Georgia State University
Department of Physics & Astronomy

Graduate Student Handbook
version 3

Effective date: August 2024

Disclaimer

This document is intended to provide an overview of procedures and policies for earning a graduate degree (MS, PhD) in the Department of Physics and Astronomy. Deviations from these guidelines may be necessary. This is a dynamic document that will be updated as needed based on new information or changes in the programs. Official policies can be found in the Graduate Course Catalog for the College of Arts & Sciences.

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1. Programs

The Department of Physics & Astronomy offers several graduate programs in Physics and Astronomy. The programs that are active as of 2019 are the following:

Programs administered by the Graduate Director for Physics:

- Master of Science (MS) in Physics, Standard Program.
- Doctor of Philosophy (PhD) in Physics, Concentration in Atomic Physics
- Doctor of Philosophy (PhD) in Physics, Concentration in Biophysics
- Doctor of Philosophy (PhD) in Physics, Concentration in Molecular Physics
- Doctor of Philosophy (PhD) in Physics, Concentration in Nuclear Physics
- Doctor of Philosophy (PhD) in Physics, Concentration in Condensed Matter Physics
- Doctor of Philosophy (PhD) in Physics, Concentration in Applied Physics

Programs administered by the Graduate Director for Astronomy

- Doctor of Philosophy (PhD) in Astronomy
- Master of Science (MS) in Physics, Concentration in Astronomy
- Doctor of Philosophy (PhD) in Physics, Concentration in Astrophysics

A description of the rules of the programs along with graduation requirements are provided in the Graduate Course Catalog for the College of Arts & Sciences, at the following website:

https://catalogs.gsu.edu/preview_entity.php?catoid=5&ent_oid=356

where the above addresses refer to the 2021-2022 version of these catalogs. Earlier versions of the catalog can be accessed at xxx.

The version of the catalog that applies to the student is normally the version effective at the time the students is initially admitted in the program. However, students may at any time elect to abide by any catalog version that became effective *after* their initial admission in the program, so that a student admitted in Fall 2015 may, for example, elect to follow the rules and graduation requirements of the 2016-2017 version of the catalog.

Any question about the above programs should be addressed to the appropriate Graduate Directors. As of 2018, the Graduate Directors are:

- Graduate Director for Physics: Murad Sarsour (msar@gsu.edu)
- Graduate Director for Astronomy: Russel White (white@chara.gsu.edu)

2. Admissions

To be admitted in one of the graduate programs, prospective students must submit an online application to the Georgia State University College of Arts and Science, under “Graduate Admissions”.

Information about admission rules and deadlines can be found here:

http://cas.gsu.edu/graduate-services/

and applications must be submitted online at the following website:

https://gradapply.gsu.edu/apply/

Students must follow all requirements and deadlines specified by the College.

To receive full consideration for admission, applications must be submitted by the deadline. Current application deadlines are:

- January 15th for the Astronomy PhD program
- January 15th for the Physics PhD and MS programs

3. Department Conduct and Expectations

3.1 Etiquette

We strive to maintain a department that is supportive and productive, friendly and social, and scientifically inspirational. The Department adheres to a policy of tolerance in matters of gender, age, ethnic and national origin, sexual orientation, personal beliefs, etc... Diversity breeds creativity, and to achieve that we maintain a workplace that is inclusive. Your uniqueness isn’t just accepted here, it is valued and appreciated. Students are expected to be familiar with and to abide by the GSU Student code of conduct (https://codeofconduct.gsu.edu/).

3.2 No-Harassment Policy and Requirements for Reporting Sexual Misconduct

The department will not tolerate any discrimination against any of its faculty, students or employees. Graduate students found to have violated this tolerance policy may face disciplinary action which could include the suspension of their GRA status. Likewise, the Department holds a no-tolerance policy against any form of psychological intimidation or sexual harassment. This includes physical assault, threatening or intimidating e-mails, or social media posts sent to or about any of its faculty, students, or employees. The Department takes all these matters very seriously, and encourages all graduate students to report such actions, if they come to their attention, either to a Faculty member, to one of the Graduate Directors, or to the Department Chair. Please consult the Department’s Harassment and Discrimination Resources webpage (https://www.phy-astr.gsu.edu/harassment-and-discrimination-resources/) if you need any additional help or assistance.

GSU has a no-tolerance stand on sexual misconduct. According to GSU policy regarding Title IX regulations, “all university employees except those listed as a confidential resource (Counseling and Testing Center, Student Health Clinic, and Student Victim Assistance Services) serve as responsible employees who are required to share all reports of sexual misconduct with administrative officials for university review.” (http://deanofstudents.gsu.edu/reporting-sexual-harassmentmisconduct).

