covering a subject in the student's chosen area of research, and is followed by a question and answer period designed to assess the student's background knowledge and research potential, The question and answer period typically takes place both in open session (in front of a general audience) and in closed session (just in front of the committee). The committee then deliberates the exam outcome in closed session, and communicates the result to the student once the decision is made.

A student planning to take the Preliminary Examination will need to present a completed and signed Minor Agreement Form and request a Preliminary Examination Warrant Request Form from the Graduate Student Coordinator at least three weeks prior to the date of the examination. Please note that a warrant from the Graduate School is required before taking the Preliminary Examination. Please be aware that the warrant will not be issued if the student has any grade of "Incomplete" in their academic record. It is the responsibility of the student to check with the Director of Graduate Studies to ensure that such a grade does not appear on their record.

2.5 Dissertator status

A graduate student has achieved dissertator status when they have

- passed the Qualifying Examination;
- satisfied the Ph.D. graduate-level credits requirement;
- completed the required core course sequence (Physics 711, 715, 721 731, 732) with a grade of B or better;
- satisfied the Minor requirement;
- passed the Preliminary Examination; and
- the signed and dated Preliminary Exam warrant is returned to the Graduate School.

Dissertator status is effective at the start of the semester immediately following the completion of these requirements. (For example, if you have completed all course/credit requirements and take the Preliminary Examination in the middle of the semester, you will be a dissertator at the start of the next term.) Official determination of dissertator status is made only at the Graduate School. For more information, visit https://grad.wisc.edu/documents/dissertator-status/.

Dissertators must register for three credits per semester (including at least two credits the Summer Session if on an appointment and/or if student is depositing their dissertation with the Graduate School in the summer term). These credits are typically 990 (research) credits. Continuous registration is required from the time a student has achieved dissertator status through the filing of the Ph.D. dissertation in the Graduate School. (This includes Fall and Spring semesters, and if holding an appointment, Summer semesters, while on or off campus.)

Please note that students are strongly encouraged to make sure that the department administrator and any other relevant payroll personnel have been properly notified once dissertator status is achieved.

2.6 Thesis defense

The doctoral thesis defense is an oral defense of the dissertation. The thesis defense includes both a presentation of the dissertation material, and question/answer sessions that can take place both in open session (before a general audience) and closed session (just in front of the doctoral thesis committee). Graduate School policy dictates that the thesis defense must be undertaken within five years of passing the Preliminary Examination. For more information, visit https://grad.wisc.edu/documents/final-oral-examination/.

In accordance with Graduate School policy, the doctoral thesis committee consists of the student's advisor and three other committee members. Two of these three must be faculty or former faculty up to one year after resignation or retirement. The third is an external committee member who may be a UW-Madison faculty, a visiting professor, a faculty member from another institution, an academic staff member (including scientists and emeritus faculty), a postdoctoral scholar, or another individual deemed qualified by the student's research advisor and the Department Chair. The Department Chair must approve the Final Committee Approval Form. Forms may be obtained from the Graduate Student Coordinator. More information is at https://grad.wisc.edu/documents/committees/.

The thesis defense also requires a warrant, so again you should plan accordingly. Warrant requests must be made to the Graduate Student Coordinator at least three weeks prior to the date of the thesis defense. It is very important to be aware of the Graduate School's deadlines for the degree to be conferred either in May, August, or December. For further details, please consult https://grad.wisc.edu/current-students/doctoral-guide/.

2.7 Satisfactory Progress

A student is making satisfactory progress toward the Ph.D. degree if they:

- Carries at least six credits if a TA or eight credits if a Fellow or an RA (all until dissertator status) unless granted special permission by the Chair to register for fewer credits in exceptional cases. Please be mindful to take a sufficient number of credits per year to satisfy the graduate credit and residence requirements in a timely manner.
- Completes all core courses by the end of the fourth semester, or is granted an extension by the Director of Graduate Studies.
- Enrolls in at least one physics course per semester until the Preliminary Exam is passed, or is granted exemption by the Director of Graduate Studies. (Physics 990 is sufficient, subject to advisor approval.)
- Does satisfactory course work (average grade B or better overall, and at least a B in each required course).
- Passes the Qualifying Examination requirement (either by passing all sections of the written exam at the Ph.D. level or via a successful appeal) by the end of the fourth semester. (Students are allowed to take the qualifying exam during each of the first four semesters in the program for a total of four attempts.)

