Physics & Astronomy Graduate Student Handbook

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I. Introduction

Graduate school is among the most intellectually stimulating phases of your academic career. You will find that your study of physics will take you to the frontier of human knowledge. You will transition from being one of our students to being one of our colleagues over the next few years. While this is an exciting time for most students, it can also be stressful, frustrating, and confusing. As a faculty, we are here to guide you through this process and offer encouragement and support along the way. Part of the support we offer is this handbook. We want to make our policies (and their justification) as transparent as possible and minimize the headaches that come from the administrative details that must be satisfied as you pursue your degree.

This handbook is a compilation of policies, procedures, and advice about the graduate program in Physics & Astronomy at Clemson University. It is meant to serve as a guide to help you make your way through the program. This handbook does not cover all the policies of the Graduate School of Clemson University. Those policies are compiled in the "Graduate School Policies and Procedures Handbook" on the Graduate School Policies page, which are published by the Graduate School each school year. You must follow both the Graduate School and the Physics & Astronomy Department guidelines as you pursue your advanced degree. This handbook also includes some general information about life on campus, but it is not, in any way, complete. You will undoubtedly learn even more as you chat with your fellow students and faculty members. Some additional information can be found in the PandA Grad Canvas group.

Usually, your first point of contact in the graduate program when you have questions is the Graduate Program Coordinator, Dr. Jens Oberheide. He can answer most questions related to Department and University policies and procedures and represents your interests to the Graduate School. Our Graduate Student Services Coordinator, Amanda Ellenburg, will handle the processing of all forms related to the program. The Department Chair for Physics & Astronomy, Dr. Chad Sosolik, is ultimately responsible for Department academic matters and welcomes your questions and input.

Please note that this handbook summarizes the policies and procedures as of the date on the front of the booklet. However, policies evolve over time and the policies listed in this handbook are subject to change. The entire Physics & Astronomy faculty and staff would like to wish you success at every stage of your academic journey. If we can be of assistance, please do not hesitate to call upon us.

II. Programs of Study

Overview

The Clemson University Physics & Astronomy Department offers programs of study leading to Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees. Each degree program has specific requirements. It is possible to earn a Ph.D. without earning an M.S. degree first. It is also possible to earn only an M.S. degree. If you are admitted as a Ph.D. student, you will need the approval of your committee, Graduate Program Coordinator, and Department Chair to switch to the terminal M.S. program. Your thesis advisor and committee may require you to write and defend an M.S. thesis as part of your preparation for your Ph.D., resulting in an en route M.S. degree. It is important that you discuss this possibility with your advisor early in your graduate school career.

The following sections summarize Physics & Astronomy Department policies as they relate to the programs of study for the M.S. and Ph.D. degrees. The Clemson Graduate School also has policies that relate to programs of study for these degrees. These are summarized in the Graduate School Policies and Procedures Handbook. It is important for you to remember that you must satisfy BOTH the departmental and Graduate School criteria.

A student holding a master's degree or a doctoral degree may not, as a rule, become a candidate for the same degree in the same field of study. Exceptions must be appealed directly to the Graduate School. Please see the Graduate School Policy Handbook for further information.

Master of Science (M.S.)

There are two options for getting an M.S. degree in Physics at Clemson University: a thesis and a non-thesis option.

Thesis option

This program requires 24 credit hours of course work with at least 12 hours of Physics and Astronomy course work at the 8000 level or above and at least 6 hours of Research in Physics and Astronomy (PHYS 8910), which culminates in the writing of a thesis submitted to the Graduate School. A maximum of 3 credit hours of course work can come from 1 or 2 credit hour(s) special topics courses such as PHYS 8750 and ASTR 8750. There is no limit on credit hours from special topics courses with 3 or more credit hours.

Prior to the convocation at which the student expects to receive a Master's degree, a final oral examination and thesis presentation must be completed (see the Graduate School website for deadlines). You will need to schedule your defense with your committee, reserve the room for the defense (see Kim Webb in the main office for help with that), and notify the Graduate School, via the Defense Calendar, of the time and place of the defense at least 10 days in advance. Students or their advisor should invite the Physics & Astronomy department faculty and the Dean of the Graduate School to attend the examination. Committee members should receive a copy of the thesis at least one week in advance of the defense date. Some committees may require more advanced notice. You should discuss this with your committee early in the process.

Prior to the presentation, you need to complete the GS7M form. Upon passing this examination, you should have your committee sign the form, give a copy to the Graduate Student Services Coordinator, Amanda Ellenburg, and forward a copy to the Graduate School as soon as possible, and no more than three days after the defense. During the thesis defense, committee members will make suggestions concerning the thesis. You will need to make any suggested changes and have your committee sign the completed thesis. You will then need the Graduate School to approve your thesis. This must all be completed at least two weeks prior to graduation. It is advisable to make an appointment with the Graduate School to review your thesis before the defense as reviewers get “booked up” at the end of the semester.

Non-thesis option

The non-thesis option requires 30 credit hours of graduate course work, with a minimum of 15 credit hours taken from required core courses, a minimum of 3 credit hours of required elective courses and the rest taken from the departmental list of approved elective courses. The required and approved courses are listed in section XII. At least 15 credit hours must be taken from Physics and Astronomy courses numbered 8000 or above. Research credits are not required and do not count towards the degree requirements. In order to complete the requirements for a non-thesis Master of Science Degree in Physics, you must achieve at least a 2.8 GPA in required core courses, in addition to the 3.0 GPA in all graduate level courses requirement by the Graduate School. There is no final examination, no written report/thesis, no defense, and no GS7M form.

The Graduate Program Coordinator will serve as your Advisory Committee chair for the purpose of curriculum guidance, with no other committee members.

Students who were admitted into the M.S. program before the Fall 2022 semester and who pursue the non-thesis M.S. option can choose to fulfill the degree requirements in place at the time of their admission into the M.S. program. A copy of these requirements can be obtained from the Graduate Student Services Coordinator or the Graduate Program Coordinator.

A master's student has six years to complete a degree; however, it is expected that full-time physics students should complete their master's degree within two years of their arrival at Clemson. Ordinarily, financial support will not be extended beyond the second year of study.

M.S. Timeline

Thesis Option (Example courses, there are no specific 3 credits course requirements for the M.S. degree when you choose the thesis option)

First Year

Fall
- Mathematical Methods (PHYS 8110) 3 credits
- Classical Mechanics (PHYS 8210) 3 credits
- Optics (PHYS 6320) 3 credits

Total: 9 Credits

Spring (GS2 must be submitted by start of this semester)
- Electrodynamics I (PHYS 8420) 3 credits
- Statistical Mechanics (PHYS 8150) 3 credits
- Masters Research (PHYS 8910) 3 credits

Total: 9 Credits

Second Year

Fall
- Quantum Mechanics I (PHYS 6550/9510) 3 credits
- Solid State Physics I (PHYS 8450) 3 credits
- Masters Research (PHYS 8910) 3 credits

Total: 9 Credits

Spring
- Quantum Mechanics II (PHYS 6560/9520) 3 credits
- Solid State Physics II (PHYS 8460) 3 credits
- Masters Research (PHYS 8910) 3 credits

Total: 9 Credits

Summer enrollment is not required unless one is being paid as a graduate assistant or graduating in August. You are expected to remain in residence and pursue your research during this time.

Non-thesis Option (Example curriculum without summer courses)

First Year

Fall 1
- Mathematical Methods (PHYS 8110) 3 credits
- Classical Mechanics I (PHYS 6210) 3 credits
- Electrodynamics I (PHYS 6410) 3 credits

Total: 9 Credits

Spring 1
- Thermodynamics and Statistical Mechanics (PHYS 6650) 3 credits
- Required Elective (e.g., Numerical Fluid Dynamics [PHYS 8750]) 3 credits
- Elective 1 (e.g., Methods of Spectroscopy [PHYS 8510]) 3 credits

Total: 9 Credits

Second Year

Fall 2
- Quantum Mechanics I (PHYS 6550) 3 credits
- Elective 2 (e.g., Scattering and Imaging [PHYS 8520]) 3 credits

Total: 6 Credits

Spring 2
- Quantum Mechanics II (PHYS 6560) 3 credits
- Elective 3 (e.g., Atomic Physics [PHYS 8500]) 3 credits

Total: 6 Credits

Doctor of Philosophy (Ph.D.)

Course Requirements

Study for the Ph.D. degree begins with the core courses intended to prepare you to carry out and publish independent scientific work. The core courses are PHYS 8110, 8150, 8210, 8410, 9510, and 9520. The core courses must be completed by the end of your second year. You are also required to take four advanced courses at the 8000-9000 levels. These courses must be selected in consultation with your Advisory Committee and will form part of your plan of study. These courses may be drawn from offerings in Physics & Astronomy or from programs in related fields. ***Special topics courses such as PHYS 8750 and ASTR 8750 may not be used to satisfy the elective requirements.*** There is a narrow exception in the case that the department faculty approve the use of a special topics course submitted for approval for addition to the course catalog. This is an unusual event. The same special topics course provisions apply to special topics courses from other departments. Committees may require additional courses/professional development seminars, and you may want to take additional courses to support your professional goals. This should be discussed with your committee.

Part One (Committee Selection) and Part Two (Plan of Study) of your GS2 form should be submitted before the start of your fourth semester. It is to your advantage to form a committee as soon as possible. Committee selection and plan of study submission must not be delayed past your fourth semester. Failure to follow this timeline may jeopardize your assistantship. If your course plan of study changes you may submit an updated GS2-Plan of Study until about six months prior to graduation (see the Graduate School website for the official deadlines each semester).