4. Course registration

4.1 Types of credit-hours

Graduate students normally register for various types of credits, which account both for their lecture classes, their research activities, and other academic activities in the Department. These credits fall under three broad classes:

- Lecture credits, which include all credits for either core courses or elective courses, are credits that the student earns by completing lecture classes. To determine which classes to register for, students should consult with their research advisor and review their plan of study with their respective Graduate Director.
- Research credits, which consist of all credits for ASTR 8710, PHYS 8710, and/or PHYS 8999, are credits that students earn by completing research objectives or making progress in their thesis research, as determined by their advisor.
- Academic work credits, which consist of all credits for ASTR 8910 and/or PHYS 8910, are credits that students earn by completing additional academic activities, such as individual readings, group discussions, participation to seminars or scientific meetings, or any other activity determined by their advisor.
- Dissertations credits, which consists of all credits for ASTR 9999 and/or PHYS 8999 and/or PHYS 9999, are credits that the students earn by writing or working towards any part of their dissertation.

Registration to these classes should be done by the student through the University Student portal at https://paws.gsu.edu/

4.2 Total number of credit hours

All full-time graduate students must register for a minimum of 12 credit-hours in the fall and spring semesters and 9 credit-hours in the summer. Student should register for these credit-hours according to the following rules.

MS students:

- Fall and Spring semester:

First year students: credits to complete appropriate lecture classes, plus 3 credits of academic work (ASTR 8910 / PHYS 8910). If the total does not reach 12, add as many additional credits of research ((ASTR 8710 / PHYS 8710)) as needed to reach 12 credits.

Second year students or higher: credits to complete appropriate lecture classes, plus 3 credits of academic work (ASTR 8910 / PHYS 8910). If the total does not reach 12, add as many additional credits of research (PHYS 8999) as needed to reach 12 credits.

- Summer semester: credits to complete appropriate lecture classes, plus as many credits of research (PHYS 8999) as needed to reach 9 credits.

PhD students:

- Fall and Spring semester: credits to complete appropriate lecture classes plus 3 credits of academic work (ASTR 8910 / PHYS 8910). If the total does not reach 12, add as many additional credits of research (ASTR 9999 / PHYS 9999) as needed to reach 12 credits.
- Summer semester: credits to complete appropriate lecture classes plus as many credits of research (ASTR 9999 / PHYS 9999) as needed to reach 9 credits.

4.3 Registering for classes outside GSU

Georgia State University students may enroll in courses offered by member institutions of the Atlanta Regional Council for Higher Education (ARCHE) under a cross registration program agreement. Graduate students may use this service to register for graduate classes that are, for example, not offered at GSU, but may be credited to their program. Rules and procedures can be found here:

https://registrar.gsu.edu/registration/cross-registration/

4.4 Registration assistance

For assistance with their course registration, students may contact their appropriate Graduate Director, or contact the College of Arts & Sciences academic advisor, Katina Akins (kakins@gsu.edu).

5. Research Advisors

5.1 General requirements

All students enrolled in any of the Physics or Astronomy graduate programs must have a graduate research advisor. Any graduate faculty member in the Department of Physics & Astronomy may act as graduate advisor for any student in a Physics or Astronomy graduate program.

5.2 Selection of advisors for students in the Physics programs

In the Physics program, advisors are identified upon admission into the program, after consultation with both the prospective student and prospective advisor. The name of the advisor will normally be announced at the time an offer of admission is made to the student.

5.3 Selection of advisors for students in the Astronomy programs

In the astronomy program, all students initially enter the program with no formal PhD advisor. For the first two semesters into the program, students are encouraged to meet individually with the Faculty, and identify possible topics for their thesis research. Students are also expected to conduct at least one scientific research project during their third semester (which will normally be their first Summer semester in the program), under guidance of one or more of the Astronomy faculty. Students are then expected to formally declare their PhD advisor to the Graduate Director by the end of their first summer in the program.

The Graduate director will initially act as interim advisor to all students admitted in one of the Astronomy programs until their PhD advisor has been formally declared.

5.4 Role of the advisor

The advisor is responsible for guiding the student through all aspects of their graduate research, and offering assistance as considered appropriate. The advisor is also the primary point of contact of the graduate student for all academic and administrative matters. Any question or concern that the student has should be addressed first to their advisor, who will then direct the student to the appropriate resources as needed. For additional assistance, students may contact their respective Graduate Director or the Department Chair.

The advisor is responsible for providing regular feedback to the student about their research progress. In particular, the advisor is responsible for grading all research, academic, and dissertation credits, including ASTR 8710, ASTR 8910, ASTR 9999, PHYS 8710, PHYS 8910, PHYS 8999, and PHYS 9999. Grades for dissertation credits (ASTR 9999, PHYS 9999) are all marked as “in progress”, or “IP”, until the student has successfully defended their thesis.

5.5 Change of advisor

Students may request a change of advisor, which must be addressed to the Physics/Astronomy Graduate director, who will then authorize the student to identify a possible alternate advisor. The change of advisor must then be approved by both the Physics/Astronomy Graduate Director and by the faculty identified as the alternate advisor. Students should understand that changing advisers can slow one's progress towards the degree, making it more challenging to graduate within the secured funding timeline (Section 6.4).

