Lehigh University *Department of Physics*

Procedures, Rules, and Regulations

for

Graduate Students

Effective Summer 2025

The following is a review of various procedures and requirements for physics graduate students. It is subject to change and it does not supersede the catalog. Where there is disagreement between this and the catalog, the catalog applies. This description is meant to be helpful and indicative of practice rather than a legal description of rules.

REGISTRATION

1. Professors Cremonini and Ekuma will be your academic advisors until you have a PhD dissertation advisor. Registration questions or problems can be brought to either of them. They are responsible for monitoring your progress, though all faculty members are willing to give you advice.
2. The Business Manager, Marina Long, is responsible for office assignments.
3. Professor Licini is responsible for TA assignments.
4. You must register two times each calendar year. Check the catalog for deadline dates.

GRADES

As you are aware, graduate students are expected to perform at a higher grade level than undergraduates. Thus, a grade of C is considered poor performance for a graduate student. There is a “4-C rule” which states that a graduate student who receives MORE THAN four C's cannot continue to register and must leave the program. A course in which a student receives a grade below C- does not count toward a graduate degree. A grade of incomplete (N) must be removed within 12 months of the end of the semester of registration or all equity in the course is forfeited.

MS PROGRAM

1. The following courses, unless an approved equivalent course has been taken previously, constitute the MS program:

   Core courses (total of 18 credits):

PHY 420 - Classical Mechanics (3)	PHY 423 - Quantum Mechanics I (3)
PHY 428 - Mathematical Physics (3)	PHY 424 - Quantum Mechanics II (3)
PHY 442 - Statistical Mechanics (3)	PHY 421 - E&M (3)

   Elective courses (total of 12 credits):

   - Any 300 or 400 level courses in Physics or closely related fields. Elective courses must be selected in concert with and with the approval of the graduate advisor.

   - PHY 491 - Research (3): Research experience within an assigned research group, under the supervision of a faculty member (research assignments will be made based on availability in a specific research group, the student's academic record, faculty input and other criteria). PHY 491 could also take the form of a reading course on a topic of interest. The course can be taken at any time, including during the summer, with approval of the supervising faculty member and graduate advisor.
   Note: PHY 491 can be substituted with a 300 or 400 level course if no research opportunities are available. It can also be substituted by PHY 490 (3-6 credits), which is a Master thesis done under the supervision of a faculty member.

2. Many MS students take courses in the same order as the PhD students. This is shown below in the chapter "PhD program" in section a. 5. The MS program concludes in the fall semester of the second year.

3. The College of Arts and Sciences provides a Master's Graduation Checklist on their website: https://cas.lehigh.edu/graduate/current-students/graduate-forms-resources. At the beginning of the semester in which the degree is to be conferred students must first submit a Curriculum change request form. In addition, they must submit a "Master's Program Form" and apply for their graduate degree through Banner.

PhD PROGRAM

a. PhD COURSE AND CREDIT REQUIREMENTS

The following course requirements must be satisfied in order to successfully complete the PhD program.

1. The following core courses, unless an approved equivalent course has been taken previously, must be taken:

PHY 364 - Nuclear & Elem. Particle Physics (3)	PHY 428 - Math. Phys. (3)
PHY 423 - Quantum I (3)	PHY 420 - Mechanics (3)
PHY 424 - Quantum II (3)	PHY 421 - E&M (3)
PHY 442 - Stat. Mech. (3)	PHY 491 - Research (3)

2. In addition to the core courses listed above, students are required to take 5 more courses, to reach a total of 39 course credits required for the PhD degree. This may include any 300 or 400 level physics courses <u>except</u>: courses that are part of the undergraduate Physics and Astrophysics major cores (301, 302, 340 and 362, 369), graduate research courses other than 491 (i.e. 490, 492 and 499), independent study courses, reading courses, seminar courses, and GAANN courses. Note: 300 or 400 level courses <u>outside the department</u> can count towards the 39 credits if they have been approved by the graduate academic advisor or by the dissertation committee.

3. PHY 491 Research is usually taken during the first summer by all PhD students. Students will submit an ordered list of choices of prospective faculty advisors by mid-February during their first spring semester. The actual assignments will be made based upon the student's academic record, faculty input, and other criteria.

4. Students entering with a master's degree in physics covering the material described in point 1 are required to take a total of 9 additional course credits. The 9 credits must satisfy the requirements listed in *item 7* below. Note: students who have not taken a course on Nuclear and Elementary Particle Physics as part of their master degree must take PHY 364 as part of their 9 credit requirement.