If you have taken courses equivalent to our required core courses elsewhere, you may petition the faculty for exemption from these courses. To do so, you should provide the Graduate Program Coordinator with the courses you want to exempt, the syllabus of the course (including textbook(s) used and topics covered) and copies of the final exam(s) from the course(s) if available. You will still be required to complete the minimum credit hours defined by the Graduate School (at least 12 hours of graded coursework and 18 credits of research beyond the M.S. degree or at least 60 hours of credit beyond the bachelor's degree, with a minimum of 12 credit hours of coursework and 18 credits of research).

Placement Examination

We administer a placement diagnostic exam to new students during orientation. This written exam covers 4 topics: classical mechanics, statistical mechanics, electromagnetism, and quantum mechanics. Based on your performance on each topic, you will either be required to take the relevant 6000 level courses before taking the core 8000/9000 level courses, or directly take the core courses.

For example, if you pass all 4 topics, you will take the 8000/9000 level courses as outlined in the Ph.D. Timeline. If you do not pass any of the 4 topics, you will take 6000 level courses in your first year, and all 6 core courses in your second year. If you pass some but not all of the topics, see section XIII for mandatory courses and timeline. Appendix A provides you with further details of the placement exam including expectations.

Core Course GPA Requirements and Comprehensive Examination

To apply for admission for candidacy, ***you must 1) score a minimum average GPA of 3.0 in your 6 core courses,*** and 2) pass the Comprehensive Examination. The core average GPA is computed such that a "+" can compensate a "-" grade. If you do not score the required minimum core course GPA average, you will not be eligible to earn a Ph.D. in Physics at Clemson University. You may, with the approval of the faculty, complete an M.S. degree by satisfying the requirements for the M.S. degree. You are also eligible to transfer to a different Ph.D. program within the university. Programs have varying policies and procedures for handling transfers. If you think you might want to move to a different program, you should contact that program to determine their requirements, deadlines, etc. well in advance of the semester you will transfer. You are strongly encouraged to meet with your Advisory Committee to discuss career options if you decide to take this route. You may also find it helpful to discuss your options with the Graduate Program Coordinator and/or Department Chair.

The comprehensive exam is an oral exam that must be taken before the end of your sixth semester. Your Advisory Committee plus one member from the Invigilation Committee (IC) will form your Comprehensive Examination Committee (see Appendix A). You must notify the Graduate Program Coordinator six weeks ahead of the oral exam and submit a written thesis proposal to the Comprehensive Exam Committee one month ahead of the oral exam, which you will present to the committee during the oral exam. See Appendix A for further details. ***If you do not submit a written thesis proposal on time, or you submit a proposal that does not meet the requirements, you will receive a "fail" in the comprehensive exam.*** The proposal and presentation should describe the work others have done related to your proposed thesis topic and how you will advance our knowledge of this field. Appendix B specifies the expectations for your proposal. You should also discuss the tools you will bring to bear on this topic, and convince the committee that you can do this work. During the oral exam, your examination committee will probe your understanding of the underlying physics of your problem, your knowledge of the literature in the field, and the tractability of the problem you pose. Appendix C further specifies the expectations and overall grading criteria. If you do not pass the exam on your first try, you may retake it within 6 months at the invitation of your committee.

Extenuating circumstances may justify a deferral of the comprehensive exam. If such a circumstance arises, you should discuss this with your Advisory Committee and Graduate Program Coordinator as soon as possible. You will need to petition the department faculty for a deferral by making a request, in writing, to the Department Chair with copies to the Graduate Program Coordinator and your thesis advisor.

Your Advisory Committee is more than simply an examination committee. Your committee members are available to provide advice and guidance – both on your research projects and career goals. ***It is strongly encouraged that you meet with your committee at least once every semester*** to ensure your committee is well-informed of your progress and can provide timely support when any issue arises.

Dissertation defense

Prior to the convocation at which you expect to receive a Ph.D. degree, a final oral examination and dissertation presentation must be completed (see the Graduate School webpage for deadlines). Prior to the defense, you need to complete the GS7D form. You will also need to schedule the defense of your dissertation with your Advisory Committee, reserve the room for the defense (see Kim Webb in the main office for help with that), and notify the Graduate School, via the Defense Calendar of the time and place of the defense at least 10 days in advance. You or your advisor must invite the Physics & Astronomy department faculty and the Dean of the Graduate School to attend the examination. It is best practice to provide committee members, Graduate Program Coordinator, and Department Chair a copy of the completed dissertation that you will be defending four weeks in advance of the defense date and absolutely no later than one-week prior. Some committees may have different requirements, so it is important to discuss this early in the process.

During the thesis defense, committee members will make suggestions concerning the thesis. Students will need to make any suggested changes and have their committee sign the completed thesis. Upon passing the dissertation defense and satisfying the committee's comments on your manuscript, you should have your committee sign the GS7D form, give a copy to the Graduate Student Services Coordinator, and forward a copy to the Graduate School as soon as possible, and no more than three days after the defense. You will then need the Graduate School to approve the thesis. This must all be completed at least two weeks prior to graduation. It is advisable to make an appointment with the Graduate School to review your thesis before the defense as reviewers get "booked up" at the end of the semester.

In thesis and oral examinations, it has been a custom in our department for students to provide refreshments for those attending. As of August 2018, this practice was discontinued. The Department, faculty, or staff may wish to celebrate the accomplishments of students by providing refreshments, but the student being examined may not be expected to contribute to this in any way.

Ph.D. Timeline

The following timeline is for students who passed all topics in the placement exam. If you failed one or more topics in the placement exam, you will need to take the courses and follow the timeline listed in section XIII. Electives can also be taken in different years than listed but the six core courses must be completed by the end of Spring 2 and the comprehensive exam must be taken before the end of Spring 3.

First Year

Fall 1
- Mathematical Methods (PHYS 8110) 3 credits
- Classical Mechanics (PHYS 8210) 3 credits
- Doctoral Research (PHYS 9910) 3 credits

Spring 1
- Electrodynamics I (PHYS 8410) 3 credits
- Doctoral Research (PHYS 9910) 6 credits

Second Year

Fall 2
- Quantum Mechanics I (PHYS 9510) 3 credits
- Doctoral Research (PHYS 9910) 6 credits

Spring 2
- Quantum Mechanics II (PHYS 9520) 3 credits
- Statistical Mechanics (PHYS 8150) 3 credits
- Doctoral Research (PHYS 9910) 3 credits

Third Year

Fall 3
- Elective 1 3 credits
- Doctoral Research (PHYS 9910) 6 credits

Spring 3
- Elective 2 3 credits
- Doctoral Research (PHYS 9910) 6 credits
- Comprehensive Exam

Fourth Year

Fall 4
- Elective 3 3 credits
- Doctoral Research (PHYS 9910) 6 credits

Spring 4
- Elective 4 3 credits
- Doctoral Research (PHYS 9910) 6 credits

Future Semesters:
- Doctoral Research (PHYS 9910) 9 credits

Additional electives may be taken with the approval of your advisor and the Graduate Program Coordinator as long as you are making adequate progress toward your degree. ***Taking unapproved courses outside the department may hamper your progress towards your degree and jeopardize your assistantship.*** Normally, the department does not provide financial support beyond the fifth year. If you need additional support, you should consult with your advisor and the Graduate Program Coordinator. Consideration for extending your support will be based on your progress on your dissertation, timeliness in meeting department and Graduate School requirements, evaluations from the Graduate Student Evaluation Committee (GSEC), and your performance as a GTA. Enrollment in summer classes is not required unless one is being paid as a graduate assistant or graduating in August. However, you are expected to remain in residence and pursue your thesis research during this time.

Academic Probation

To remain in good standing with the Graduate School, you must maintain a GPA of at least 3.0 at all times. Failure to maintain a 3.0 will result in academic probation. The Graduate School policy is available in the Graduate School Policies and Procedures Handbook. Currently, students put on probation will be given one semester to raise their GPA above a 3.0. To continue in the program, you must fill out a Graduate Student Plan for Success (GSPS) and have it signed by your advisor, the Graduate Program Coordinator, and Associate Dean of the Graduate School. If you do not raise your GPA above a 3.0 after one semester, you may be allowed one additional opportunity to do so. You must complete a second GSPS and have it approved by your advisor and Graduate Program Coordinator. Failure to raise your GPA above a 3.0 after two semesters may result in dismissal and disqualification from pursuing any graduate degree from Clemson. Note that your status in the program is determined by the Graduate School, not the Department of Physics & Astronomy. While

we can provide input and advice to the Graduate School, ultimately, they alone can admit and dismiss students from their programs of study. Other conditions may apply to conditionally admitted students on a case-by-case basis. These will be described in your admission letter. Further note that the GPA requirement for remaining in good standing with the Graduate School is different from the minimum core GPA requirement set by the department to be eligible to earn a Ph.D. in Physics at Clemson University.

Checklist on Graduate School Procedures

This is admittedly a lot of information. Here is a summary of the forms you need to fill out as you work your way to your degree. You should carefully note this checklist as well as the deadline dates.