- Makes progress toward acquiring a research advisor and joining a research group in a timely fashion (preferably by the beginning of the third semester), so as to be on track to take the Preliminary Examination according to the prescribed standard timeline.
- Takes the Preliminary Examination by the end of the fifth semester, and passes it by the end of the sixth semester (extensions may be granted by the Department Chair, in consultation with the Director of Graduate Studies and the Associate Chair).
- Makes satisfactory progress in research work as judged by the research advisor.

Please be aware that satisfactory progress is very important. Students who are not achieving satisfactory progress in graduate studies over an extended period run the risk that they may be dropped from the Ph.D. program.

2.7.1 Delays

Delays in the Qualifier or Preliminary deadlines can only be granted by the Department Chair, in consultation with the Director of Graduate Studies and the Associate Chair. Delays in the Qualifier exam timeline must involve unusual circumstances. Extension requests for the Preliminary Exam are to be submitted to the Department Chair, in writing, from the student's research advisor and must confirm the student is making satisfactory progress in their research. The research advisor should also include a general timeline for taking the prelim. Failing to pass the Qualifier on the first attempt does not normally constitute grounds for delaying the Preliminary Examination schedule. The use of delays for the Preliminary Exam is intended (for example) to aid those students who encounter unavoidable delays in the choice of a permanent research advisor.

2.7.2 Leave of Absence Policy

While in most cases participation in the program is continuous through time, students sometimes find it necessary to take a temporary leave of absence. Graduate students may request a leave of absence by submitting a statement of their timeline for the leave and general reasons for the absence. The advisor of record must agree that the student is leaving in good standing and may re-enter the program in a reasonable stated length of time.

Written requests for a one semester or full year leave of absence should be addressed to the Department Chair, and should be communicated also to the Director of Graduate Studies and the research advisor. If a student is granted a one semester leave of absence, the milestone due dates and terminal deadlines are pushed back approximately one semester. If a student is granted a full year leave of absence, all due dates and deadlines are pushed back one year. Students may be granted a leave of absence for no more than one year. Students who do not register for more than one year will be considered inactive.

If you need to request a leave of absence, the first step is to write a letter requesting a leave of absence that includes the reason and time for the leave, and to obtain an endorsement from your advisor. The letter and advisor endorsement should be communicated to the Director of Graduate Studies and the Graduate Student Coordinator, who will provide you with a leave of absence form. Please note that the Department Chair, in consultation with the Director of Graduate Studies and the Associate Chair, decides on all of the requests. Please also note that the Office of Graduate Admissions, room 217 Bascom Hall, must be notified of the semester of re-entry, and the leave of absence form should be returned to the Graduate Student Coordinator upon re-entry.

2.7.3 Re-Entry Policy for Department of Physics

Graduate students who leave the program in good standing for more than one year may request re-entry to the program by completing the Graduate School application for admission. The Department Admissions Committee in consultation with the student's advisor will review the request and approve the request based on information provided. A leave of absence request on file will enhance the re-entry approval process.

2.7.4 Time Limits for the Ph.D.

If a student has not enrolled for more than one year, they must submit an online application to the Graduate School and pay the application fee. If they did not do their thesis defense within five years after passing the preliminary examination, they must take another preliminary examination to be awarded dissertator status.

The department can submit a written request to the Graduate School Office of Academic Services if they believe an appeal to the time limit policy is appropriate. An appeal should provide information demonstrating that that the student has remained current in their field of study, for example, a resume showing applicable work experience in the area of specialization and/or official transcripts from other schools attended. At the time of re-admission, the department should recommend to the Graduate School which credits, if any, should be counted toward the Graduate School Minimum Credit Requirement for work done more than five years ago.

2.8 Enrollment and Course Load

The standard (full-time) program consists of 8 to 12 credits of graduate work for a semester, and 2-3 credits for the 8-week Summer Session. Students may not register for more than 12 graduate credits during the semester, or more than 8 graduate credits in the 8-week Summer Session, without prior approval from the Graduate School. In order to have access to University facilities graduate students must be registered for at least two graduate credits during the regular academic year.

2.8.1 Course Loads for RAs, TAs, PAs, and Fellows

RAs or students with fellowships must carry a full graduate load (8-12 credits per semester, and at least 2 graduate credits, typically Physics 990, in the summer) until dissertator status is achieved. TAs and PAs are expected to carry a minimum of 6 credits. It is often suggested that TAs take only 6 credits during their first semester, as more than this may affect performance in both teaching and coursework as students become acquainted with the demands of the program. After their first semester, students are encouraged to take three courses per semester until they reach dissertator status. All students must meet with their advisor each semester for approval of their course schedule.