5. Most PhD students take courses in the following order:

Fall semester - 1st year:	PHY 420 Classical Mechanics PHY 428 Mathematical Methods of Physics Free elective or PHY 362 catch up with quantum
Spring semester - 1st year:	PHY 423 Quantum Mechanics I PHY 421 Electricity & Magnetism PHY 442 Statistical Mechanics
Summer semester - 1st year:	PHY 491 Research project

Fall semester - 2nd year:	PHY 424 Quantum Mechanics II Free elective Free elective
Spring semester - 2nd year	PHY 364 Nuclear and Elementary Particle Physics Free elective Free elective
Summer semester - 2nd year:	PHY 492 Research

6. The PHY 364 (Nuclear and Elementary Particle Physics) requirement may be waived for students who have obtained a B+ or better in a comparable advanced undergraduate or graduate course.

7. Breadth Requirement. At least 3 credits of 300 or 400 level advanced physics course work must come from each of at least two of the three categories shown in the table below. One-, two-, and three-credit special-topics lecture courses will be assigned to one of the three categories by the instructor in consultation with the department chair and associate chair. Exceptions to this rule may be approved by the dissertation committee. The breadth requirement is also included within the 39 credit total.

   Course Categories:

Category 1 (Astrophysics, Nuclear & Particle Physics and String Theory)	**Category 2** (Optics, Solid State Physics and Atomic and Molecular Physics)
AST 332/PHY 332 – High-Energy Astrophysics AST 342/PHY 342 – General Relativity AST 344/PHY 344 – Cosmology PHY 366 – Intro to String Theory PHY 372/PHY 472 – Advanced Nuclear & Particle Physics PHY 495 – Quantum Field Theory	PHY 352 – Modern Optics PHY 355 – Nonlinear Optics PHY 363 – Physics of Solids PHY 431 – Theory of Solids PHY 446 - Atomic and Molecular Physics
Category 3 (Soft Matter and Biophysics)	**Category 4** (Computational and Data Science Physics)
PHY 365 – Physics of Fluids PHY 382 – Physics of Cells PHY 495 – Soft Matter Physics	PHY 333 – Experiential Materials Modeling PHY 380 – Introduction to Computational Physics PHY 381 – Machine Learning in Physics

8. Total credit requirement. Doctoral students whose graduate study is carried out entirely at Lehigh University must register for a minimum of 72 credits beyond the bachelor's degree. Students who have earned a master's degree at another university must register for a minimum of 48 credits. These requirements are typically met by registration for dissertation or research credits, beyond the course credits. Prior to being admitted to doctoral candidacy (see candidacy requirements below) students need to register for at least 3 credits per semester, even if they have attained the 72 or 48 credit requirement.

b. PhD QUALIFYING EXAMS

1. Qualifying exams will be scheduled just before the start of the spring semester. All students entering with a bachelor's degree in physics are expected to take these exams after completing one and a half years of graduate work. Students entering with a master's degree in physics are expected to take the exams just before starting their second semester of residence at Lehigh.

2. The exams presuppose course work through the first three semesters and consist of two written exams (each with two parts), and one oral exam. The material to be tested includes topics covered in core courses during the first three semesters of graduate study (Quantum I & II, Math Physics, Classical Mechanics, E&M, and Stat. Mech.) as well as additional material from these areas and other areas normally mastered by PhD students at this level. Sample exams may be obtained from Alicia Hepner, and questions can be directed to Prof. Knospe, chairman of the qualifying exam committee.

   The exams consist of the following sections:

   a) Exam I:

      Part A
      i) Classical Mechanics – 1 hour
      ii) Statistical Mechanics – 1 hour
      Part B
      iii) General Knowledge, short answer questions – 1 hour
      iv) Mathematical Physics – 1 hour

   b) Exam II:

      Part A
      i) Quantum Mechanics I – 1 hour
      ii) Quantum Mechanics II – 1 hour

      Part B
      iii) E&M, part 1 – 1 hour
      iv) E&M, part 2 – 1 hour

   c) Oral exam - 1 thirty to sixty-minute session

3. A student who does not pass the exam on the first attempt must retake the exam during the following June. The PhD Qualifying Exams may be taken only twice. *(Except, see item 5 below.)*

4. If a student (excluding first year students taking the exam as a free shot – *see item 5 below*) does well on most of the exam but poorly on one or two sections, it is possible that the student may only be required to retake those sections.