If due to unforeseen circumstances a faculty member is no longer able to act as the student's advisor (for example if the faculty has left GSU), then a new advisor will be assigned by the Physics/Astronomy Graduate Director, after consultation with the student.

6. Facilities

Students will be granted full time access (24 hours, 7 days a week) to the Department general areas and facilities, including reader card entry to the buildings where the Department has facilities. Keys to specific offices, labs, or classrooms may also be provided as needed. For assistance in gaining card access to various buildings and rooms, students should contact Felicia Shantrice Watts <fwatts@gsu.edu>.

Students will be provided with a desk in one of the labs, rooms, and/or cubicles controlled by the Department. These desks will be equipped with a desktop and/or laptop computer connected to the GSU network, to be used for their research and classwork. Students will also receive computer accounts on the Department computer network as well as an e-mail account.

For any help with the Department computers or computer networks, students may contact Department IT specialist Justin Cantrell (cantrell@astro.gsu.edu).

7. Graduate Research Assistantships (GRAs)

7.1 Initial qualification

Upon completion of College requirements for graduate admission, and of University requirements for employment, every student admitted in one of the graduate programs is normally hired by the Department as a Graduate Research Assistant (GRA). In order to qualify for GRA status, students must have received a formal letter of admission from GSU and be enrolled as a graduate student. The Department normally hires new GRAs during the month of August of each year, and students should expect to receive their first stipend check at the end of the month of September (normally September 30th).

Students with GRA status receive the following benefits:

- A tuition waiver.
- A monthly stipend.

The tuition waiver covers the costs of normal tuition for GSU graduate students. The waiver however does not cover University Fees.

The amount of the monthly stipend may vary, but is normally calculated based on the following schedule[1]:

- All PhD students upon initial admission: $24,000/year.
- All MS students: $6,000/year.
- PhD students with internal, merit-based fellowships (2CI, MBD, B&B, etc.): $26,000/year

The exact amount of the annual stipend may be changed by the Department Chair at the time it is initiated. Student stipends are normally paid in monthly installments. The payment for a given month is normally issued on the last day of that month.

Because new students are normally hired during the month of August, it is assumed that their GRA status begins halfway through that month, and students therefore receive half of their monthly stipend for that month. This amount will be included in the first stipend check issued in September, which will therefore be equivalent to 1.5 months, i.e. covering the half month of August plus the full month of September.

In the first year, graduate research assistantships are granted for a 10.5-months term, from mid-August through the following June. Subsequent renewals are on a 12-months term, from July through June.

7.2 Continued qualification

Students in good academic standing will have their GRA status automatically renewed every year for an additional 1-year period; these automatic renewals can be granted up to four times. Students are in good academic standing if they (1) maintain a Grade Point Average (GPA) of 3.0 or more (evaluated over any three consecutive semesters), (2) if they successfully complete their qualifier exams and present their prospectus talk or master's presentation within the allowed time frame (see sections 7 and 10 below) and for Ph.D. students, (3) if they maintain significant research progress toward their dissertation as determined by their dissertation committee.

Upon renewal, the amount of the monthly stipend for the following year may be increased based on the schedule listed in the Appendix, assuming the qualifications are met. The exact amount of the annual stipend may be changed by the Department Chair at the time of renewal. Stipends may be supplemented based on additional service provided by the student to the Department (e.g., Department webmaster role), typically in the amount of $3000/year.

[1] This standard schedule became effective starting in July 2024. For the standard stipend schedule before that date, please consult the table in the Appendix (page 16).

7.3 Termination upon graduation

MS students who have met all requirements for graduation will have their GRA status terminated at the end of the semester in which they graduate.

PhD students who have successfully defended their PhD thesis and have met all requirements for graduation will have their GRA status terminated at the end of the semester in which they graduate.

7.4 Extension after five years

PhD students who have not yet defended their PhD thesis at the end of their fifth year after initial admission may petition for an extension of their GRA status. The petition (in the form of an e-mail) should be submitted to the appropriate Graduate Director. A one-year extension will be granted if the student shows evidence of significant progress toward the completion of their thesis research as determined by the student's dissertation committee.

Afterwards, students may petition again for additional one-year extensions of their GRA. The petition should again be submitted in the form of an e-mail to the appropriate Graduate Director. Additional extensions may be granted if the student shows evidence of significant progress toward the completion of their thesis research, as determined in consultation with the student's PhD Dissertation committee (see section 9 below), to be approved by the graduate director and department chair. The department chair will have final say on any additional extension. After the sixth year, PhD students *should expect* to assume additional instruction duties to maintain their GRA status.