1. Select a thesis advisor and Advisory Committee.
2. Submit Committee Selection and Plan of Study Curriculum (**Form GS2**).
3. Satisfy the comprehensive examination prerequisite for admission to candidacy.
4. Apply for admission to candidacy for a doctoral degree (**Form GS5D** and **GS-Approval of Thesis/Dissertation Research Proposal**).
5. Complete Final Examination (**Form GS7M** for master's students or **Form GS7D** for doctoral students).
6. Order diploma (**through iRoar**) after completing at least half the prescribed course work.
7. Order cap, gown, and hood from University Bookstore.
8. Submit completed thesis (if required) or dissertation to research advisor and arrange for final examination by the Advisory Committee.
9. Review thesis/dissertation submission guidelines and procedures, and make sure you submityour properly formatted manuscript prior to the deadline.

The final responsibility for ensuring compliance with these procedures rests with you. Special problems should be referred to the Dean of the Graduate School.

The En Route M.S. degree

While taking courses for your Ph.D. and preparing for your dissertation research, you will likely satisfy the requirements for an *En Route* M.S. degree. With the approval of our committee, you may apply for the M.S. degree. You will need to file the GS2-14 with the Graduate School prior to the semester in which the degree is conferred. You can satisfy either the thesis or non-thesis requirements. Many faculty members require their students to complete an M.S. thesis before starting their Ph.D. dissertation. You should discuss this with your committee.

Dissertation Formatting and Binding

The Graduate School has specific guidelines for formatting your thesis. After your defense, the Graduate School must approve your manuscript before you can be a candidate for graduation. The Department of Physics & Astronomy does not have any guidelines in addition to those specified by the Graduate School. Neither the Graduate School nor the department requires that you present either with bound copies of your thesis. Some students have been known to provide copies of their thesis to their advisor as a gift, and some faculty will request that their student provide a bound copy of the thesis to the research group and department (at the faculty member's expense).

Non-Physics Courses

You may choose non-Physics courses as part of your plan of study. These decisions are normally made with the student's research advisor and are designed to enhance the student's understanding of their emphasis area. Credit received for graduate-level courses taught by other departments may also be counted toward a Physics and Astronomy degree, provided those courses are not special topics courses

and involve subject matter that is relevant to the student's degree program. You should consult with and receive approval from your research advisor before taking such classes with the intention of having them count toward a graduate degree in Physics and Astronomy. A student supported by either a research or teaching assistantship must obtain approval from his/her/their research advisor and Graduate Program Coordinator prior to taking any non-physics electives not required on the GS2 while working toward a graduate degree in Physics and Astronomy. Failure to do so can result in loss of financial support.

III. Comprehensive Exam Committee and Graduate Student Evaluation Committee

The Comprehensive Exam Committee will administer your comprehensive exam. See Appendix A for the format of the exam and committee make-up. Note that the Comprehensive Exam Committee is not identical to your Advisory Committee: it is your Advisory Committee and a member of the Invigilation Committee.

Your progress toward either the M.S. or Ph.D. degree is monitored by your thesis advisor and advisory committee. Regular communication with your Advisory Committee is essential to making efficient progress toward your degree, ***and you are strongly encouraged to meet with your advisory committee at least once per semester.***

In addition, all students are interviewed and evaluated annually by the Graduate Student Evaluation Committee (GSEC). The purpose of the GSEC evaluation is (1) to share information about your research and professional accomplishments (2) to provide you an opportunity to voice concerns you may have with your progress that you may not feel comfortable sharing with your committee, (3) to receive outside feedback on your progress.

GSEC will be perform their evaluations annually during the fall semester. The result of the evaluations can be as follows:

(1)	Satisfactory progress in the program, or
(2)	Unsatisfactory progress in the program degree

GSEC will provide a summary report to the Department Chair, Physics and Astronomy faculty and Graduate Program Coordinator after the annual evaluations have been completed.

Annual Student Evaluations

In conjunction with the GSEC evaluations, annual evaluations for all students will be based on research progress documented by the Faculty Evaluation Report, course grades, and the student's transcript (i.e. timely progress through the required core and elective courses).

Satisfactory progress toward the Ph.D. degree would typically include a grade of B or better in all courses in which the student is/has been enrolled. Factors contributing to grades lower than B will be evaluated on an individual basis. Ph.D. students shall provide an annual update of their research progress to their committee, and the committee shall review the student using the Faculty Evaluation Form.

The result of the annual evaluations will be available to the student through GS Info or other means.

IV. Research

Original research is a primary difference between graduate school and other education. Our graduate students participate extensively in our major thrusts in research in the following areas:

- Astrophysics
- Atmospheric and Space Physics
- Atomic Physics
- Biophysics
- Medical Physics
- Condensed Matter and Materials Physics

You are encouraged to visit individual faculty members' research and web pages, which can be found on the Physics Department's website. Many students also find it helpful to talk to senior students from different groups. Most importantly, you should arrange a meeting with the professor you are interested in working with.

Selection of Research Advisor and Advisory Committee

The following only applies to Ph.D. and MS students pursuing the thesis option. If you are in the MS program pursuing the non-thesis option, the Graduate Program Coordinator will be the Chair of your Advisory Committee, and no other members are needed.

If you are a Ph.D. student, you may choose a ***Provisionary Research Advisor*** upon entering the program. The faculty member will be your PHYS 9910 instructor. You may change your Research Advisor without losing research credits and your enrollment in the program and GTA support is not dependent on the research group you join.

After you and a faculty member mutually agree to work together, you should notify the Graduate Student Services Coordinator (Amanda Ellenburg) and Graduate Program Coordinator (Jens Oberheide). Keep in mind that this must be a mutual decision. No faculty member is required to take you on as a student.

You will then work with your Research Advisor and the rest of your Advisory Committee (to be selected no later than the beginning of the fourth semester for Ph.D. students and no later than the middle of the second semester for MS students) to complete the GS-2 (Committee Selection/Plan of Study) Form. This two-part form will outline the courses you will take in order to fulfill the degree requirements. Your Advisory Committee will need to consist of a minimum of two (for a master's committee) or three (for a Ph.D. committee) faculty members, in addition to your advisor, who will work with you as you pursue your thesis work. These faculty members should be approached after discussion with your Research Advisor.

The chair of your Advisory Committee must be a T/TT faculty member in the Physics & Astronomy Department (including those with 0% joint appointments). Physics & Astronomy Department faculty members who are not in tenured or tenure-track positions are generally not eligible to serve on your Advisory Committee. T/TT faculty from other departments at Clemson, and T/TT faculty from other research universities and researchers in comparable positions at research institutions require approval from the Graduate Program Coordinator to serve on thesis committees. Committee members not falling in any of the above category must be approved by the departmental TPR committee, the Graduate Program Coordinator and the Department Chair. It is recommended for Ph.D. students that

each graduate Advisory Committee has an additional member from a field not related to the thesis topic.

If you are working towards a master's degree (thesis option), you should enroll in your advisor's section of PHYS 8910. If you are working toward your Ph.D., you should enroll in your advisor's section of PHYS 9910. You can change your advisor at any time; however, if you change your advisor after you have completed the comprehensive exam, you will need to form a new committee and defend your new thesis topic. Note that a change of advisors after the comprehensive exam may also be considered as unsatisfactory progress towards your degree with potential implications for financial support.

Your committee is a valuable resource, but it is your responsibility to take advantage of this resource. You should keep all your committee members up-to-date on your progress and accomplishments. Regular meetings with your committee members are essential for maximizing the benefit of their advice.

V. Financial Support

There are several options for financial support available to students in the graduate program, including teaching assistantships, research assistantships, and fellowships. The purpose of this support is to provide students the means to concentrate on their scholarship with minimal distractions. Because of this, outside employment is prohibited as a condition of accepting full-time support. Each type of support is awarded to qualified students on a competitive basis. Continuation of all support is based upon satisfactory progress towards a degree and satisfactory performance of your duties. To receive financial support, a student must maintain full-time status, which, by University policy, is defined as being enrolled in a minimum 9 credit hours in the Fall and Spring semesters and 3 credit hours in each Summer session (if on a 12-month assistantship). Most forms of support are distributed over nine months to prevent the requirement of registering for classes (and paying fees) during the summer.

Fellowships

The Graduate School awards several fellowships. The department nominates candidates who will compete for the fellowships with other nominees throughout the university. These fellowships currently pay from $5,000 to $10,000 per academic year in addition to any assistantship granted by the Department. Graduate School fellowships require no explicit duties and may be renewable.

Some students are awarded extramurally funded fellowships. The Graduate School maintains a list of fellowship opportunities and offers grant-writing workshops that can help guide you through the process of applying for a fellowship. You should also consult early with your advisor to apply for NSF Graduate Fellowships and other opportunities, as many of those fellowship require an application no later than your third semester.

Teaching Assistantships

These are the most common type of financial support for incoming graduate students. These assistantships provide the equivalent of 12 months of support, though the payment is distributed during the academic year (over nine months). This is to save GTAs the cost of summer enrollment fees. It is your responsibility to budget carefully to ensure that you have sufficient funding for the summer. No specific teaching duties are assigned during the summer, though students are expected to remain in residence and continue making progress toward their degree during that time.

A teaching assistant's duties usually entail teaching two to three undergraduate labs per semester, and/or grading assignments for undergraduate courses. Typically, your TA duties should not exceed 20 hours/week; however, the workload throughout the semester can vary considerably. Senior students

who have distinguished themselves as TAs may be given the option of teaching a full course at Clemson or release to teach at a local college. This can be an excellent professional development opportunity for students interested in careers in academia. For the year 2025-2026, teaching assistantships were, on average, $25,500 per nine months. Exceptional performance (or negligence) may affect your stipend. A reduction in pay due to poor performance will be communicated to you within two weeks of the end of the semester.