5. First-year graduate students are allowed to take a “free shot” at the written parts of the Qualifying Exam in January. If a student's score is sufficiently high, they will also be invited to participate in the oral examinations. A first-year student who passes both written and oral exams will have completed the qualifying exam requirements and their progress towards the PhD degree will be substantially accelerated. There is no penalty for not passing the “free shot.”

c. DISSERTATION ADVISOR

Normally, soon after passing the qualifying examination, a student will begin the search for a suitable dissertation topic and a faculty advisor to direct their research project. This will be one of the most important steps the student will take in their career. The actual process is similar to that of a student seeking an advisor for their PHY-491 research project, except that the degree of commitment on the part of both student and professor is far more significant.

The faculty will try to keep students apprised of the activities and research projects that are available in the department, but it is the student's responsibility to acquire enough information to make a choice of dissertation project. The student should talk to several professors, participate in group meetings held by some of the research groups, and consult with previous and current graduate students about their research experiences.

Although the faculty will do everything it can to provide assistance, it is each student’s responsibility to identify their research advisor. However, individual faculty are not required to accept as dissertation students each and every student who requests to work with them, and a student/faculty collaboration on a PHY 491 research project is never a commitment by either party to a continued relationship. In addition, students who are making less than satisfactory progress may find it difficult or impossible to find a faculty member willing to direct their dissertation work. Please see appendix A for “Best Practices for Doctoral Advisors” as recommended by the GRC (Graduate Research Committee). This will give students a good idea of what to expect from their advisor.

Students are reminded that their achievements in graduate study at Lehigh can provide a substantial beginning for a very successful career in physics. Subsequent success in the job market will depend upon their accomplishments as measured relative to other young PhD's from quality programs.

d. DISSERTATION COMMITTEE

The student must form a committee in consultation with their dissertation advisor. In the Physics Department, the committee normally consists of the advisor (who serves as chair of the committee), three additional Lehigh physics faculty, and one professor from outside the department.

According to university rules, the minimum number of committee members is four. The committee chair must be a voting member of Lehigh's Department of Physics. At least two other committee members must also be voting Lehigh faculty members (voting defined here according to R&P as a voting member of the Lehigh faculty). With the written approval of the department and the Associate Dean for Graduate Studies, one of these two (but not the committee chair), may be drawn from categories that include departmentally approved adjuncts, emeritus faculty, professors of practice, university lecturers, and courtesy faculty appointees. Such a member must have a doctoral degree. The fourth required member must be from outside the student's department. With approval of the graduate director, PhD scientists from outside the university may serve as the outside member of the committee or even as dissertation advisor, but not as committee chair. Committees may also include additional members who possess the requisite expertise and experience, with approval of the graduate director.

It should be noted that forming a committee with only four members or choosing committee members from outside the university can lead to difficulties in scheduling mandatory committee meetings, and that such scheduling difficulties are not an acceptable excuse for missed deadlines (see below). The department strongly recommends that each committee have a minimum of five members (the advisor plus three other physics faculty and one Lehigh faculty member from outside the department). If the advisor and student want to include a scientist from outside the university, we recommend that this individual be added as a sixth member of the committee. This committee makeup reduces the risk of being unable to assemble a legal committee for crucial meetings.

e. PhD DISSERTATION PROPOSAL

DEADLINE - Last day of class, SPRING Semester of Year 3.

During the third year, the student will prepare a proposal for dissertation research, in consultation with their dissertation advisor, which will be presented in both written and oral formats to the dissertation committee. The student should prepare a list of all graduate courses taken and to be taken, including those taken at other institutions, and this should be attached to the proposal. A proposal signature sheet for the committee members should also be prepared. See the Appendix at the end of this document for templates for the signature sheet and proposal format. Once the student's dissertation advisor has approved the proposal, the written document is distributed to the committee and the oral presentation is scheduled. It is generally expected that committee members will receive the written document at least a week before the meeting.

The student's proposal for research must be signed by members of the student's committee following the oral presentation wherein the committee will assess the suitability of the project and the likelihood that the student will be able to successfully complete it.

In addition to approving the student's research plan, the committee may also require additional courses and language proficiency, as it deems appropriate.

Note that both the proposal and the General Exam (*see Sec. f below*) must be completed by the last day of class in the spring semester of year 3. Typically, the General Exam requires at least 2-3 weeks to prepare, and generally this occurs AFTER the proposal presentation. In addition, students are warned that it is often difficult to find meeting times that are acceptable to all committee members. "Scheduling difficulties" is not considered to be an acceptable excuse for missing the proposal or General Exam deadline. Thus 3rd year students are well advised to schedule their proposal meetings for January, February, and early March to allow plenty of time to also complete the General Exam by the end of the semester.