7.5 Instruction duties

Students with GRA status are expected to act as instructor on a number of undergraduate lab classes or "sections". Each section normally consists of up to 24 undergraduate students, meeting ~2-3 hours per week to complete laboratory activities required for their undergraduate classes. Instructor duties for one such lab section is counted as 1 credit-hour of teaching (CHT) earned by the graduate student; some sections may require additional hours of work and will earn additional CHTs. All Astronomy labs count as 1 CHT and Physics labs count as follows: 1000 level – 1 CHT, 2000 level – 1.5 CHT, Studio – 1.5 CHT. GRA duties include being present at every lab meeting, instructing the students on how to complete the activities, providing guidance and answering student questions, and returning graded assignments in a timely manner. The GRA is also expected to grade the activities, and submit the grades to the lab coordinator or to the Faculty in charge of the course before the end of the semester.

Students with GRA status may be assigned up to 8 CHT per academic year, defined as a sequence of Fall+Spring+Summer semesters. Students in the MS program can be assigned no more than 12 CHT over the course of their studies (assuming these are completed within 2 years), whereas students in the PhD program can be assigned no more than 17 CHT over the first five

years of their studies – additional CHT may be required of students who continue past their 6th year. Shortly before the start of a semester, all GRAs will be contacted by their respective lab coordinators to build the instructor schedule for the semester.

Instructional training via the pedagogy courses (PHYS/ASTR 6300 & PHYS/ASTR 6310) and via class room experience is considered to be an integral part of doctoral education. The PhD curricula for both Physics and Astronomy requires that students take these classes and that students teach a minimum of 5 CHTs. Note that this requirement supersedes recommendations from a student's source of funding.

7.6 Lab/research duties

Students with GRA status are expected to work as part of the lab/research unit of their advisor, and should follow the work schedule determined by their advisor. Lecture class schedules, Department colloquia, and instruction duties should however take precedence, and the advisor cannot require the student to be present on lab premises during lectures or exams that the student is required to attend, during normally scheduled Department colloquia, or at times when the student has instruction duties (see 6.5 above). In addition, advisors should leave reasonable periods of time to the students to allow them to complete their homework and study for their tests and the qualifier exams.

As part of their lab/research units, students will assume the role of research assistants, and may be asked to assist in conducting scientific and academic work as determined by their advisor. This work should normally be tied directly or indirectly to the thesis research project of the student, or provide a relevant learning experience to the student in a way that will help the student progress in the completion of their MS or PhD.

Students with GRA status are NOT expected to conduct any work for their advisor that is not directly or indirectly related to their thesis research, or does not provide relevant academic or research experience. This includes administrative work not directly or indirectly connected to their thesis research, and work performed for their advisor outside of University premises unless it is part of normal field work. Students who feel they are asked to perform tasks that are not relevant to the completion of their degree, or feel that the amount of work required of them is unreasonable, should consult with their respective Graduate Director and/or with the Department Chair.

7.7 External Fellowships

Students are encouraged to apply for external fellowships that cover a fraction or all of their stipend. This typically results in higher stipends and reduces their required level of instruction duties (see 6.5 above).

8. Qualifier exams

8.1 Physics PhD qualifier

Students in the Physics PhD program must pass two qualifier exams, one before the beginning of the second year (also known as the “written qualifier”), and one at the end of their second year (also known as the “research qualifier”).

8.1.1 Written Physics qualifier

Students in the Physics PhD program must receive at least an “A-“ grade or pass a written qualifier exam in the following topics:

- Electromagnetic Theory
- Advanced Classical Mechanics
- Statistical Mechanics
- Quantum Mechanics and Modern Physics

The written PhD qualifier exams are administered in August of every year, typically one week before the start of classes. Each test is administered on a separate day. Students will be permitted to take the written qualifier exam twice.

8.1.2 Research Physics qualifier

The research physics qualifier is an oral presentation at the end of the second year and should contain the following information:

- The topic of the dissertation and an explanation of its importance. What in general might one expect to learn from the dissertation that is not now known, understood, or appreciated?
- A concise review of what has been done on the topic in the past. Specifically, how will the proposed dissertation differ from or expand upon previous work?
- Where most of the work will be carried out - for example, in the laboratory of a particular faculty member, or as part of a program of field work at specific sites in the United States or abroad.
- A provisional timetable for completion of the dissertation

The student must form the exam/prospectus committee at the beginning of his/her second year in consultation with his/her research adviser. The committee must have a minimum of three members, and should include at least the following persons: (a) the student’s research advisor who will be acting as chair of the committee, and (b) two other graduate faculty members from the Department of Physics & Astronomy. The committee will determine if the students passes the research exam. The student who fails the examination for the second time will be subject to termination. The results of the second year qualifying exams will be communicated individually to the graduate students by the Graduate Director within roughly one week of the exam.