GTAs with grades below "B" in mandatory 6000-level courses (if any), or with an average GPA below 3.0 in core physics courses, or an "unsatisfactory" rating by the GSEC will be given one semester to show substantial improvement. Expectations will be communicated to the student in writing by the Graduate Program Coordinator. Failure to meet these expectations may result in losing the assistantship.

Research Assistantships

Research Assistantships are available to graduate students through research grants and contracts held by faculty members in the department. They may pay a somewhat higher rate than the teaching assistantships and are awarded based on availability and the qualifications of the recipients. Many students work as Research Assistants after passing the Comprehensive Examination. While the research assistant's work is usually closely aligned with their thesis research, this need not be the case. GRAs (like GTAs) are limited to 20hrs/week while working on the funded project; however, this does not include work on a dissertation project. It is important to discuss the expectations for the work with the PI, as the boundary between work on one's dissertation and work performed as a GRA can be quite fuzzy.

All assistantships carry a waiver of graduate tuition, but there is a fee imposed for the Fall/Spring semesters and the Summer Session. Currently, the academic fees are about $919/semester in Fall/Spring and about $670/Summer. Summer fees are only required if you register for a summer course and/or research hours in either summer session or long summer.

Additional Summer Support

Some students may receive summer support in addition to their Academic year stipend. There are a limited number of positions available for support of summer courses, and some faculty may have funds to pay students to work on projects in the summer. Research support is offered at the discretion of the faculty member. Such support is usually provided in the form of hourly wages in order to alleviate the payment of additional fees and enrollment in summer research credits. When one is paid as an hourly employee, one must track the hours worked on the project. Usually, the funds available and the term of the work are decided in advance and the pay rate is set assuming 20 hours of work per week. Thus, it is imperative that the appropriate number of hours are recorded on the timecard each week to ensure that you receive the full amount of the intended support. As with GTA and GRA support, this hourly cap only applies to work on the project for which you were hired. Additional, unpaid time will be needed to complete your dissertation research.

Special Requirements for International TAs

If you are a new, non-native English speaker performing TA responsibilities, you must pass the VEST (Verification of English Skills Test). This test will determine how well you can understand and communicate in spoken English. The test is given on campus, free-of-cost. The Graduate Student Services Coordinator, Amanda Ellenburg, will schedule the test. You will be informed of your test date and time either in person or in an e-mail. If you have a conflict with the scheduled date and time, you should contact Amanda immediately. Your teaching assistantship will be rescinded if you do not pass the VEST. It is your responsibility to find an alternative source of funding in this case.

If you hold F-1 or J-1 status, you are required to register for full-time status (a minimum of nine credit hours per semester, excluding summer sessions), based on Graduate School and departmental regulations. It is important that you do not fall below the required credit hours. If you elect to withdraw from the University, you must discuss your plans with the Foreign Student Advisor (FSA) in the Office of International Services (108 Long Hall) to avoid problems with the US Immigration and Naturalization Service (INS). If you anticipate completing and filing your thesis or dissertation between the end of one semester and the beginning of another, you should contact the FSA before filing your thesis or dissertation.

Time Limit on TA Support

Teaching Assistantship support is normally available to graduate students for a limited time. Allocation of TA support to continuing students will be recommended by the GSEC and is generally dependent on making satisfactory progress towards a degree (M.S. or Ph.D. in physics). A student pursuing a Ph.D. degree should not expect to be supported by departmental funds for more than 10 semesters. A student pursuing an M.S. degree should not expect to be supported by departmental funds for more than 4 semesters. These numbers do not include summer sessions.

Federal Financial Aid

Some students may choose to pursue federal financial aid such as federal loans. To do so please see the Financial Aid website.

To qualify for federal financial aid, you must make satisfactory progress towards your degree as defined by the Financial Aid office.

Because of the way satisfactory progress is defined for students pursuing graduate degree, it is highly likely that your record will be flagged by the fifth year of graduate school (once you exceed 90 credit hours). This is not necessarily a problem, but there is additional paperwork involved.

In short, you will need to complete the graduate Satisfactory Academic Progress Appeal Form.

Graduate Assistant Evaluations and GTA policy

An important part of your professional development is formative evaluation of your teaching and research performance. The GSEC and your Advisory Committee members are currently charged with evaluating your research performance. The GTA supervisor will work with the Graduate Program Coordinator to evaluate your performance as a GTA. These evaluations will provide you with documentation to include in your teaching portfolio when applying for jobs, provide the faculty with a basis for nominating students for teaching awards, provide the Department Chair with a fair basis for distributing raises, and provide documentation of any deficiencies that need to be addressed.

All GTAs will be evaluated at least annually to assess their performance. The outcome of the annual evaluation will be either:

1. *Exemplary performance* – Student exceeds expectations by taking on a leadership role among the GTAs, receiving accolades from students, or otherwise demonstrating excellence in the performance of his/her/their duties. Students who receive an "Exemplary" evaluation will be highest priority for nomination for GTA awards and for a raise if funds are available.
2. *Adequate performance* – Student meets expectations by arriving prepared for each lab and on time. The student also submits grades and attendance reports in a timely manner and meets other necessary deadlines. Complaints from students are minimal. Such students will be eligible for a cost of living stipend adjustment if funds are available.
3. *Fair Performance* – Student mostly meets expectations, but occasionally is late for meetings or

class (or otherwise underprepared), is reminded occasionally to follow policy, does not get grades submitted in a timely manner, or receives a large number of student complaints. A "Fair" evaluation will result in a warning. If a student's performance is gauged "Fair" two semesters in a row, that student will be put on probation. Students who earn a "Fair" evaluation will not be eligible for a raise.

4. *Poor Performance* – Student fails to meet expectations. The student is regularly late for lab, meetings, or in getting grades turned in. The GTA coordinator often must correct the GTA for not following policy. "Poor" performance will result in probation the following semester of teaching. If a student continues to perform at this level, he/she/they will not be eligible for further GTA support from the department without approval from the GSEC. Students who earn a "Poor" will not be eligible for a raise.

You should discuss your evaluations with your supervisor. You can appeal to the Graduate Program Coordinator and the Department Chair if you feel an evaluation is unfair. You also have the right to file a grievance with the Graduate School. It is highly recommended that you discuss your situation with the Ombudsman prior to filing a grievance.

Timing of evaluations: By the end of the fall semester (on or about December 15), the GTA supervisor will provide an initial evaluation of all first time GTAs and GTAs on probation. All other students will be evaluated by the end of the Spring semester (on or about May 15). These evaluations will be copied to the Graduate Program Coordinator and the GSEC. The GTA supervisor will address major accomplishments or deficiencies immediately. These will be documented in writing and copied to the Department Chair, Graduate Program Coordinator, and GTA.

Teaching Courses: GTAs who have earned their M.S. degree, have passed the comprehensive examinations, and have demonstrated excellence in their teaching may be afforded the opportunity to teach a full lecture course as a Graduate Teacher of Record (GTR) under the supervision of a faculty member. Teaching a course will be considered a full GTA workload and will come with a 10% supplement for the semester during which the course is taught.

Evaluation of GRAs: The evaluation of GRAs will be handled by the Primary Investigator (PI) of the grant from which the GRA is being paid. The PI is not necessarily the student's thesis advisor, and the work the GRA is being paid to deliver is not necessarily directly connected to the student's thesis work. Thus, the evaluation of performance for the GRA rests with the PI rather than the GSEC or the Advisory committee.

The expectations for the GRA should be clearly defined prior to the student starting work on the grant. The student is limited to 20hrs/wk. of work on tasks for which he/she/they is/are compensated. This is in addition to the work the student must do to make adequate progress to his/her/their graduate degree (i.e., satisfy the demands of PHYS 8900/8910/9910). While there is typically a great deal of overlap between the work the student does as a GRA and the research required to complete his/her/their thesis, it is crucial that the PI delineate the two.

PIs have wide discretion on how they administer their grants, thus it is crucial for PIs to be very clear about their expectations and to be upfront with students and the Department about the timeline for funding. If a PI is not going to fully fund a student for the academic year, he/she/they should let the Department and the GRA know. If a PI anticipates terminating a GRA from a grant for the subsequent academic year, the PI should alert the Department by January 30. If additional funding is anticipated, that should be communicated to the Department as well.

If a PI finds a GRA's performance unsatisfactory, he/she/they should attempt to work with the GRA to rectify the deficiency and alert the Department Chair and Graduate Program Coordinator. Termination

mid-semester should be reserved for the egregious violations of responsible conduct of research or other egregious violations of Department policy. If termination is necessary, the PI should discuss this with the Department Chair and Graduate Program Coordinator.

Guarantees of Support

While most students in the Physics & Astronomy department receive some type of financial support (based on the availability of funds), it should be understood that financial support is not guaranteed to any student. No contracts, whether written or verbal, may guarantee a student support. Unsatisfactory performance of teaching duties, in course work, in research work, or on the VEST may all be considered cause for reduction or termination of financial support. Other reasons may be considered just cause for termination of support at the discretion of the Physics & Astronomy Department.