Note that if the proposal is not accepted by the committee at the first meeting, the student must schedule another committee meeting to present a revised proposal as soon as possible. Failure to present a proposal that is acceptable to the dissertation committee by the last day of class in the spring semester of year 3 results in the student being placed on departmental probation. If an acceptable proposal has not been presented to the committee and approved by the first day of class, fall semester year 4 (i.e. by the end of that summer) the student will lose their financial support, and will no longer be considered a student in good standing in the graduate program.

f. GENERAL EXAM

DEADLINE - Last day of class, SPRING Semester of Year 3.

The purpose of the General Exam is to determine whether or not the student is knowledgeable in their chosen area of specialization. The specifics of the General Exam will be determined by the student's dissertation committee on or about the time of their first meeting (Spring, year 3).

The General Exam will be administered by the dissertation committee in a meeting closed to the public. Once the exam has been completed the student should submit the General exam form. The Physics Department Office will receive a completed copy once the committee members have indicated the results of the exam and signed the form.

The General Exam will normally be completed within 1 – 1 ½ years after the student has passed the PhD qualifying exam, and usually follows the admission to candidacy. The departmental deadline is the last day of class in the spring semester of Year 3. The College deadline is no later than seven months prior to the anticipated date of graduation.

If the student does not pass the examination at the first attempt, a re-exam must be scheduled as soon as possible. Failure to pass the General Exam by the last day of class in the spring semester of year 3 results in the student being placed on departmental probation. If the

General Exam is not passed by the first day of class, fall semester year 4 (i.e. by the end of that summer) the student will lose their financial support, and will no longer be considered a student in good standing in the graduate program.

g. PhD CANDIDACY

A student should 'apply for admission to candidacy' no later than TWO YEARS after passing the qualifying exam, and preferably sooner. To apply for candidacy, the student must submit

1. A completed Application for Candidacy. The candidacy application must be signed by each committee member before the posted deadlines to be considered complete.

2. A Dissertation timeline (see samples here).

3. Approved original proposal with committee signatures.

4. Copy of transcript or a list of all graduate courses taken and to be taken, including those taken at other institutions. A total of **39** course credits is required for the PhD degree and the list of courses should satisfy the course requirements outlined in *Sec. b*.
5. A signed General Exam Form or explanation from the program when this requirement will be fulfilled.

Once this candidacy paperwork is submitted, you will receive an appointment for your mandatory interview with the Associate Dean as the final step to formally enter Candidacy.

The College of Arts and Sciences provides a Doctoral Graduation Checklist on their website: https://cas.lehigh.edu/graduate/current-students/graduate-forms-resources

h. YEARLY DISSERTATION COMMITTEE MEETINGS AND FORMS

DEADLINE - Last day of class, SPRING Semester each year.

After the Proposal (*see Sec. e*) has been accepted and the General Exam (*see Sec. f*) has been passed, students must continue to hold annual dissertation committee meetings, starting in year 4. The deadline for these meetings is the last day of class of the Spring semester. Even if the student plans to have a dissertation defense in the summer, he or she must still convene a meeting of the dissertation committee during the academic year (i.e. a meeting MUST take place each year between the first day of class fall semester, and the last day of class spring semester – no exceptions!).

i. FULL TIME STUDENT STATUS

Graduate students who are on maintenance of candidacy (72 credits or above) or who are approaching maintenance, will typically register for less than 9 credits. In this case, the student is required to fill out a **Full Time Certification** form in order to maintain full time status

(important for student loans and student visas among other things). The Full Time Certification form can be found on the College of Arts and Sciences website: https://cas.lehigh.edu/graduate/current-students/graduate-forms-resources

j. A PATH FOR Ph.D. CANDIDATES TO DISSOLVE AND REFORM A NEW DISSERTATION COMMITTEE

Sometimes conditions arise where a student's current advisor's service as chair of the dissertation committee is no longer feasible, due to situations including health problems, personal conflict, or other circumstances to be reviewed by the department's graduate advisor in consultation with the Department Chair. This situation only applies to students who have entered Ph.D. candidacy, as outlined in section (g) of this document. If the existing committee, along with the current chair (if available) and the graduate student, are able to unanimously approve a new committee chair, the newly selected chair immediately assumes that role.

In cases where unanimous approval of a new dissertation committee chair is not possible, members of the existing dissertation committee who are not in conflict with either the current chair (if available) or the graduate student will form an interim committee. The interim committee will select an interim committee chair from members of the physics department, in consultation with the student and research advisor (if available). If the interim dissertation committee fails to choose an interim dissertation committee chair, the Department Chair will appoint an interim dissertation committee chair. In cases when the Department Chair is in conflict, the Associate Dean for Research and Graduate Programs of the College of Arts and Sciences will appoint a new interim dissertation committee chair.