8.2 Astronomy PhD qualifiers

Students in the Astronomy PhD program must pass two qualifier exams, one at the end of the Spring semester of their first year (also known as the “first-year qualifier”), and one at the end of the second semester of their second year (also known as the “second-year qualifier”). The most up-to-date descriptions are maintained by the Graduate Director as separate documents, “Procedures for the Astronomy First-Year Qualifying Exam” and “Procedures for the Astronomy Second-Year Qualifying Exam”. The 2023 versions of these are copied below for completeness.

8.2.1 First-year Astronomy qualifier

How it Works - The first-year qualifying exam is scheduled after final exams in the Spring Semester of the first year. The exact date, time, and location of the exam will be determined by the Graduate Director in consultation with the astronomy faculty and will be communicated to the graduate students well in advance of the exam. This closed book exam typically consists of 100 multiple choice ASTR 1010-like questions and 100 multiple choice ASTR 1020-like questions; the questions may be from any source but will be at this level. The goal of this exam is to assess the student's comprehension of basic astronomical knowledge. Students may use a calculator. The values of less common astrophysical constants (e.g. the Gravitational Constant) will be provided as needed, but common ones will not (e.g. the speed of light). Students are given 6 hours to complete the exam.

Grading and Results - A score of 75% or above is a passing score. A score below 75% is a failing score. If students fails a portion of the exam, they need to retake that portion. A passing score on all portions of this exam is a required part of both the M.S. and Ph.D. degrees. The results of the first-year qualifying exam will be communicated individually to each student by the Graduate Director within roughly one week of the exam.

8.2.2 Second-year Astronomy qualifier

Overview - The second-year qualifying exam is usually scheduled after final exams in the spring semester of a student’s second year in the program. The exact date, time, and location of the exam will be determined by the Graduate Director in consultation with the astronomy faculty and will be communicated to the graduate students well in advance of the exam. This exam consists of three parts: a written research report describing the student's research accomplishments here at Georgia State, an oral research exam, and an oral academic exam (the latter two portions are administered together as the 'oral exam', lasting approximately 2.5 hours). Additionally, students are encouraged to submit a curriculum vitae along with their research report. This may be useful to the committee if the student’s exam score falls within the grey area (see the section on Grading below).

The goal of this exam is to assess (1) the student's graduate-level comprehension of astronomy and astrophysics, and (2) the student's potential for successfully conducting (over the next few years) the independent research required to complete a Ph.D. in Astronomy.

The Examination Committee - The audience for a student's oral exam is the examination committee. This committee will consist of up to 5 department faculty, including the Graduate Director and the student's research adviser (assuming both are available). Students will not know who their committee members are ahead of time. The committee will have read the written research report prior to the oral exam.

The Written Research Report - The written research report will be submitted electronically to the Graduate Director and the student's research adviser at least 10 days prior to the scheduled oral exam, or at a date agreed upon with the Graduate Director. The document should include the following: (1) an abstract, (2) background information and a motivation and/or justification for the research, (3) a description of the scientific research accomplished, (4) a description of the analysis and results, (5) a discussion of the results, (6) a summary that includes potential future work in this area, (7) any tables, figures and references that are appropriate for the work. The document should demonstrate effective scientific communication skills (see below) and be grammatically correct. The document should be prepared using the most recent AASTeX template (current version is AASTeX v6.3.1) for submissions to AAS Journals (single-spaced, 12-point font, 1-inch margins; \documentclass[preprint]{aastex631} should set things up correctly). The document should have a minimum of 8 pages but no more than 15 pages of text, including all figures and tables. The list of references is not included in the above page count. The document should convey that significant research[2] was accomplished and that the student has a working understanding of the scientific context of their research and the methods used in their research; this includes an understanding of vital references. One possible page count by section is the following (for a 13.5-page document): Abstract (1/2 page), Introduction (~3 pages), Research Accomplished (~2 pages), Analysis (~3 pages), Results (~3 pages), Summary (~1 page) and Future Work (~1 page).

An Emphasis on a Well Written Report - Clarity in writing conveys clarity of thought. How a student writes conveys how well they can communicate science and ultimately their potential to make an impact on the field. With these in mind, students should strive to make this document clear, comprehensible and as short as is consistent with the goal of conveying that significant research was accomplished. The document should be

[2] "Significant research" generally means that the presented background, analysis, results and interpretations could comprise a major portion (e.g. >50%) of an article suitable for publication in a refereed scientific journal.

typeset in a professional manner, including equations. Pay attention to figures and tables to make sure they are labeled and discussed in the text; all figures should have informative captions. The Nature Editorial *Elements of Style* explains the importance of clear and accessible science writing, and provides some additional practical writing tips: https://www.nature.com/articles/nphys724

Finally, understand that a document cannot be well-written quickly. Start writing early. A student's adviser may read and provide overall guidance on the report, but the adviser should not edit the document. Students are encouraged to have peers or others proofread the document for clarity, typos, etc.