Payroll and Paydays

All Clemson University employees are paid semi-monthly: on the 15th and last day of the month (if either of these dates falls on a weekend or bank holiday, you will be paid on the prior business day). An employee's first paycheck may take up to 6 weeks to process. All employees are required to have direct deposit of their checks into an U.S. bank account. You need to see Kim Webb in the main office (118 Kinard) before beginning your teaching duties to complete required paperwork. You will be required to bring your Social Security card, a government-issued photo ID (e.g. Driver's License or Passport), a cancelled check, and any additional paperwork required by DHS and/or INS. International students will have additional required paperwork to complete.

Holidays and Time Off

You are entitled to take, as holidays, the days on which the University is officially closed (note that the university is often open even when classes are not in session). In addition, you may take ten working days during the year as vacation. The latter should be taken so that the interference with your teaching and/or research responsibilities is minimal. Your supervisor and/or thesis advisor should approve leave in advance. Keep in mind, however, that your primary responsibility is to complete a dissertation of original research, and you have a limited term of financial support to do so. Taking extended leave can result in your project being scooped by someone else and putting you further behind than you anticipated. Therefore, extended leave should be reserved for extenuating circumstances.

If you are working as a TA, you should not take vacation while classes are in session. In the event you must miss a lab section or other job requirement because of an illness or injury, inform your immediate supervisor (e.g., Dr. Daniel Thompson) ***and*** Amanda Ellenburg. It is a good idea to let your thesis advisor know as well. It is your responsibility to perform your due diligence in finding a replacement for your lab section; however, if you are unable to find a replacement for your lab, your supervisor will help you do so.

While it is imperative that you keep your absences to an absolute minimum while classes are in session, we also recognize that your research responsibilities may lead to conflicts (e.g. attending conferences, off-site research trips, etc.). When you know you will need to miss time in your lab, it is incumbent upon you to find a replacement. You must also have approval from your thesis advisor and alert the lab supervisor as soon as possible, but no later than two weeks before your trip. If you have trouble making arrangements to have someone cover your lab section, your thesis advisor and laboratory supervisor will work with you to find a replacement.

Many students find it helpful to arrange informal agreements with their fellow students to help each other in cases when a conflict prevents you from being able to teach your lab(s). This is great, but you still must let your lab supervisor and thesis advisor know you will be absent. You are responsible for

your lab sections. We take your responsibilities as an instructor very seriously and you should, too. Your performance as a TA will be considered by the GSEC when deciding whether to recommend further financial support.

Outside Employment

One of the purposes of TAs and RAs is to support you during your graduate studies. Therefore, it is the policy of the Physics & Astronomy Department to disallow students from outside employment if their assistantship is equivalent to more than half time. Exceptions to this policy are temporary consulting and/or tutoring jobs that the student may do with the approval of their thesis advisor.

Taking on outside employment without approval from your thesis advisor while on an assistantship may result in immediate termination of your assistantship.

VI. Academic Integrity

As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, academic dishonesty, in any form, will not be tolerated.

Moreover, as scientists, we depend on the trustworthiness of our colleagues to advance knowledge in our discipline. Academic dishonesty can shake the public's confidence in the reliability of scientific knowledge as well. The American Physical Society has also adopted guidelines for professional conduct with which you should become familiar. The National Science Foundation and National Institute of Health also require that everyone supported by NSF/NIH funds receive Responsible Conduct in Research training. The Office of Research Compliance provides brown bag lunch seminars and online training seminars that you should work through as soon as possible.

The Graduate School provides a comprehensive description of University policy as it pertains to Academic Integrity. You should read this carefully and make sure you understand everything in it. If you have questions, feel free to discuss these policies with your advisor, the Graduate Program Coordinator, and/or the Department Chair.

VII. Other Academic Policies

The Graduate School maintains a database of university academic policies. These cover readmission, residency requirements, continuous enrollment requirements, leave of absence, duplication of higher degrees, auditing courses, protesting grades, transfer credits, deadlines for graduation, and so forth. If there is a conflict, Graduate School policy supersedes departmental policies. Please refer to the Graduate School webpage for official university policies, important deadlines, and questions about issues not described here.

VIII. Departmental Operations

Most of you will be assigned a space in Kinard 310 for your first year. After you have chosen a Research Advisor, you will likely move to a different office with students in your area. When moving, you should notify Amanda Ellenburg in 118 Kinard. Space is limited, so you may be required to move your office as demand on space requires.

Building Security and Keys

A member of the office staff in 118 Kinard will issue you the appropriate keys. Building security is

everyone's responsibility, so please keep the following in mind:

- Take great care to prevent loss of the key(s) assigned to you. In the unlikely event that you lose your key(s), notify the Graduate Program Coordinator and office staff in Kinard 118 immediately.
- Refrain from loaning a key to anyone.
- See that the outside doors and all appropriate laboratories are locked when entering or leaving the building outside regular hours.
- Under no circumstances allow anyone into the building after hours who does not have key card access to Kinard Lab. NEVER PROP OPEN THE DOORS TO THE BUILDING AFTER HOURS.
- Report to the University Police and to the Department Chair any unusual or suspicious occurrence or persons found in Kinard Lab at any time.

Mail

Student mailboxes are located in the mail/copier room (108 Kinard Lab). You should check your mail daily.

E-mail

E-mail is the primary way the Department and the University will contact you. Both student and employee e-mail accounts should be checked regularly (at least once per day) as you will receive important information concerning courses, Department events and University information. Many of these may require immediate attention. It is particularly crucial that you carefully read all communications from the Department Chair (Dr. Sean Brittain), Graduate Program Coordinator (Dr. Jens Oberheide), the Graduate Student Coordinator (Amanda Ellenburg), and office manager (Kim Webb). Many of these email messages may be time sensitive and affect your ability to progress efficiently through the program.

Office and Computer Supplies

Office and computer supplies are ordered through the department office in 118 Kinard. Items that are needed for instructional labs and classrooms are maintained by office staff and/or the GTA supervisor. Your advisor will provide materials for research labs. Office supplies are not intended for personal use. Office supplies that are not maintained in stock in the office may be ordered by request to Kim Webb in the main office. You will not be reimbursed for personal supplies.

Equipment and Other Supplies

Before ordering any equipment or supplies, you should check with your research advisor, Kim Webb, or Dr. Daniel Thompson, (if ordering for instructional labs). You may ask Laura Walker for help with ordering research lab equipment or supplies. You will need an account to charge the purchase against and approval from the owner of that account. You should deliver confirmations/invoices/receipts for any orders to Laura Walker in 118 Kinard within one business day of placing the order. All orders must be delivered to the Department, not to the home address of a student or professor. You will not be reimbursed for supplies you purchase on your own without *prior* approval.

IX. University Resources

Clemson Computing and Information Technology (CCIT)

Services

CCIT provides computer support, manages the campus network, and sets computing policy. Their information for new students is primarily directed to undergraduates, but you may find some of the information useful. While undergraduate students are required to have a laptop approved by CCIT, graduate students are not. It is, however, strongly recommended that you have your own computer. Most students find it helpful to have LINUX installed on their personal computers. Some students set up a dual boot with MS Windows. Others use Macintosh computers that have X11 built in. Before purchasing a new laptop, you should discuss your computing needs with your thesis advisor.

CCIT provides robust computing support – from hard drive recovery to help setting up your email. They also provide access to high performance computing with the Palmetto Cluster and high throughput computing. The Palmetto Cluster is a 12,000-core supercomputer for large calculations. High throughput computing is a network of 1700 machines across campus useful for running a large number of serial jobs. CCIT provides training on these facilities as well as training in the use of UNIX/LINUX, scripting, and writing optimized parallel code.

Network

CCIT maintains the campus network. Wi-Fi is available across campus (EduRoam), and Ethernet connections are available in all offices. Instructions for setting up your devices to use EduRoam are available on the CCIT solutions page. Be sure not to connect an unauthorized router to the campus network. This can result in the loss of access to the campus network.

Software

CCIT provides access to a number of Software titles for free or steeply discounted prices. Talk to your advisor about other software you may need for your research. Do not risk using pirated software on your machine. The penalties can be harsh, and you have no expectation of privacy while using the campus network.

Computing Policy

Be sure to familiarize yourself with the campus computing policy. Most regulations are common sense. Keep in mind that the campus network exists to promote official University business (teaching, research, and service to the state). Any activities that compromise the ability of campus users to do their job is strictly forbidden.

Clemson University computing resources are the property of Clemson University, to be used for University-related business. *You have no expectation of privacy when utilizing university computing resources, even if the use is for personal purposes*.

Clemson University Libraries

Clemson's main library, the Robert M. Cooper Library, is located at the center of campus and provides students with a variety of services and up-to-date collections. More than 1.6 million items are available as books, periodicals, microforms, government publications and electronic materials. Detailed information regarding facilities, hours of operation, loan privileges, policies, and fine regulation is available at the circulation and reference desks and on Cooper Library's website.

Career Services

You are now a professional student, and it is never too early to start thinking about the next stage of

your career. What do you hope to do with your graduate degree in physics? Many students plan to follow the traditional path from Ph.D. to postdoc to faculty job. Perhaps that is your goal as well; however, you may find that your goals shift as you move through your graduate studies. It is a very good idea to be aware of the opportunities available to you and learn how you need to position yourself to take full advantage of those opportunities. Previous students in our program have found rewarding careers in government labs, industry, and secondary education. As you think through your goals, you may find that the Michelin Career Center is helpful. The Michelin Career Center is committed to meeting you unique needs as a graduate student.