2.8.2 Summer Session Enrollment

Graduate students who have served as graduate assistants with tuition waivers during the previous academic year have the same waiver during the Summer Session. A student holding a research assistantship during a Summer Session must be concurrently registered for at least two credits. Graduate students who are TAs during the Summer Session do not have to be registered; however, the department recommends that all students register for summer to obtain summer university privileges and for tax reasons. Dissertators must register in the summer if they will graduate that summer term. The credits taken can be Physics 990 credits or an upper graduate level course (numbered 500 or above) in the student's field as approved by the advisor.

3 Master's Degrees

Students may be admitted directly to the Master's program in Physics or earn either a Master of Arts (M.A.) or Master of Science (M.S) en route to a Ph.D. in Physics.

3.1 Professional Master of Science (M.S.) Program

The M.S. program is a professional program designed to strengthen the student's physics background, and enhance their opportunities for employment as a physicist or in physics education. The program should normally be completed in two years or less by full-time Master's students.

To earn the M.S. degree in the Department of Physics, a student must satisfy the department's minimum graduate-level credit requirement and pass the Qualifying Exam at the Master's level (nominally a score of 50% or better on each of the four sections of the examination). The department requires at least 30 credits at the 500 level or above. 15 of the 30 credits must be earned from taking the core graduate courses, each passed with a grade of B or better. These courses are Physics 711 (Dynamics), 715 (Statistical Mechanics), 721 (Electrodynamics), and 731 and 732 (Quantum Mechanics). The remaining 15 credits may be earned through a combination of research (Physics 990) and coursework. The courses should be selected in consultation with the student's advisor to best meet the student's professional objectives. An overall 3.0 GPA must be maintained.

The student must present satisfactory evidence of scientific research, writing, and presentation skills. This will usually be done through a Master's research project that results in the submission of a Master's Thesis written at a satisfactorily professional level, together with an oral presentation of the project in a Master's Thesis Defense or through the Preliminary Examination en route to the Ph.D. The Master's project is a directed physics research project which can be completed in one to two semesters. No later than the end of the second semester in residence, every Master's student should acquire an advisor who agrees to supervise the Master's project. The thesis must be approved by the student's advisor and a second faculty member appointed by the Director of Graduate Studies.

In summary, a Master of Science Degree in physics is awarded to a student who has:

- satisfied the graduate-level credits requirements and Physics course requirements,
- passed the Qualifying Examination in Physics at the Master's level,
- completed a Master's project that is written up as a Master's thesis, and
- made a presentation of the project in a Master's Thesis Defense or passed the Preliminary Examination.

The M.S. degree requires a warrant, and it is important to plan accordingly. Warrant requests must be made to the Graduate Student Coordinator at least three weeks prior to the date of the thesis defense. It is also important to be aware of the Graduate School's deadlines for the degree to be conferred either in May, August, or December. For further details, please visit https://grad.wisc.eduacademic-policies/.

3.2 Academic Master of Arts (M.A.) Program

The M.A. program is an academic, course-based program designed to strengthen the student's physics background, and to enhance their opportunities for employment as a physicist or in physics education. The program should normally be completed in two years by full-time Master's students.

To earn the M.A. degree in the Department of Physics, a student must satisfy the Department's minimum graduate-level credit requirement and pass the Qualifying Exam at the Master's level (nominally a score of 50% or better on each of the four sections of the examination). The department requires at least 30 credits at the 500 level or above. Fifteen of the 30 credits must be earned from taking the physics core graduate courses, each passed with a grade of B or better. These courses are Physics 711 (Dynamics), 715 (Statistical Mechanics), 721 (Electrodynamics), and 731 and 732 (Quantum Mechanics). The remaining 15 credits may be earned through a combination of coursework, directed study, and research to be determined in consultation with the student's academic advisor. An overall 3.0 GPA must be maintained. Prior to the end of the first semester in residence, each Master's student must acquire an academic advisor. The advisor will consult with the student prior to the start of each term to assist the student in selecting coursework to help the student achieve his or her professional goals.

In summary, a Master of Arts Degree in physics is awarded to a student who has:

- satisfied the graduate-level credits requirements and Physics course requirements,
- passed the Qualifying Examination in Physics at the Master's level.