Grading Rubrics (25 pts)

1. Meets the research report guidelines
2. Demonstrates a good understanding of the scientific context for the research
3. Demonstrates a good understanding of the methods used in the research
4. Conveys that significant research was accomplished
5. Is clear, concise, comprehensible, grammatically correct, and demonstrates a proficiency in formal technical writing

The Oral Research Exam – The 2.5 hr oral exam will begin with a 30-minute presentation that describes research conducted as a graduate student at GSU. During this, the student should demonstrate a good understanding of the scientific context of their research and the methods used in their research; this includes an understanding of vital references. The presentation should convey that significant research was accomplished by the student. The presentation should distinguish work done by the student as opposed to work done by their adviser and others, in cases where it is ambiguous (e.g., data reduction, modeling, or analysis routines). The presentation is to be produced solely by the student, but the student is encouraged to seek comments from their adviser. Throughout the presentation and following the presentation, the student can expect questions from the examination committee. As with the research report, the research presentation should be clear and easy to follow. In addition to assessing what was accomplished, the committee will assess the student's ability to verbally communicate science effectively. Students are encouraged to give one or more practice talks prior to the exam.

Grading Rubrics (25 pts)

1. Demonstrates a good understanding of the scientific context for their research
2. Demonstrates a good understanding of the methods used in their research
3. Conveys that significant research was accomplished
4. Verbally communicates science effectively

The Oral Academic Exam – This portion of the exam will consist of additional astronomy and astrophysics questions from the examination committee. A general understanding of topics from the Department's introductory astronomy courses (ASTR 1010, ASTR 1020) is expected. A more advanced understanding of material is expected for questions related to the student's general area of research and for topics covered in graduate courses that the student has taken at GSU, or for which they have received transfer credit at GSU.

Grading Rubrics (50 pts)

1. General understanding of introductory astronomy topics
2. Advanced understanding of the student's research area
3. Advanced understanding of graduate course material

Grading - The second-year qualifying exam will be graded out of 100 points. The written research report is worth 25 points, the oral research exam is worth 25 points, and the oral academic exam is worth 50 points. A combined score of 80% or above is a passing score, a combined score between 70% and 80% is in *the gray area* and additional metrics such as class performance and research accomplishments will be considered in evaluating the student's performance. The student's curriculum vitae may be used by the committee for this grey area assessment, if provided. The curriculum vitae will *not* be used to determine a student's exam score otherwise. A combined score below 70% is a failing score.

A passing score on the research oral exam must be attained, regardless of the combined score, in order to pass the exam; a score of 80% or above is passing, and a score between 70% and 80% is in *the gray area* and additional metrics will be considered in evaluating the student's performance.

Results - The results of the second-year qualifying exams will be communicated individually to the graduate students by the Graduate Director within roughly one week of the exam. In the event that a student does not pass the exam, they have the option to retake the exam. In concordance with the GSU Graduate Catalog, "the examination may be repeated once following a minimum interval of six months either with the original committee or a duly constituted new committee. The examination must be passed at least one academic year prior to the conferral of the degree." In situations where a student fails the exam, the Department will continue to be supportive if the student wishes to retake the exam. However, the student should seriously consider the results for what they are - professional feedback on their (1) graduate-level comprehension of astronomy and astrophysics, and (2) potential for successfully conducting the independent research required to complete a Ph.D. in Astronomy. If a student fails the examination the second time, they will be terminated from the program. If they have met the requisite criteria, they can do so with a master's degree.

8.3 Second attempt at a qualifier exam

In concordance with the Graduate Catalog of the College of Arts and Sciences, any qualifier exam may be repeated after a minimum of six months of the first attempt. At the student's request, the appropriate Graduate Director will arrange for the qualifier exam to be retaken at a time convenient for the student. According to College rules, the examination must be passed at least one academic year prior to the conferral of the degree.

8.4 Qualifier test fail and termination from the program

Students who fail the examination for the second time will be subject to termination from the graduate program. Students terminated from the program for this reason will also have their GRA status terminated at the end of the semester in which the exam was retaken.

9. Transfer of a PhD student to an MS program

A PhD student may ask at any time to be transferred to one of the MS programs. This includes students who have failed the qualifying exams, and wish to complete an MS degree instead of continuing in the PhD program. PhD students who wish to transfer to an MS program should contact their Graduate Director to review the graduation requirement for the MS program, and determine whether they may immediately qualify for an MS, or require the completion of additional requirements.

10. PhD Dissertation Committee

A PhD Dissertation committee shall be selected by the student and their advisor, and approved by the appropriate Graduate Director, after a student has completed all their Qualifier Exams. For Astronomy Students, the committee should also be selected before a student presents their prospectus talk (see Section 11 below).

10.1 Composition of the PhD Dissertation committee

The PhD Dissertation committee must have a minimum of three members, and should include at least the following persons: (a) the student's *research advisor* who will be acting as chair of the committee, and (b) two other *graduate faculty members* from the Department of Physics & Astronomy. Students are also encouraged to include at least one *external member*, identified among non-GSU scientists who are active researchers in the field of study of the student's PhD thesis.