Role of the interim dissertation committee: The interim dissertation committee is composed of the new interim chair and the existing dissertation committee members who are not in conflict with either the student or the prior advisor. The role of the interim dissertation committee will be to form a new dissertation committee comprising existing and/or new members with balanced expertise who can evaluate the student's research progress and their thesis defense. Under the direction of the interim chair, the interim dissertation committee must discuss, and when necessary help guide the development of, a research plan and potential new dissertation committee composition separately with both the graduate student and prior dissertation advisor (if available). The interim committee will recommend a plan for the student towards a Ph.D. under the current or a new dissertation advisor, ensuring the rules and procedures of the physics department are followed.

Formation of a new dissertation committee: If the interim dissertation committee recommends a new committee, the interim dissertation committee will select members of a new dissertation committee including a new dissertation committee chair. The selection process will be done in consultation with the student and the former research advisor (if available). Once a new dissertation committee forms, the prior and interim committees are dissolved. If necessary, the new dissertation committee chair can rebalance the composition of the new dissertation committee by inviting additional members. Under the direction of the new dissertation committee chair, the new

dissertation committee must help guide the student with the development of a research plan to continue the Ph.D. candidacy.

Conflict resolution of the ownership of intellectual property: The process for conflict resolution of intellectual property should follow the guidelines of the University policy on the intellectual property (https://www.lehigh.edu/~policy/ip.html). Intellectual property conflicts, if they arise, should be dealt with by informal discussion among the creators, committee members and, when necessary, by the faculty of the department, and possibly with the involvement of the Associate Dean for Research and Graduate Programs of the College of Arts and Sciences and the Associate Dean of the Graduate Student Life. When all attempts for conflict resolution fail, the Intellectual Property Review Board would come in as a last resort.

k. PhD DISSERTATION

Research for the dissertation should be started as soon as possible. Typically, completion requires about two years of research plus a semester of writing the dissertation. There are, of course, significant variations. A MAXIMUM time limit is set by the university requirement that ALL post-baccalaureate work toward the doctorate must be completed within TEN years (SEVEN years for students entering with a Master's degree). Students are strongly discouraged from attempting to complete their dissertations in absentia. The completed dissertation must be written in accordance with style requirements established by the College of Arts & Sciences and must be submitted (in draft form) to the Associate Dean by the appropriate date (approximately six weeks before graduation; see the catalog for details). Please find deadlines and helpful tools on the College of Arts and Sciences website: https://cas.lehigh.edu/graduate/current-students/graduate-forms-resources

The College of Arts and Sciences dissertation guidelines can be accessed through the "Doctoral graduation checklist" link on this website. Please contact Daniel Goonewardene in the Research and Graduate Programs Office at 610-758-4281 or dig321@lehigh.edu to schedule your draft appointment.

After the dissertation has been revised and approved by the research advisor, copies of the dissertation should be distributed to the committee members and a FINAL EXAMINATION scheduled. **The committee should be allowed two weeks to read the dissertation and provide comments.**

l. FINAL EXAMINATION

The **Dissertation Defense** will be administered by the PhD committee. Other faculty and students in the university may be invited to attend the public presentation of the dissertation and may participate in questioning. After the public presentation and defense, the committee (with additional invited faculty) will examine the candidate's dissertation further and, by vote of the committee members, determine whether or not the candidate passes the dissertation defense.

DISSERTATION APPROVAL FORM – In most cases, the committee members will have

suggestions for corrections and revisions to the dissertation itself. A graduate student may spend anywhere from a few days to several weeks revising their dissertation after the dissertation defense. Once the committee members are satisfied with the final revisions to the dissertation, after the dissertation has been successfully defended and revised accordingly, the student must submit the final draft to the Associate Dean for Research and Graduate Programs for review by the Graduate Committee no later than TWO WEEKS before the degree is to be conferred.

The dissertation must be sent to the Associate Dean for Research and Graduate Programs, College of Arts & Sciences. The required final paperwork can be found in the College of Arts and Sciences Doctoral Graduation Checklist:
https://cas.lehigh.edu/graduate/current-students/graduate-forms-resources
The candidate must pay a dissertation distribution fee and present a bursar's receipt for the payment.