The M.A. degree also requires a warrant, and it is important to plan accordingly. Warrant requests must be made to the Graduate Student Coordinator, allowing at least three weeks for the warrant to be processed. It is important to be aware of the Graduate School's deadlines for the degree to be conferred either in May, August, or December. For further details, please visit https://grad.wisc.eduacademic-policies/.

3.3 Time Limits

A Master's Program should normally be completed in two years or less. The program must be completed in three years. The time limit may be extended by the Department Chair, in consultation with the Director of Graduate Studies, for Master's candidates who were accepted into the program on a part-time basis and who have presented an acceptable plan for completing the degree. If you are applying to resume your studies after five years to complete a degree that was in progress, you must fulfill the Graduate School's minimum credit requirement. Credits earned while previously enrolled are not counted toward this requirement. Ph.D. candidates who wish to obtain a Master's degree in Physics may do so at any time prior to earning the Ph.D. by completing the requirements for either the M.S. or the M.A.

A warrant from the Graduate School is required to receive the M.S. or the M.A. degree. The warrant will not be issued if the student has a grade of "Incomplete" on their record. It is the responsibility of the student to inform the Graduate Student Coordinator at least six weeks before the end of the semester that the degree is expected and to determine that all required work has been completed.

Students admitted initially only to a Master's program must reapply to the Physics Admissions Committee if they wish to enter the Ph.D. program. Acceptance into the Ph.D. program is not automatic, and will be decided on the basis of the student's record and prospects for completing the Ph.D.

4 Minimum Graduate-Level Credit Requirements

The credit requirement, shown below, reflects the minimum number of UW-Madison graduate-level credits that must be taken in order for the degree to be considered a UW-Madison degree. Graduate-level credits include those courses in physics numbered 500 or above as well as those courses in other departments numbered 300 or above.

Minimum Graduate-Level Credits for degrees conferred by the UW-Madison:

- Master's Degrees: 30
- MFA, Specialists: 30
- Ph.D., DMA: 51

The minimum credit requirement for Ph.D. students must be completed prior to achieving dissertator status. The Graduate School will not "transfer" any graduate work done at another institution toward fulfillment of the minimum UW-Madison credit requirement. All graduate-level credits, including those taken during the summer, will count toward fulfillment of the minimum credit requirement. Students must have at least a 3.0 GPA in their graduate coursework in order to graduate. Students who receive Graduate School approval for a credit overload (more than 12 credits in a semester) will be able to count all graduate-level credits toward fulfillment of the minimum credit requirement. A graduate-level course taken at a distance will count toward the minimum credit requirement only if the course is considered a UW-Madison course. For more details, see https://grad.wisc.edu/documents/minimum-graduate-degree-credit-requirement.

5 Teaching Assistantships

Many of you will, at least at some point in your graduate study, hold a teaching assistantship. A teaching assistantship is both a job and a means of support for graduate study. Because of the coexistence of these two functions, the relationship between the department and the individual teaching assistant (TA) is complex. The advantages of holding a teaching assistantship for at least one semester during graduate studies are that teaching activities solidify and deepen the teaching assistant's undergraduate education in physics, help improve communication skills, and help prepare for a possible career in teaching.

Because teaching is a job, the department conducts regular TA evaluations. TAs are evaluated by their students

at the middle and end of each semester. The evaluation questions in the questionnaire are provided in Appendix C. The purpose of the mid-term evaluation is for the TA to get feedback from the students (who remain anonymous), while there is still time to change teaching practices. The mid-term evaluations are not part of the TA's permanent record. The final evaluation results in a letter, which does remain on the TA's record, in which the TA's performance is classified as either 'Excellent", "Very Good", "Good", "Satisfactory", "Marginally Satisfactory", or "Unsatisfactory". The Department offers several awards, including the Dillinger Teaching Award, the "Best TA of the Semester" award, and the "Rookie of the Year" award, which are based in part on teaching evaluations.

Also because teaching is a job, TAs are subject to discipline for just cause. Just cause for discipline pertains to actions by the TA which are detrimental to the students, such as missing class, or disorderly/disruptive conduct. A variety of disciplinary actions are possible, up to and including termination of the TA position (i.e. being fired) and being expelled from the University. The Teaching Assistants' Association (`http://taa-madison.org`) may be able to assist TAs who may be at risk of disciplinary action. For more details about possible disciplinary procedures, students can consult the Director of Graduate Studies (dgs@physics.wisc.edu) and the Director of Instructional Labs (jcreardon@wisc.edu).