As you search across campus, you will find that there are several certification programs that may help you pursue your professional goals. For example, many students find they are interested in teaching high school science. If you think this is for you, you might be interested to learn that the School of Education offers an intensive 13-month Master of Arts in Teaching in Secondary Science. Other students want to go into business for themselves. Such students may find the Technology Entrepreneurship Certificate of interest. If you think you may want a career teaching at a non-research-intensive college, you might find the Certificate in Engineering and Science Education useful. These are just a few examples of the certification programs available on campus. As you think through your career goals, you may find it helpful to explore additional options as well.

Nevertheless, be sure to get the approval of your thesis advisor before taking any courses beyond those approved on your GS2. Approval of extra coursework is contingent on making satisfactory progress toward your degree as determined by the GSEC. Taking extra courses without prior approval by your advisor will place your assistantship in jeopardy.

X. Student Life

Graduate Student Government

The mission of the Graduate Student Government (GSG) is to represent the interests of all graduate students at Clemson University in four vital focus areas:

- Involvement -to encourage graduate student participation in the University process;
- Communication -to act as the liaison between the University and graduate students with an emphasis on honest and open communication;
- Collaboration -to promote the efforts of graduate students and the University into one united mission of making the Clemson experience one of quality education and reward; and
- Development -to provide participatory learning experiences that allow for the enhancement of graduate students' academic, civic, social and professional development.

The GSG is composed of all graduate students at Clemson University. Its Senate consists of one representative from each academic department. The Executive Board consists of the president, vice president, secretary, treasurer and chairs of the GSG committees. In addition, there are board seats for the executive assistant, the news editor and the assistant news editor. The GSG elects representatives to various University boards, commissions, committees or councils that solicit graduate student opinions. GSG also participates in the planning and implementation of Graduate Student Orientation and the Graduate Student Research Forum. Students can contact GSG via e-mail at gsg@clemson.edu.

Health Services

Most students satisfy the mandatory health insurance requirement by enrolling in the University Health Plan. Preventative care Redfern Health Center consists of four divisions: Medical Services,

Counseling and Psychological Services (CAPS), Disability Services and Health Education/Alcohol and Drug Education. Redfern Health Center, an outpatient facility, operates Monday through Friday, 7:30 a.m. to 5:00 p.m. (summer hours are 8:00 a.m. to 4:30 p.m.). Students without an appointment are seen in the Nurse's Clinic. ASK-A-NURSE telephone services (864-656- 2233) are also available. The student health center offers outpatient ambulatory care for illnesses and injury, pharmacy, lab, X-rays, and specialty clinics including orthopedics and women's health.

A completed medical history questionnaire is required of all students entering the University for the first time. Documentation of two red measles (rubella) vaccines since the student's first birthday is required. Students born prior to January 1, 1957, are exempt from the measles requirements. A tuberculin skin test (PPD) is required within the year before the student's enrollment at the University. Students with a history of a positive skin test are required to have a chest X-ray within the year before the student's enrollment at the University. Students not in compliance with immunization requirements will not be allowed to complete registration.

Counseling and Psychological Services

CAPS strives to provide quality counseling and mental health services to enhance students' intellectual, social and personal growth. Counselors work with students to improve self-awareness, understanding, and coping skills. All information is kept confidential and separate from medical and academic records. CAPS offers individual and group counseling for a range of personal problems, including, but not limited to anxiety, depression, trouble coping, sexual concerns, relationship problems, substance abuse, and alcoholism. Testing and counseling groups are also offered for students with learning disabilities and attention deficit hyperactivity disorder. Testing is also provided to aid in the diagnosis of problems. Some testing services require a fee, but most are free of charge.

Accessibility Services

Clemson University is committed to providing educational opportunities for all students and assisting them in making their college experience successful. In compliance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, Clemson University recognizes a student with a disability as anyone who has a physical or mental impairment that substantially limits one or more major life activity. Individualized accommodations for students with disabilities are coordinated through the Office of Student Accessibility Services. Reasonable and compensatory strategies are developed confidentially with each student based on the nature of the disability and the academic environment.

Students requesting accommodations must provide current documentation of their disability from a physician or licensed professional to Student Accessibility Services in Redfern Health Center (Voice/TTY (864) 656-0515). For more information, visit Student Accessibility Services Student Guide

Health Education

Health Education provides information and wellness challenges on a variety of subjects: alcohol and other drugs, sexuality, leadership, nutrition and stress management. Health Education provides the opportunity to develop leadership skills through peer education programs. Alcohol and Drug Education offers social host training, on-campus party registration, and an Assessment, Choices, Treatment and Transitions (ACTT) program.

Health Fee

University policy requires that all students registered for seven or more credit hours during the fall or spring semester or four or more credit hours during a summer session pay the University health fee. The health fee provides access to the professional services of University physicians/nurse

practitioners, counselors, and health educators at no additional cost, reduced costs for medical diagnostics, and an after-hours urgent care excess insurance benefit. Students pay for pharmaceuticals, orthopedic equipment, specialty clinics and psychological testing. Payment is expected at the time of service. Students may pay with cash, check, MasterCard, Visa or Tiger Stripe.

Health Insurance

The University offers an accident and sickness insurance plan to help cover major medical expenses. Information is sent to all students prior to the fall semester. All students are strongly encouraged to have comprehensive health insurance coverage during their tenure at the University. International students' dependents are required to have comprehensive health insurance as well.

After Hours

Students may call ASK-A-NURSE at (864) 656-2233 Sunday through Thursday, 4:00 to 8:00 p.m. A registered nurse is available to answer questions, provide health information and schedule appointments. Students requiring the care of a physician after hours may choose from area emergency rooms and urgent care facilities including Clemson Health Center, Oconee Memorial Hospital, Anderson Area Medical Center, Baptist Medical Center and Greenville Memorial Medical Center. Medical costs incurred are the student's responsibility. Students should contact Redfern the next business day for follow-up care. After-hours CAPS counselors can be reached by calling the Clemson University Police Department at 864-656-2222 and asking for the CAPS on-call counselor.

On-campus medical emergencies are transported by the University ambulance to the closest community medical resource. The University ambulance is staffed with licensed emergency medical personnel 24 hours a day. Students are required to pay for off-campus ambulance transportation except for those medical resources within the city of Clemson for after-hours urgent care.

Graduate Student Housing

There is no Graduate Student housing on campus. While you may apply to live in general student housing, almost all of our graduate students live off campus. There are several economical options available near campus. Talking to more senior graduate students is the most helpful way to find the best living arrangement for you.

Dining Plans

The University has a number of dining options on campus and provides a number of convenient meal plans some students find attractive. There are also several restaurants in walking distance from campus, and a number of grocery stores and shopping centers serviced by the CAT bus.

Tiger 1 Card

The Tiger 1 Card is every student's official Clemson University ID. Many departments use Tiger 1 Card as a means of granting access to their information and services. The Tiger 1 Card will serve as a:

- Personal student identification card
- Personal debit card to access pre-deposited funds in a Tiger Stripe account
- Meal plan card
- Library card
- Residence hall access card
- Building access card
- Fike Recreation Center access card

You will also need to show your Tiger 1 Card in order to receive tickets to athletic events. You should keep your Tiger 1 Card with you at all times.

Parking Information

Students living off-campus who intend to drive to campus and park their cars must obtain a parking permit from Parking Services, which is located at G-01 Edgar Brown Union. Information about obtaining a parking permit, parking lot locations, and game day parking are available at the Parking Services website. The Clemson Area Transit (CAT) Bus is a *free mode of transportation to Clemson students, faculty and staff. Many students find taking the CAT bus to campus is much more convenient than searching for a parking place on campus.

*While CAT buses do not charge a fare, their maintenance and operation is supported by the transit fee paid by each student.

Campus Recreation

The Department of Campus Recreation provides a wide array of recreation opportunities. The centerpiece of Campus Recreation is the Fike Recreation Center. Fike offers fitness equipment, fitness classes, athletic courts, and a pool. There is also a campus beach for enjoying warm sunny days. The University also sponsors organized outdoor getaways. The Edgar Brown University Union Underground Recreational Center has pool tables, bowling alleys, and various arcade games at reasonable rates. McKissick Theatre in the Hendrix Student Center hosts discounted or free movies throughout the semester. The Brooks Center for the Performing Arts hosts a number of live events throughout the year. Most of these are at very reasonable rates, and some are even free. The Lee Gallery for the visual arts hosts visiting artists and various visiting exhibits each year.

Clemson University fields several competitive men's and women's varsity athletic teams. Many of these sporting events offer free admission to students.

XI. University Harassment Policies

General Harassment Policy

Clemson University is committed to being an inviting community of scholars that respects the dignity of every individual. Therefore, harassment of any kind will not be tolerated. Details of the University Harassment policy are available from the Office of Access and Equity. The policy defines harassment, provides information on how to report claims, and describes how complaints may be resolved. While most of this information is common sense to most people, you should still review it to make sure you do not run afoul of university policy and so that you know your rights and responsibilities in the unlikely event you run into an issue.