Two additional unbound copies of the dissertation should also be delivered to Alicia Hepner to be sent for binding. One of the resulting hardcover copies will be archived in the Physics Reading Room while the other copy is for the student.

m. CLEARANCE

Graduate students must receive clearance from the university prior to the awarding of a degree or prior to resignation from the university. The following obligations must be satisfied:

1. All INCOMPLETE (N) grades must be removed.
2. The dissertation must be cleared by the Associate Dean for Research and Graduate Programs, College of Arts & Sciences.
3. All financial obligations must be cleared with the bursar, including: tuition fees, library fines, bookstore charges, motor vehicle fines.
4. All library books on loan must be returned.
5. Students must turn in their student identification cards at the ID card office. The Interdepartmental Clearance Sheet must be completed and signed by the department chairperson, the Bursar, and Facilities Services officer and submitted to the registrar at least THREE days prior to graduation.

n. FINANCIAL SUPPORT

Once a student has been accepted for graduate study in Physics at Lehigh, this department will do all it can to provide financial support in the manner of teaching and/or research assistantships and/or fellowships for the first five years that the student is in graduate school, provided of course that satisfactory progress is being made. Satisfactory progress will be measured by course grades, progress in the student's research project, and by the successful execution of the necessary duties required in the PhD program (e.g. Qualifying Exam,

formation of a PhD committee, proposal, General Exam, candidacy, dissertation defense).

Renewal of TA Appointments: Appointments of continuing students as teaching assistants is dependent upon satisfactory performance as a teaching assistant as well as satisfactory academic performance.

Progress Review: Each Spring the entire faculty will review the progress of all graduate students and determine whether or not satisfactory progress is being made. In addition, petitions for support for a sixth year are reviewed at this time.

Petitions for Extension of Support: Students in their fifth year of graduate study at Lehigh who determine that they will not be able to complete the requirements for the PhD within the expected five years will be required to submit a petition for an extension of support for a sixth year to the graduate advisor by April of their fifth year. The form of this petition should be:

1. A list of the items yet to be accomplished and the anticipated dates by which these will be completed.
2. The endorsement of the student's PhD committee of the feasibility of the plan to complete all requirements within the sixth year. (In order to obtain committee endorsement, the student must convene a formal meeting of the dissertation committee prior to the April faculty meeting.)
3. Optionally, the petition may also contain an explanation of extenuating circumstances that may have been a cause of impeded progress towards the degree.

Support beyond the sixth year will not be available except in very extreme situations.

o. SUMMARY OF SCHEDULE and DEADLINES

Item	**Schedule/Deadlines**
PhD Qualifying Exam	1st try: January, Year 2 2nd try: June, Year 2*
Proposal and First PhD Committee	Deadline: Last day of spring classes, Year 3* Meeting
Admission to Candidacy	Normally just after the 1st committee meeting. Deadline: Last day of spring classes, Year 3*
General Exam	Deadline: Last day of spring classes, Year 3*
YEARLY Committee Meetings	Once per year, beginning Year 4. Deadline: Last day of spring classes, each year*
YEARLY progress evaluation	April, following last day of class by physics faculty
Limit of support	Five years*

Failure to meet any of the above deadlines marked by an asterisk will result in loss of the registration privilege for the next registration period and/or forfeiture of support until the problem is corrected. Students not registered will not receive any form of financial aid and upon late registration will have to pay a late registration fee to the University. Students unable to meet deadlines for truly extenuating reasons may, of course, petition the faculty for a waiver of the rule.

APPENDIX A

BEST PRACTICES FOR DOCTORAL ADVISORS

Fundamental Commitment of the Advisor

- Commit to the education and development of the graduate student and fostering student development as a future member of the disciplinary community.

Communication with the Graduate Student

- Engage in clear and open communication with advisees regarding expectations such as work hours, vacation time, sick leave, how best and how often to communicate.
- If appropriate to the field, discuss authorship and other intellectual property issues with the student and work with them to publish work prior to graduation.

Academic Development

- Commit to the research project of the graduate student and help plan and direct the student's project by establishing a timeline, setting reasonable goals, and milestones.
- Help the student select a dissertation committee and facilitate meetings in order to review the student's progress.
- Strive to provide the student with access to the necessary financial resources according to institutional and departmental guidelines assuming adequate academic progress.
- Be knowledgeable about the requirements of the graduate program and the institution; guide the students through the process.
- Provide guidance, both encouragement and constructive criticism, in a timely fashion.
- Encourage the student's creativity, intellectual risk-taking, and critical thinking.

Professional Development

- Encourage students to attend professional meetings and strive to find travel funding.
- Write honest letters of recommendations, provide career advice, and assist with finding the student a position if possible.
- Provide opportunities for students to develop skill sets that support various career pathways.