Because teaching is a means of support for graduate study, the department typically admits graduate students with a guarantee of support. This guarantee is described in each student's offer of admission. During the time covered by the guarantee (typically the first three years), students who are not supported as RAs or Fellows, and who remain in good standing, are guaranteed by the department to be supported as TAs during the academic year.

After the natural expiration of the guarantee, students who need TA positions during the academic year may apply for them, but cannot be assured of receiving them. The number of TA positions available depends on the number of undergraduates who enroll in physics classes that use TAs, as well on the percentage time of each position. Whereas guarantees of support typically specify 50% time appointments (360 hours of work during the semester), the minimum percentage required for a TA to receive a tuition waiver is 33% (240 hours of work during the semester), so the department sometimes offers non-guaranteed graduate students 33% positions, in order that as many non-guaranteed students as possible might receive the tuition waiver. On occasion students have requested 33% positions rather that 50% positions in order to free up more time for research. If a teaching assistant transfers to another department, the physics department's commitment to continuing support is terminated. However, exceptions may be made for joint Ph.D. programs or in other special circumstances, at the option of the physics department.

There is a small number of TA positions available in the Summer Session. Please note that the support guarantee does not extend into the summer. Depending on the number of requests, TA positions may or may not be available for all who request them. For further information about summer TA positions, please consult the Director of Instructional Labs (jcreardon@wisc.edu).

The majority of TA positions are in large General Physics classes for non-physics-majors. TAs in these classes lead both discussion sections and laboratory sections. There are also a few TA positions in smaller, more advanced classes for physics majors. These are usually (although not always) given to experienced TAs. Some involve discussion only (no lab), others involve lab only (no discussion).

6 General Information for Students

6.1 Support Resources for Students in the Department

There are a number of resources in the department to help you navigate your time in graduate school. These resources include academic resources, such as faculty advisors/mentors, the Director of Graduate Studies, and the Director of Instructional Labs. If you have questions about administrative issues such as warrants, payroll, etc., please contact the Graduate Student Coordinator.

The Physics Graduate Student Council (PGSC) is an organization run by physics graduate students that provides informal mentoring and support from peers, and hosts social activities where students can get to know each other. The mission of the PGSC is to improve the well-being and success of graduate students in the department. The PGSC works toward the following goals:

- Facilitate communication with the department and advocate on behalf of the graduate students,
- Assist the department in welcoming new students and recruiting prospective students,
- Promote social cohesion among graduate students, and
- Provide resources to help prepare students for post-graduate careers.

All students are welcome to get involved in PGSC activities in whatever capacity they can, such as attending meetings or events. All students are also encouraged to reach out to PGSC members for assistance, advice, and support. This can range from advice about how to join research groups to what neighborhoods students enjoy living in. More information can be found at https://pgsc.physics.wisc.edu.

The Women and Gender Minorities in Physics (GMaWiP) group is a student organization that provides a community for women and gender minorities in physics as well as professional development resources for them. It is open to anyone at any level in academia (undergraduate, graduate, postdoc, research scientist, and professor) who identifies as a woman, gender minority (such as people who are transgender or nonbinary), or ally of women and gender minorities. The group collaborates with the department to enact policies that promote a more inclusive and improved environment within the department. GMaWiP hosts mentorship, fellowship, and professional development events (for example, s'mores at Picnic Point, movie nights, mentorship dinners, and negotiation seminars) to create a supportive community for its members, and participates in numerous outreach efforts in the local community. For more information, visit https://gmawip.physics.wisc.edu.

There are also campus-wide student organizations that provide spaces and support specifically for students holding underrepresented social identities including but not limited to gender, race, sexual orientation, socioeconomic background, and ability. Many of these resources are listed on the department's Climate and Diversity page (https://www.physics.wisc.edu/resources/climatediversity). For more information, you can also contact PGSC and/or GMaWiP, and/or watch for announcements within the department or on campus.

6.2 Campus Information and Resources

Below please find information about a number of additional topics that are relevant for UW-Madison students.

6.2.1 Student Code of Conduct

Students are expected to conform to accepted codes of conduct. This includes avoidance of disruptive or harassing behavior and sensitivity toward issues related to race, gender, disabilities, and sexual orientation. For more information and resources, please see https://conduct.students.wisc.edu.