10.2 Meetings with the PhD dissertation committee

The PhD Dissertation committee shall meet with the student at least once per year. The committee will normally meet with the student the first time during their prospectus talk or masters presentation (see section 11 below), and should meet with the student annually after that, meeting for the final time during the student's Dissertation Defense. During these meetings, the committee will provide feedback to the student about the progress of their research and provide suggestions to help the student complete their thesis research within a reasonable timeframe.

11. Prospectus Talk (Astronomy) / Masters Presentation (Physics)

Students in the Physics PhD and Astronomy PhD programs must give a presentation, called "the Prospectus Talk". This presentation is normally scheduled during the student's third year.

This oral presentation will be scheduled as a Department Seminar, and will be open in attendance. The presentation should be between 40 minutes and 50 minutes in length. In this talk, the student will present initial ideas and preliminary results from their scientific research, and will discuss their plan for completing work towards their PhD dissertation.

Immediately following the prospectus talk, members of the PhD thesis committee in attendance will meet privately with the student, and advise them on their progress and dissertation plan.

Students may delay their presentation to their fourth year upon recommendation of their Thesis Advisor and with the approval of the Graduate Director. Students who fail to present their prospectus talk within this allowed time will however no longer be considered in good academic standing, and may face the non-renewal of their GRA status.

12. Award of an MS degree to a continuing PhD student

A PhD student who has successfully passed all their qualifier tests, has completed all their lecture class requirements, and has successfully presented their Prospectus Talk or Masters Presentation is strongly encouraged to apply for an MS degree to be awarded to them while they remain in the PhD program. Students who are awarded their MS degree by GSU after passing their prospectus talk or MS dissertation presentation become eligible for a stipend raise, see section 6.2 above.

Students who plan to obtain an MS degree in the upcoming year must first apply for graduation with the College of Arts and Science through their student PAWS accounts, see here:

https://registrar.gsu.edu/graduation/

Students must apply for graduation *1 semester in advance* of the semester they plan to obtain the MS degree.

At the start of the semester they plan to obtain their MS degree, students should meet individually with their graduate director to confirm that all academic requirements are met. Then, the student fills out and submits to the College the required signature page that is available here: https://cas.gsu.edu/doctoral-dissertation-or-masters-thesis-approval/. The option to apply for the

MS degree will need to be added to the student's PAWS record, which can be done by contacting the Graduation and Data Manager, who is currently Chad Van Gorden (cvangorden1@gsu.edu). The degree can then be applied for, and the required $50 fee paid. The final diploma is then sent via certified mail to your address on PAWS.

13. Dissertation

To satisfy all graduation requirements, students in the Physics PhD and Astronomy PhD programs must write a dissertation describing the research they have conducted and the results of this research. The thesis must follow the dissertation guidelines of the College of Arts and Sciences, which can be found here:

https://cas.gsu.edu/graduate-student-journey/

https://cas.gsu.edu/thesis-dissertation-formatting/

Examples of completed dissertations are available in the Department.

The thesis must be distributed to the dissertation committee at least 14 calendar days before the scheduled date of the dissertation. Any student not submitting their written dissertation at least 14 calendar days prior to their scheduled defense date will have their defense delayed and rescheduled to a later date.

14. Dissertation Defense

To satisfy all graduation requirements, students in the Physics PhD and Astronomy PhD programs must defend their thesis in a dissertation defense. This defense will take the form of a 1-hour seminar, which will be open to the public, and during which the student will present the results of their research. All members of the PhD thesis committee should be in attendance, or should be watching the presentation remotely through a direct video feed. The presentation itself should be about 50 minutes, to be followed by a period of questions from the audience.

After the seminar, the students will meet only with the dissertation committee, who will be asking questions to the student about their presentation or about any aspect of their dissertation or the work they conducted as part of their PhD research.

The PhD Dissertation committee will then deliberate in private, and determine whether or not the student has passed. The result will be communicated to the student, the Graduate Director, and the Department Chair, after the committee has finished its deliberations. If the student has passed, all members of the committee should append their signature to the thesis signature page, which the student must then submit to the College by the appropriate deadline.

Even in the case of a dissertation pass, the committee may require a student to make a number of corrections to their written dissertation. The expectation is that such corrections will be made and approved by the end of the semester when the defense occurred. If the changes are not

made or cannot be completed within that semester, a meeting shall be convened between the student, their advisor, the Graduate Director, and the Department Chair to resolve the issue.