Interpersonal Expectations

- Do not require the student to perform tasks unrelated to their training or professional development.
- Provide the graduate student with an environment that is respectful, emotionally supportive, safe, and free of harassment and bullying behavior.
- Respect appropriate boundaries of the advisor/advisee relationship.

Adapted from the *AAMC Compact between Biomedical Graduate Students and their Research Advisors (2016)*

LEARNING OUTCOMES OF MS and PhD PROGRAMS

The MS and PhD programs are designed to provide an academic education in physics at the graduate level. In order to contextualize the graduate education leading to this degree, the tables below outline the learning outcomes that we expect our students to achieve at the end of their time here, classified according to the five core competencies of academia defined by the Lehigh University Graduate Research Council (GRC).

Knowledge	● Students should have knowledge of the core fields within physics: mechanics, electromagnetism, quantum mechanics, thermodynamics, and modern physics (relativity, particle physics, nuclear physics), along with many of the related fields of application (condensed matter, biophysics, astrophysics, optics, etc.).
Application	● Students should know how to use analytical, experimental, mathematical, and numerical methods to solve physics problems, and qualitatively evaluate the results.
Context	● Students should be able to apply physical reasoning to real-world problems, and understand the relationship between physics and related fields such as engineering and mathematics. ● Students should have a basic grasp of the historical development of physics as a discipline.
Communication	● Students should be able to answer a physics exam question and respond with a clear, logical answer, showing intermediate steps of calculation and reasoning. ● Students should be able to write a paper describing a physics experiment or area of research, using clear language and proper terminology. They should be able to give a talk to an expert audience in their specialty between 15 and 60 minutes long, explaining their work and discussing its significance.
Leadership	● By the time students have received an MS, they should be able to describe how research projects are conducted, evaluated, and communicated. ● By the time students have received a PhD, they should be able to conceive of a research topic in physics, design an experiment or theoretical approach to address that topic, carry out the project, and report on the results in both an article suitable for peer review and in a seminar. ● Students should understand the structure of the physics profession, in terms of the path to being a professional scientist, the relationship between government, academia, and industry, and how funding is allocated. ● Students should have some experience in a professional physics organization (APS, AAS, OSA, etc.).

The following table lists each of the activities that are part of the physics graduate program, and identifies how each activity contributes to either the development (D) or assessment (A) of each of the core competencies, as interpreted in the table on the preceding page.

MS and PhD students					
	Knowledge	Application	Context	Communication	Leadership
Academic Courses	D, A	D, A	D, A	D, A	D, A
Subfield group meetings / seminars	D	D	D	D	D
491 Summer research	D, A	D, A	D, A		
Peer mentorship	D	D		D	D
TA position	D	D		D	D
Attending colloquiums	D	D	D	D	
Departmental service				D	D
PhD students, also available to MS students					
	Knowledge	Application	Context	Communication	Leadership
Writing journal articles	D, A	D, A		D, A	D, A
Conference presentations	D			D	D
Conference posters	D			D	D
Giving colloquiums / seminars	D			D	D
PhD students					
	Knowledge	Application	Context	Communication	Leadership
Written qualifier exams	A	A	A	A	
Oral qualifier exams	A	A	A	A	
Dissertation Proposal	D, A	D, A	D, A	D, A	D, A
General exam	D, A	D, A		A	A
Committee meetings	A	D, A	D, A	D, A	D, A

DISSERTATION COMMITTEE MEETINGS AND FORMS

The following pages contain a summary of dissertation committee meeting requirements, necessary official university forms, and templates for forms constructed by the student.

1) **Proposal:** Your first committee meeting is generally the one where you present your dissertation proposal. See following pages for a sample format of the proposal, which must include a title page, signature sheet, comments/suggestions/requirements sheet, grade sheet, and the proposal itself. After you successfully presented your proposal to your dissertation committee, you should send the original packet of documents to Alicia.

2) **General Exam:** Your second committee meeting is usually held soon after your proposal meeting and corresponds to your General Exam. Your advisor and dissertation committee will let you know (usually at or soon after your proposal meeting) what is the format and what is required for your General Exam. After your meeting where you have successfully passed your General Exam, you should fill out a "General Exam form" which can be found in the Doctoral graduation checklist on the College of Arts and Sciences Graduate Programs website:
https://cas.lehigh.edu/graduate/current-students/graduate-forms-resources

3) Once you have completed the Proposal, you should officially "**Apply for Candidacy**." The appropriate form is a powerform found in the Doctoral graduation checklist on the College of Arts and Sciences Graduate Programs website. Note, if you plan to have your General Exam within a few weeks of the Proposal, you may want to wait until after the General Exam to apply for candidacy.