Amorous Relationships

Amorous relationships that might be appropriate in other circumstances can be inappropriate when they occur with a person for whom you have a professional responsibility (e.g. a student in a lab section you teach). Those in positions of authority inherently carry the element of power in their relationships with subordinates. It is imperative that you neither abuse, *nor appear to abuse*, the power entrusted to you. You should be aware that any romantic involvement with a student or subordinate employee could make you liable for formal action if a complaint is initiated. Even when both parties have consented to such a relationship, it is the officer, supervisor, instructor, or faculty member who may be held accountable for unprofessional behavior. *Difficulties can also arise from third parties who may feel that they have been disadvantaged by such relationships*. You would be wise to exercise special care in your relationships with students you instruct or evaluate. A simple policy to avoid problems and perception of problems is not to date or develop close personal relationships with your students while they are in your class or lab. An amorous relationship with a student you are charged with grading will result in immediate loss of support.

Ombudsman Information

Overview

The Ombudsman is an independent, confidential resource that provides assistance to you in resolving problems, complaints and conflicts when normal processes and procedures have not worked satisfactorily. The Ombudsman's Office serves as a central information source on policies, procedures and regulations affecting faculty, graduate students and post docs. The office refers individuals to persons able to resolve problems or handle appeals at the lowest possible level. Where appropriate, the Ombudsman can facilitate and/or mediate communication between parties in a dispute.

The Role of the Ombudsman

The Ombudsman strives to ensure that faculty members, graduate students and post docs receive fair and equitable treatment within the University system. He or she provides an independent point of view in an informal and confidential environment. The Ombudsman will not identify any student with whom he or she has contact or discuss his or her personal concerns with anyone without the student's permission. Private confidential meetings can be arranged at the convenience of the student. All communications will be treated with strict confidentiality. The Ombudsman works toward resolutions based on principles of fairness. He or she is neither an advocate for faculty members, administrators, nor students. Nor is the Ombudsman an agent of the University, rather he or she is an advocate of fair process.

Contacting the Ombudsman

Any complaint should first be taken to the faculty or staff member involved to reach a resolution. If no resolution is reached, the graduate student should consult with the Graduate Program Coordinator, Department Chair, or the Dean who will hear the complaint and act as a referee. If an acceptable resolution is not reached or if you are not comfortable approaching one of these three people, you should discuss your situation with the University Ombudsman. If a resolution cannot be made, the student should then consult with the Dean of the Graduate School. Graduate students should talk with the associate dean responsible for academic grievances if mediation is necessary. The Graduate School is located in E-106 Martin Hall, and the telephone number is 656-4172.

XII. List of required and elective courses for the MS (non-thesis option)

Required core courses (18 or 15 credit hours), a minimum 2.8 GPA is required for graduation

- Math Methods: PHYS 8110
- Statistical Mechanics: PHYS 6650 OR PHYS 8150
- Classical Mechanics: PHYS 6210 OR PHYS 8210
- Electrodynamics: PHYS 6410 OR PHYS 8410
- Quantum Mechanics: PHYS 6550 & 6560 OR PHYS 9510

6000/8000/9000 level courses will be assigned by the Graduate Program Coordinator based on the student academic record and plan of study. 18 credit hours if PHYS 6550/6560; 15 credit hours if PHYS 9510.

Required elective course (3 credit hours)

One course of the following: Advanced electronics course (need to be approved by the Graduate Program Coordinator) OR Advanced statistics/modeling course (MATH 8050) OR Advanced numerical methods/computation course (PHYS 8750 – Numerical Fluid Dynamics), ME 8190 Computational Methods in Thermal Sciences, ECE/CPSC 6780 General Purpose Computation on Graphical Processing Units, ECE 6730 Introduction to Parallel Systems

Elective courses (9 or 12 credit hours depending on required core course credit hours)

To be drawn from the following list. Note that some courses are not offered every semester/year. Prerequisites can also be fulfilled by consent of instructor.

PHYS 6220 – Mechanics II	Preq: PHYS 6210
PHYS 6420 – Electrodynamics II	Preq: PHYS 6410
PHYS 6170 – Intro to Biophysics	
PHYS 6180 – Intro to Cellular Biology	
PHYS 6200 – Atmospheric Physics	
PHYS 6320 – Optics	
PHYS 6450 – Solid State Physics I	
PHYS 6460 – Solid State Physics II	Preq: PHYS 6450
PHYS 6520 – Nuclear and Particle Physics	
PHYS 8170 – Molecular Biophysics	
PHYS 8180 – Cellular Biophysics	
PHYS 8190 – Computational Biophysics	Preq: PHYS 6170 or PHYS 8170
PHYS 8250 – Atmospheric Dynamics	
PHYS 8260 – Ionospheric Physics	
PHYS 8270 – Meas. Techniques Aeronomy	Preq: PHYS 8250
PHYS 8280 – Tidal and Planetary Waves	Preq: PHYS 8250
PHYS 8450 – Solid State Physics I	
PHYS 8460 – Solid State Physics II	Preq: PHYS 8450
PHYS 8500 – Atomic Physics	
PHYS 8510 – Methods of Spectroscopy	
PHYS 8520 – Scattering and Imaging	
PHYS 9520 – Quantum Mechanics II	Preq: PHYS 9510
PHYS 9530 – Quantum Field Theory	Preq: PHYS 9520
PHYS 9660 – Relativity	Preq: PHYS 8210
ASTR 8100 – Rad. Processes & Meas.	
ASTR 8200 – Stellar Astrophysics	
ASTR 8300 – Galactic Astronomy	
ASTR 8400 – Cosmology	
PHYS 8750/ASTR 8750, PHYS 6750/ASTR 6750 – Selected Topics	Max of one 3-cr course, 1-cr courses do NOT count towards the requirement
8000-level or above electives with PHYS or ASTR prefix not listed above	Preq: case-by-case basis

XIII. List and timeline of required core courses for Ph.D. program

Depending on what topics in the placement exam a student passed/failed, the following courses and timeline are mandatory. In case the final grade in PHYS 6210, PHYS 6410 or PHYS 6550 was "A" and at the recommendation of the instructor, the requirement of taking PHYS 6220, PHYS 6410 or PHYS 6560 is waived. A grade of "A-" or lower does not qualify for the waiver. It is the student's responsibility to obtain the instructor's recommendation and inform the Graduate Program Coordinator before the first day of classes.

	Fall 1	***Spring 1***	***Fall 2***	***Spring 2***
Pass all	***8110***	***8410***	***9510***	***9520***
	8210			***8150***
Fail QM	***6550***	***6560***	***9510***	***9520***
	8110	***8410***		***8150***
	8210			
Fail EM	***8110***	***6420***	***9510***	***9520***
	8210			***8150***
	6410			***8410***
Fail CM	***8110***	***8410***	***9510***	***9520***
	6210	***6220***	***8210***	***8150***
Fail SM	***8110***	***8410***	***9510***	***9520***
	8210	***6650***		***8150***
Fail SM CM	***8110***	***8410***	***9510***	***9520***
	6210	***6220***	***8210***	***8150***
		6650		
Fail SM EM	***8110***	***6420***	***9510***	***9520***
	8210	***6650***		***8150***
	6410			***8410***
Fail SM QM	***8110***	***8410***	***9510***	***9520***
	8210	***6650***		***8150***

	6550	***6560***		
Fail CM EM	***8110***	***6420***	***9510***	***9520***
	6210	***6220***	***8210***	***8150***
	6410			***8410***
Fail CM QM	***8110***	***8410***	***9510***	***9520***
	6210	***6220***	***8210***	***8150***
	6550	***6560***		
Fail EM QM	***8110***	***6420***	***9510***	***9520***
	6550	***6560***	***8210***	***8150***
	6410			***8410***
Fail SM QM EM	***8110***	***6650***	***9510***	***9520***
	6410	***6420***	***8210***	***8150***
	6550	***6560***		***8410***
Fail SM QM CM	***8110***	***6650***	***9510***	***9520***
	6550	***6560***	***8210***	***8150***
	6210	***6220***		***8410***
Fail SM CM EM	***8110***	***6650***	***9510***	***9520***
	6210	***6220***	***8210***	***8150***
	6410	***6420***		***8410***
Fail CM EM QM	***6410***	***6420***	***9510***	***9520***
	6210	***6220***	***8210***	***8150***
	6550	***6560***	***8110***	***8410***
Fail all	***6210***	***6220***	***8110***	***8150***
	6410	***6420***	***8210***	***8410***
	6550	***6560***	***9510***	***9520***
		6650		

Appendix A - Evaluation of Students in the Graduate Program In the Department of Physics and Astronomy

I. Annual Student Evaluations

The progress of students will be evaluated annually during the fall semester by the GSEC. The evaluations can be as follows:

(1)	Satisfactory progress toward the program, or
(2)	Unsatisfactory progress toward the program

Evaluations for all students will be based on research progress, course grades, opinions of the faculty teaching courses in which the student is enrolled, the student's transcript, and one or more meetings between the GSEC and the student, as deemed necessary. Information about research accomplishments provided to the GSEC by the student and the student's research advisor, if one has been chosen, will be considered as well.

Satisfactory progress toward the Ph.D. degree would typically include grades no lower than B in courses. Factors contributing to grades lower than B will be evaluated on an individual case basis.

Students who seek only a Masters degree carry out their research as part of Physics 8910 for the thesis option. Students in the Ph.D. program carry out their research as part of Physics 9910. The student can change his or her research professor at a later date, if desired. MS students shall complete their GS2 by the end of their first year and Ph.D. students shall complete their GS2 no later than the end of their second year. Ph.D. students shall provide an annual update on their research to their committee, and the committee shall review the student using the Faculty Evaluation Form. The result of the evaluation made by the GSEC will be reported to the Department Chair, to the student's research committee, if a committee has been constituted, to the Department's Graduate Student Advisor, and to the student. In addition, a summary of the overall results of the evaluation process will be reported to the Physics and Astronomy faculty after the annual evaluations have been completed.