6.2.2 Grievances

An important question that many of you might have is the question of to whom you should go to register a grievance, complaint, or just a suggestion. We recommend that you inform your research advisor, if appropriate, and/or the Director of Graduate Studies (dgs@physics.wisc.edu), and/or the chair of the departmental Climate and Diversity Committee about any concerns you may have about academic issues or the academic environment. This is not meant to discourage a direct approach to the Department Chair (chair@physics.wisc.edu), only to provide alternative avenues. Some issues can be discussed with your research advisor, others with the Director of Graduate Studies and/or the chair of the Climate and Diversity Committee, and still others with the Department Chair. The hope is that this will result in the development of a working environment that all will find supportive. If you have a question of whether or not a situation or discomfort should be discussed, the answer is YES! Any issue which troubles you should be addressed and, if it is within our authority, it will be resolved.

If you feel unfairly treated or aggrieved by faculty, staff, or another student, it is recommended that your concerns are first handled directly with the person responsible for the objectionable action, if possible. If you are uncomfortable making direct contact with the individual(s) involved, you should contact the advisor or the person in charge of the unit where the action occurred (program or department chair, section chair, lab manager, etc.), and/or contact the people mentioned above.

There are also resources and formal grievance procedures at the campus level that can be followed, which are outlined in the Academic Policies and Procedures of the Graduate School (https://grad.wisc.edu/academic-policies/). The following administrative offices have formal procedures available for addressing various concerns:

- Offices of the Dean of Students (for all grievances involving students):
  75 Bascom Hall, (608) 263-5700, students.wisc.edu
- Office for Equity and Diversity (for discrimination or harassment issues):
  179A Bascom Hall, (608) 262-2378, oed.wisc.edu
- Employee Assistance (for conflicts involving graduate assistants and other employees):
  256 Lowell Hall, (608) 263-2987, eao.wisc.edu
- Ombuds Office for Faculty and Staff (for graduate students and post-docs, as well as faculty and staff):
  523-524 Lowell Center, (608) 265-9992, ombuds.wisc.edu
- Graduate School (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions):
  217 Bascom Hall, (608) 262-2433, grad.wisc.edu.

For further details about grievance procedures, please consult with the Director of Graduate Studies and the Graduate Student Coordinator.

6.2.3 Climate and Diversity

We are committed to providing an optimal environment for intellectual achievement at both the undergraduate and graduate levels. All members of the physics department are expected to do their part to maintain this positive academic climate. We do not tolerate harassment of any member of our community.

The department's Climate and Diversity Committee is the right place to start if you have concerns about the departmental climate. More information is at https://www.physics.wisc.edu/resources/climatediversity.

At the campus level, the Office for Equity and Diversity (OED, https://oed.wisc.edu/) can assist with concerns about any type of prohibited harassment or discrimination, including harassment based on gender, race, religion, ethnicity, age, disability, and sexual orientation. University guidelines are at http://www.oed.wisc.edu/sexualharassment/. Concerns should be first addressed to Luis Pinero, Director of Equity and Diversity Resource Center (263-2378), luis.pinero@wisc.edu. Other resources include the Title IX Coordinator, Lauren Hasselbacher (890-3788), lauren.hasselbacher@wisc.edu), Title IX/Equal Opportunity complaint investigators Bobby Brown (265-2320), bobby.brown@wisc.edu and Jennifer Horace (265-2349), jennifer.horace@wisc.edu, the Office of Legal Affairs, Student Advocacy and Judicial Affairs (263-5700), the University Ombudsman office (265-9992), https://ombuds.wisc.edu/), and employee assistance confidential email (eao@mailplus.wisc.edu, phone 263-2987).

6.2.4 Mental Health Resources

We quote directly from the University Health Services (UHS) website (https://www.uhs.wisc.edu/): "Our mental health providers understand the complexities of student life and offer an open, safe, and confidential environment to help students through issues that may interfere with their development, well-being, and academic productivity.

The no-cost mental health services at UHS include individual, couple/partner, group counseling, campus-based programming, stress management, and psychiatry services. We also offer crisis services, which are available 24/7."

- Individual counseling https://www.uhs.wisc.edu/mental-health/individual/
- Violence prevention https://www.uhs.wisc.edu/vpss/
- 24 hour crisis services https://www.uhs.wisc.edu/mental-health/crisis/
- Substance use treatment https://www.uhs.wisc.edu/mental-health/aoda/

- Other services for students https://www.uhs.wisc.edu/mental-health/

Graduate school will involve a certain amount of stress (by definition), and everyone copes with stress in different ways – but don't let isolation be the result of your approach to managing your stress. We urge you to maintain good lines of communication with your fellow students, the departmental staff (Jim Reardon jcreardon@wisc.edu, Jeff Schmidt dgs@physics.wisc.edu, and the Graduate Student Coordinator), and with your advisor.