4) **Annual Dissertation Committee Meetings:** After your Proposal and General Exam meetings, you are required to have at least one meeting of your dissertation committee each academic year (between the first day of class, Fall semester, and the last day of class, Spring semester). After each meeting, you should see Alicia to prepare the "Report on PhD Dissertation Committee Meeting" form to be sent to your committee members. A copy is provided in this Appendix.

5) **Final Examination:** After you have successfully defended your dissertation and have obtained approval for the final draft, you should submit all required final paperwork.
The "Dissertation Exam Form," the "Signature Sheet" indicating approval of the dissertation itself by your committee along with a list of all required final paperwork can be found in the Doctoral graduation checklist on the College of Arts and Sciences Graduate Programs website:
https://cas.lehigh.edu/graduate/current-students/graduate-forms-resources

PhD Proposal Template

The PhD thesis proposal should consist of the following items:

1) Title page: should include title of proposal, student's name, and date. See following page for suggested format. (Note: you are free to modify the suggested formats as long as you provide the same information.)
2) Signature page: See following for suggested format. Note that a legal dissertation committee must consist of a minimum number of four members. Three of these, including the committee chair, must be voting faculty members in the Department of Physics (one of the three, but not the committee chair, may be a departmentally approved adjunct faculty member, lecturer, or research scientist). The fourth committee member must be from outside the Physics Department (either from another Lehigh department or from outside the university). Additional committee members (beyond the required four) can also be included and are generally a good idea. In the Physics Department, the typical dissertation committee consists of four Physics faculty and one faculty member from another Lehigh department. This composition allows you to still have a legal committee if, for example, one member of the committee is unable to complete their service on the committee. You should also try to avoid selecting committee members who have to travel long distances to attend annual committee meetings. Committee members need to be informed that service on the committee generally requires attendance at on-campus meetings at least once per year for ~ 3-4 years.
3) Comments/Suggestions/Requirements page: See following for suggested format.
4) Program of study for the PhD: should include courses taken and future coursework. See following for suggested format. Note that the program of study should add up to at least 72 credits (including dissertation credits).
5) Narrative: should include description of proposed work, proposed timeline, and references.

Theoretical Studies of XXX

by

John J. Smith

Graduate Research Proposal

Presented to the Graduate and Research

Committee of Lehigh University

in Application for Candidacy for the Degree of

Doctor of Philosophy

in Physics

Lehigh

University

January 2018

Approved and recommended for acceptance as a proposal in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Physics

_____
Date

Committee Members:

_____
Dimitrios Vavylonis, Committee Chair

_____
Sera Cremonini

_____
Volkmar Dierolf

_____
Ivan Biaggio

_____
Anand Jagota

Comments/Suggestions/Requirements
(please continue on additional sheets if necessary)

Dimitrios Vavylonis, Committee Chair

Program for PhD – John J. Smith
Department of Physics, Lehigh University

- BS Physics: XYZ University, May 2016
- MS Physics: Lehigh University, January 2018
- Qualifying Exam: Passed, January 2018

Courses taken at Lehigh University	Credits	Grade
PHY 362 – Atomic and Molecular Structure	3	A
PHY 420 – Mechanics	3	B+
PHY 428 – Methods of Math Physics	3	B-
PHY 423 – Quantum Mechanics I	3	C+
PHY 421 – Electricity and Magnetism I	3	A-
PHY 442 – Statistical Mechanics	3	A
PHY 491 – Research	3	B+
PHY 422 – Electricity and Magnetism II	3	B
PHY 424 – Quantum Mechanics II	3	A
PHY 352 – Modern Optics	3	A-
PHY 363 – Physics of Solids	3	B-
etc.		

Current courses

PHY 332 – High Energy Astrophysics	3
PHY 364 – Nuclear and Elementary Particle Physics	3
PHY 499 – Dissertation	3

Future coursework

PHY 355 – Nonlinear optics	3
PHY 499 – Dissertation	27

Report on PhD Dissertation Committee Meeting

Student's Name _____

Date of Committee Meeting _____

Committee Members Present_____(Committee Chair)
(please sign)

_____

_____

_____

_____

_____

Recommendation of the Committee

- □ Committee meeting passed
- □ Committee meeting failed

Next Committee meeting should be scheduled for (date) _____

Comments, Recommendations, and Suggestions (please continue on additional sheets if necessary):