15. Grievance procedures

The department follows the current procedures and policies of the College of Arts and Sciences regarding grade appeals and other complaints. Students who believe that they have been treated in an unethical, unprofessional, or unfair manner by university faculty, staff, administrators, or fellow students should act to correct the situation. Several procedures are available to do so. First, students should attempt to solve the issue with the specific person if they feel comfortable in doing so. The student should also bring the situation to the attention of their advisor. If the issue is not resolved, the student should first seek assistance from the Director of Graduate Studies, and then might want to discuss the problem with the Chair of the department. If the issue is still not resolved, the student should consult Section IV, chapter F of the GSU Student Code of Conduct (https://codeofconduct.gsu.edu/), which described the detailed policy and procedure for filing formal petitions and complaints. At all times, students may also seek assistance from the office of the Ombudsperson (https://ombuds.gsu.edu/).

16. Time-off policy

Graduate students typically take time off in the same way full-time research employees do. This often (but not always) occurs during University holidays (totaling about 2 weeks over the year) and for an additional 2 weeks at the employee's discretion, for a total of about 4 weeks per year. Students who need to conduct research work during holidays, for example, may take the time off at some alternate times. Time off should not interfere with the academic schedule of classes (including exams) that students are enrolled in, or teaching obligations that students have. Conversely, students receiving a stipend from the Department should understand that the times between academic semesters, when no classes are in session, are not generally considered to be time off. In fact, these can be especially productive times for research and scholarly activities. Students that are away for scientific travel (e.g. collecting data, attending a conference, etc.) are considered to be working. Because of the diverse, international make-up of our graduate students, all of which are pursuing research at the frontiers of science, a one-size fits-all time off policy is not appropriate for our Department; the statements here should be considered a guideline to help students achieve a healthy life-work balance.

In all cases, students should communicate regularly with their research adviser about possible plans for time off to avoid conflicts with research obligations. This is especially important for students that anticipate lengthy travel (e.g. an international trip). Students and faculty with questions about student time off should consult with the Director(s) of Graduate Studies.

17. Additional Resources

Department Page:

https://www.phy-astr.gsu.edu/

Department Facilities:

https://www.phy-astr.gsu.edu/research/lab-and-facilities/

Travel and Finance Forms:

https://www.phy-astr.gsu.edu/resources/policies-forms/

Per Diem Rates for Travel:

https://www.gsa.gov/travel/plan-book/per-diem-rates

Student Health Insurance:

https://sfs.gsu.edu/tuition-fees/student-health-insurance/

Requesting a Safety Escort on Campus:

https://safety.gsu.edu/police/safety-escort/

The AstroPAL Website:

http://www.astro.gsu.edu/AstroPAL/about.html

GSU PAWS:

https://paws.gsu.edu/

PantherCard Office:

https://panthercard.gsu.edu/panthercard/

GSU Marta Office:

https://transit.gsu.edu/marta/

Parking Resources:

https://parking.gsu.edu/

Parking Portal:

https://gsu.t2hosted.com/Account/Portal

Counseling Center:

https://counselingcenter.gsu.edu/

HLCO Observatory:

http://www.astro.gsu.edu/HLCO/

Astronomy Labs:

http://www.astro.gsu.edu/lab/

Graduation Requirements:

https://registrar.gsu.edu/graduation/

Degree Requirements:

https://www.phy-astr.gsu.edu/graduate/degree-requirements/

Dissertation LaTeX Template:

https://www.overleaf.com/latex/templates/georgia-state-dissertation-template-with-modifications-for-astronomy/xpxrgmrcfhbm#.V__OU5MrKRs

Department Software:

http://www.physics.gsu.edu/software/

Department Facebook:

https://www.facebook.com/GSUPhysAstro/

Department Twitter:

https://twitter.com/gsu_phys_astro

Library Physics Page:

http://research.library.gsu.edu/physics

Library Curve Office:

http://sites.gsu.edu/curve/

Physics & Astronomy Dissertations (Ph.D.):

https://scholarworks.gsu.edu/phy_astr_diss/

Physics & Astronomy Theses (M.S.):

https://scholarworks.gsu.edu/phy_astr_theses/

GSU Payment Plan for Fees:

https://sfs.gsu.edu/tuition-fees/payments/georgia-state-payment-plan/

Immunization & Travel Requirements:

https://health.gsu.edu/services/immunizations-travel/

International Student Office:

https://isss.gsu.edu/

ISAC Facebook Page:

https://www.facebook.com/groups/205778592822896/

International Student Pre-Orientation:

https://isss.gsu.edu/future-students/pre-arrival/facebook/

International Student Handbook:

https://isss.gsu.edu/files/2013/11/International-Student-Handbook.pdf

APPENDIX

Standard student stipend schedule:

Year in attendance	Monthly stipend
Year 1	$2,000.00 / month
Year 2	$2,000.00 / month
Year 3, if student has passed their qualifier exam	$2,083.33 / month
Year 4, if student has completed their MS degree and prospectus	$2,166.67 / month
Year 5, if student has completed their MS degree and prospectus	$2,166.67 / month
Year 6, if student has completed their MS degree and prospectus	$2,166.67 / month
Students with internal, GSU merit-based fellowships (all years)	$2,166.67 / month