A Qualifying Examination Information

General Information. The qualifying exam is a written exam that covers four core topics: Classical Mechanics (CM), Electricity and Magnetism (EM), Statistical Mechanics (SM), and Quantum Mechanics (QM). Each exam topic can be passed independently of the others. The nominal passing score for each area is 60% for the pursuit of the doctoral degree and 50% for the pursuit of a M.S. or M.A. degree.

The exam is offered twice a year: in September and in January. Entering Ph.D. students are required to take the exam in their first semester in the program. Students with special requirements must consult with the Director of Graduate Studies and the Graduate Student Coordinator at least two weeks prior to the exam date. Students are expected to consult with their advisor/mentor and the Director of Graduate Studies following the initial assessment.

All physics Ph.D. students will have four opportunities to pass the written exam in its entirety at the Ph.D. level. These attempts are to take place within their first two years in the program. Physics graduate students that pass the written exam at the Ph.D. level are automatically qualified to continue in the Ph.D. program. If a student does not pass all four topics of the written exam after the four attempts, the student has the option to request an appeal, as described below.

Exam Structure and Topics. The written qualifying exam will be held over one full day. The exam consists of four sections that cover the four core topics. Two of these sections (CM and QM) will be held in the morning and two (EM and SM) will be held in the afternoon, separated by a 1.5 hour lunch break. There will be a quick 15-minute break between the two sections of the exam in both the morning and afternoon sessions.

Each section of the exam is comprised of five problems. Students have to answer the first two problems, which are on elementary level undergraduate material [Physics 200-299 level], and answer two other problems (out of three offered) on intermediate/advanced undergraduate material [Physics 300-499 level]. The first two problems count one third of the total score, and second two problems chosen count the remaining two thirds of the total score.

The areas covered for each topic include (i) CM: motion in electromagnetic and gravitational fields, rigid bodies, coupled oscillations, and continuum vibrations; (ii) EM: statics, fields in matter, Maxwell's equations, light and optics, radiation, circuits, and electronics; (iii) SM: thermodynamics and statistical mechanics of matter and radiation; (iv) QM: wave mechanics, matrix mechanics, observables and measurements, angular momentum, perturbation theory, atoms and molecules, and scattering. Further details are discussed below under the "Exam Preparation" tagline.

Exam Preparation. Students are encouraged to consult their advisors and the Director of Graduate Studies about good practices for preparing for the qualifying exam. Outside reading, auditing or taking appropriate UW-Madison courses, and possible exam and group problem solving sessions are typical strategies for students requiring additional preparation. An archive of qualifier exams can be found at https://abadonna.physics.wisc.edu/QualPrep.

Please note that the qualifying exam structure represents a very significant change in format from that of previous qualifiers (the first exam with this new structure was held in Spring 2018). Previous exams, which are also available for study, followed a different format that was not broken up into four topical sections, but instead had Part I (short problems) and Part II (long problems), which both covered a much broader range of topics. Therefore, if you use previous exams to study, please note that the scope of the current exam is necessarily narrowed and a small but non-negligible fraction of questions that were previously offered can no longer be included (e.g. electronic circuits with transistors and op amps). Some qualifier problems that explicitly cross these areas may be ruled out but one

can imagine that a SM type problem will necessarily refer to particles with, for example, charge and mass. Notable exceptions foreseen at present are for topics that relate to kinematics of charged/magnetic particles, special relativity and optics (at the introductory/"200" level). Courses at the UW-Madison that are representative of this scheme are:

- CM: Physics 207 (or 247) and 311
- QM: Physics 241 (or 249) and 448 (or 531). Physics 208 and 248 both include some quantum physics as well.
- EM: Physics 208 (or 248) and 322 (includes optics at the 200' level)
- SM: Physics 207 and 415

Useful texts for each of these subjects include the following:

- Typical textbooks at the 207/208 or 247/248 level:
  - *Physics: Principles with Applications* by Giancoli
  - *University Physics* by Bauer and Westfall
  - *Physics* by Resnick, Halliday, and Krane
- Typical textbooks at the 311 level:
  - *Dynamics of Particles And Systems* by Marion and Thornton
  - *Classical Mechanics* by Taylor
  - *Classical Mechanics: A Modern Perspective* by Barger and Olsson
- Typical textbooks at the 322 level:
  - *Introduction to Electrodynamics* by D. Griffiths
  - *Electricity and Magnetism* by Purcell
  - *Classical Electricity and Magnetism: A Contemporary Perspective* by Barger and Olsson
- Typical textbooks at the 415 level:
  - *Thermal Physics* by Kittel
  - *Fundamentals of Statistical and Thermal Physics* by Reif
  - *An Introduction to Thermal Physics* by Schroeder
- Typical textbooks at the 241/249 level:
  - *Modern Physics* by Tipler
  - *Modern Physics* by Krane
  - *Modern Physics* by Harris
- Typical textbooks the 448/449/531 level:
  - *Quantum Physics* by Gasiorowicz
  - *Introduction to Quantum Mechanics* by Griffiths
  - *Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles* by Eisberg and Resnick
  - *A Modern Approach to Quantum Mechanics* by Townsend

We recommend that you should refer to the exams and/or homework sets that are typically assigned in the above courses or the equivalent versions at your undergraduate institutions. There is also a course that will be offered, Physics 801, for which the aim is to assist students with their qualifying exam preparation. This course will review the core topics at a rapid pace and will provide an opportunity to strengthen "qualifier-like" problem solving skills.

Grading Policies and Retakes. The qualifying exam is graded anonymously by faculty. The Graduate Qualification Exam Committee collects all graded problems for all the students and reviews them in detail for consistency. Only after this thorough review will the final grade of pass or fail of each topic area be assigned. After this point, the results are unblinded and distributed.

Students may appeal for re-grades of specific exam problems to the Chair of the Qualifying Exam committee at any point within two weeks after the exam is returned. Students should be aware that the partial grading metrics that are assigned by faculty for individual problems, which will also be reviewed by the committee prior to the final pass or fail score assignments, will generally be respected unless there are obvious inconsistencies or errors.

In the case of failing scores on one or more core topics of the exam, in subsequent attempts students need to take only the portions of the exam in the topic area or areas that remain to be passed.

Final Appeal Process. If a student does not pass all four topical areas of the written qualifying exam at the Ph.D. level after the four exam attempts, the next step in the process is that the student can request an appeal. The appeal process will be handled by a committee that consists of a faculty member of the student's choosing (such as the student's advisor), and two other faculty members that will be determined on a case-by-case basis. The appeal process will involve a broad assessment of the student's progress in the graduate program that includes the student's prior qualifying exam results, performance in graduate coursework, and progress to date in research. Upon a careful evaluation of these factors, the appeals committee will make the final recommendation as to whether or not the student has achieved qualification status in the Ph.D. program. If the final recommendation of the appeals committee is yes, the student has passed the Qualifying Exam requirement in the department.

B Suggested Sequence of Core Courses

The core courses should be taken as soon as possible in the graduate career. Finishing the core courses allows the most rapid entry into research, and you will find that you need to know much of the material for more advanced work in your research specialty.

To avoid scheduling conflicts, all core courses occur in the morning on Monday/Wednesday/Friday. Usually, students take two core courses in each semester of their first year. 711, 721, and 731 are offered in the Fall, and 715, 721, and 732 are offered in the spring. We recommend that you choose your plan for completing the core course sequence after consulting with your advisor, as each research group may have a specific sequence of courses that are preferred. Advisors are expected to review course selections each semester before a student enrolls. You are also encouraged to consult with the Director of Graduate Studies about your schedule.

We strongly recommend that you attend core courses regularly, as this is often the best way to ensure the required passing grades. If you are struggling with any specific course, we encourage you to reach out to the course instructor, as well as the Director of Graduate Studies.

C Teaching Assistant Evaluation Questionnaire

The TA evaluation questionnaire consists of the following questions:

1. Meets classes on time
2. Speaks clearly and loudly enough
3. Writes clearly on the chalkboard
4. Gives suitable quizzes
5. Grades and returns papers promptly
6. Has helpful and constructive attitude towards discussion section
7. Understands lab experiments and equipment used
8. Assists the students in understanding lab work
9. Responds to questions effectively
10. Helps students to organize and understand course material
11. How does the TA rank in overall teaching effectiveness in comparison with others you have had on this campus?
12. How effective was this TA in creating a comfortable learning environment?