II. Placement Examination

Upon arrival, new Ph.D. students will take the placement exam. The test will be delivered and autograded via Canvas. Questions will be drawn from a bank of questions approved by the faculty and available to the students prior to the exam. The exam will cover four subjects (classical mechanics, statistical thermodynamics, quantum mechanics, and electrodynamics) at the advanced undergraduate level. The exam will be 2 hours, and a pass on each subject will be 5/9 questions answered correctly. Question selection for the exam will be at the discretion of the Graduate Program Coordinator.

Students who pass all parts of the examination will enroll in the six core course curriculum. Students who fail any part of the examination must take undergraduate level courses in the failed topics (see section XIII of the Physics and Astronomy Graduate Handbook) before enrolling in the corresponding core courses.

III. Comprehensive Examination

Following successful completion of their core courses, students may be invited by their Advisory Committee to stand for the Comprehensive Exam. The purpose of this exam is to establish that the student has an adequate foundation in his/her/their subfield to successfully complete a research project leading to a Ph.D. The student must stand for the Comprehensive Examination before the end of the sixth semester of their entering the Ph.D. program.

At least six weeks prior to the scheduled Comprehensive Examination date, the student must notify the Graduate Program Coordinator, who will then inform the Invigilation Committee to assign a member to invigilate the exam.The student's Comprehensive Examination Committee shall consist of their Advisory Committee and one member of the Invigilation Committee (the "invigilator"). The invigilator shall not belong to the same sub-field as the student's field of research. At least one month prior to the scheduled Comprehensive Examination date, the student shall submit to their Comprehensive Examination Committee a written Ph.D. Research Proposal which documents the proposed research area, the methods to be employed in the research, and the expected outcomes (required format and components can be found in Appendix B). The Ph.D. Research Proposal will be formally presented to the Comprehensive Examination Committee as an oral presentation on the Comprehensive Examination date. **Any student not meeting the above requirements shall fail their exam.**

The exam shall be non-public and have three parts: 1) the written PhD Research Proposal, 2) a 30 minutes oral presentation of the thesis topic that is open to the academic public of the department, 3) and at least 30 minutes of oral examination of graduate-level physics knowledge relevant to and necessary for the proposed research that is open only to the comprehensive exam committee. The criteria listed in Appendix C shall serve as a guideline for expectation and evaluation. The committee chair should ensure that the presentation finishes within 30 minutes. The committee chair and the invigilator should ensure that each committee member has an appropriate amount of time for questioning in part 3). Committee members may attend online, but the student, the invigilator, and at least one other member of the committee must be present in-person. Exceptions from this attendance policy require approval by the Student Welfare Committee.

In addition to forms required by the Graduate School, results of the Comprehensive Examination will also be recorded by the Comprehensive Examination Committee in individual Faculty Evaluation reports (Appendix C) with copies provided to the student and to the Department Chair. Once a student has passed the Comprehensive exam, they will be admitted to candidacy for the Ph.D. degree. Students who fail the exam may be invited by their committee to retake the examination a maximum of one time. The committee may request the student to retake all or parts of the exam. To gain candidacy, a student must pass the second attempt no more than 6 months after the first attempt.

IV. Students on Academic Probation

At the end of each semester, the GSEC will review the record of any student on academic probation. The GSEC will make a recommendation to the Department Chair on the status of that student. The Department Chair will communicate the recommendation to the Graduate School, which then decides if the student will be allowed to continue to be enrolled in the graduate program or will be dismissed from the program. The Department Chair will communicate the decision in a letter to the student, including any special requirements that the student must fulfill to continue in good standing in the program.

V. Makeup and Procedures of Relevant Committees

a. Graduate Student Evaluation Committee

The committee carries out the student evaluations and reports the outcomes, as described in §I. The Department Graduate Student Evaluation Committee is constituted in the manner prescribed by the Student Welfare Committee. The membership of this committee should reflect the different research groups in the department as much as possible.

b. Invigilation Committee

The Invigilation Committee ensures that comprehensive examinations are conducted appropriately as described in §III. At least one committee member shall participate in each comprehensive examination. The Student Welfare Committee will appoint Invigilation Committee members in January once a year, or on an as-needed basis. The number of committee members will be determined annually, with a minimum of one committee member per three expected comprehensive examinations. The Invigilation Committee Chair will be appointed by the Student Welfare Committee. The Invigilation Committee Chair is responsible for appointing invigilators to individual comprehensive exams. In case an exam has to be retaken, and if possible and feasible, the same invigilator should be appointed.

c. Comprehensive Examination Committee

The Comprehensive Examination Committee conducts the comprehensive exam. It consists of the student's Advisory Committee and at least one member of the Invigilation Committee who shall not belong to the same subfield as the student's field of research.

VI. Modifications for Special Circumstances

In special circumstances these rules may be modified to accommodate the needs of a student. The modification will be by vote of the Physics and Astronomy Faculty.

Appendix B – Written PhD Proposal

The written PhD proposal constitutes Part I of the Comprehensive Exam and should clearly and concisely describe the scientific merit, experimental design, and technical aspects of your proposed dissertation research. It is imperative that it be clearly written, absent of hype and superfluous adjectives. Your written PhD proposal must be submitted on time (see Appendix A). It needs to consist of the following components:

1. **Title** – Ideally descriptive, brief, with minimal jargon
2. **Background** – In this section you will place your proposed work within the framework of existing knowledge. You should describe the seminal papers related to the topic, existing debates within the scientific community, and ongoing work in the field. Be sure to properly cite your sources and give proper credit to previous work.
3. **Scientific Objectives and Justification** – Declare your science question(s). Explain why your objectives should matter to anyone. The reader should be convinced that answering the question you have posed is scientifically interesting. This is *not* the place to discuss humankind's responsibility to the accumulated body of human knowledge, just say why you or anybody else will care about the result.
4. **Methodology** – This section should start with a brief - 1-2 declarative sentence(s) describing what you will be doing. The purpose of this section is to convince your committee that your project is tractable and that you have a viable plan to generate the answer to the question you pose. An overly complex technical discussion is not desired – just include the important factors so the process to be followed, the scope of the work, and the potential problems can be identified. If you've identified collaborators who have agreed to work with you on this project, they should be mentioned here. You should also note what they will contribute.
5. **Technical Description/Feasibility** – In this section you get into the details of how you will execute your study. You should convince the committee that you have access to the resources you need and the technical know-how to do the proposed work. If there are gaps in your skillset, you should describe the training/classes you will take to fill in those gaps. Discuss backup plans if any road blocks appear.
6. **Milestones** – What are your realistic expectations of how long it will take you to achieve your objectives? Give milestones for intermediate points along the way with milestones no more than 6 months apart. If your effort will be less than full time due to coursework, exam preparation, or TA duties, give the fraction of time you will work on the project. You should plan to meet with your committee at each milestone (and no less than every six months) to describe your progress, obstacles that require you to reassess your project or its timeline, and updates to your timeline.

Proposal format:

12-point font, single-spaced, 1-in margins. You should aim for 5-6 pages including figures but excluding references. **Your proposal shall not exceed 10 pages** including figures but excluding references.

Appendix C - Department of Physics & Astronomy
Faculty Evaluation Report
for Comprehensive Examination in PHYSICS

Student Name: _____

When did the student enter the PhD program (i.e., F22, S23): _____

Date of examination: _____

Individual assessment of examination: PASS FAIL

Examiner: _____

First or second attempt? 1 2

If first attempt, is the exam before the end of the 6th semester of the student entering the PhD program? Yes No N/A

If second attempt, is the examination within six months of the first attempt? Yes No N/A

Was the written PhD proposal submitted one month prior to the examination? Yes No N/A

Has an extension been granted to the student? Yes No

If the answer to any of the first three questions is "No" and no extension has been granted, then the student failed the exam!

Rating Scale

3 = Yes (meets criterion)

2 = Partially (meets criterion inconsistently)

1 = No (fails to meet criterion)

N/A = not applicable

Part I – Research Proposal

Clear and well-motivated science question for proposed work: 3 2 1

Research appropriately placed in context of previous work: 3 2 1

Research methods are described in sufficient detail: 3 2 1

Research methods are selected appropriately: 3 2 1

Feasibility/limitations of research methods are adequately addressed: 3 2 1

Appropriate timeline and milestones towards dissertation: 3 2 1

Quality of writing: 3 2 1

Overall assessment of part I : 3 2 1

Part II – Presentation (30 min target)

Contents of the proposal are clearly and concisely presented: 3 2 1

Questions are answered appropriately: 3 2 1

Overall assessment of part II : 3 2 1

Part III – Core-physics relevant to the proposed research (minimum of 30 min examination)

Demonstrates understanding of physics principles related to the proposed research: 3 2 1

Demonstrates understanding of physics equations relevant to the proposed research, such as limitations, approximations, and physical processes that are quantified by the equations: 3 2 1

Demonstrates a proper understanding of terminology used in their proposal and their field of research: 3 2 1

Overall assessment of part III : 3 2 1

Narrative comments, i.e., if "FAIL" what parts of the examination should be retaken (use extra sheet if necessary):

Additional narrative comments for student improvement: