REQUIREMENTS FOR THE M.S. AND Ph.D. DEGREES
DEPARTMENT OF PHYSICS AND ASTRONOMY
UNIVERSITY OF PITTSBURGH

(Revised and Distributed: November, 15, 2017)

The requirements for the Master of Science (MS) and Doctor of Philosophy (PhD) degrees as described here supersede all previous versions. University requirements are described in detail in the University of Pittsburgh Graduate and Professional Bulletin, which is available under Bulletins/Courses at http://www.pitt.edu/~graduate/.

The graduate degrees offered by the Department of Physics and Astronomy are PhD in Physics (see Part A below) and MS in Physics (see Part B below).

Part A. THE PHD DEGREE IN PHYSICS

A.1 REQUIRED COURSES

Except for students on a directed study plan, each PhD candidate is normally expected to take the following physics courses for credit preferably in the first year of graduate study, but certainly within the first two years of graduate study. All incoming graduate students that do not test out of PHYS 2513 (Dynamical Systems), must enroll in Physics 2513 during their first year of study in the Department of Physics and Astronomy at the University of Pittsburgh.

Core Courses (3 credits each unless noted otherwise)

PHYS 2373 Mathematical Methods in Physics **(MUST TAKE IN FIRST YEAR)**
PHYS 2513 Dynamical Systems (**MUST TAKE IN FIRST YEAR**)
PHYS 2541 Statistical Mechanics & Thermodynamics
PHYS 2555 Classical Electricity & Magnetism (**4 credits**)
PHYS 2565 Non-relativistic Quantum Mechanics I
PHYS 2566 Non-relativistic Quantum Mechanics II

Courses Required for Acceptance to Candidacy:

PHYS 2997 Teaching of Physics (1 credit)
PHYS 2998 Teaching of Physics (or Astronomy) Practicum
PHYS 2999 Physics and Astronomy Colloquium

A minimum of 72 credits is required for the PhD degree, including any credits transferred. As part of these 72 credits, all students must take at least four advanced level (3000-level) graduate courses offered within our Department as described below in Section A.6.

A.2 ***POSSIBLE EXEMPTIONS FROM THE CORE PHYSICS COURSE***

Some incoming students may earn exemption from some or all of the core courses in one of the two ways specified in this section.

A.2.a ***WRITTEN ADVANCEMENT EXAMS FOR NEW PHD STUDENTS***

New graduate students, entering our program for the first time, may elect to take a written advancement exam in order to earn exemption from any (or all) of the six core physics courses. Each exam will be set at a level comparable to the level of the Comprehensive Examinations in each of the courses (see Section A.5) below. The exams will take place prior to the start of the fall semester each academic year. In order to earn exemption from a course and pass the Comprehensive Examination in that course, a student must earn a grade of 60% or higher in the examination. Any student earning a grade below 60% in an advancement exam will be required to take the corresponding course and pass the Comprehensive Examination in that course during their first academic year in the program.

The following rules shall apply to all advancement examinations.

1. Exams will be written, administered, and graded by a member of the faculty that has taught the relevant course within the 10 years immediately preceding the exam. This will be the faculty member that last taught the course unless unusual circumstances render this impossible.
2. Exam results will be final and will not be subject to appeal.
3. Students must notify the Department (via email to the Director of Graduate Studies and the Graduate Administrator) of their intent to take an advancement exam prior to 1 August of the year of their first entry into the graduate program.
4. Students attempting an advancement exam may not enroll in the undergraduate-level course in that same core subject area.
5. An attempt at a written advancement exam will be regarded as an attempt to pass the Comprehensive Examination in that subject (see Section A.5 below). Students may only attempt the Comprehensive Examination twice. Therefore, any student that fails to achieve the grade of 60% on the written advancement exam must pass the Comprehensive Examination in that course during the first academic year in the program. Failure to do so may result in termination from the PhD program in the Department of Physics and Astronomy at the University of Pittsburgh.

A.2.b *ORAL ADVANCEMENT EXAMS FOR STUDENTS ENTERING WITH A M.S. DEGREE IN PHYSICS OR ASTRONOMY*

New graduate students entering our program for the first time that have earned a M.S. degree in physics or astronomy may be eligible to take an oral examination to earn exemption from the core courses in physics and pass the Comprehensive Examination. In order to be eligible for an oral test out exam, the student must have earned an M.S. degree in physics or astronomy at another institution. The oral exam is designed to streamline the transition into PhD research for those students that have taken their M.S. coursework elsewhere.

The following rules shall apply to all oral advancement exams.

1. Only students with an M.S. degree may attempt an oral exam. In some cases, international students are admitted with a Bachelor's equivalency. This is typically a combination of a 3-year B.S. and a 2-year M.S. The Dietrich School does not recognize such degrees as M.S. degrees. A student with a Bachelor's equivalency is not eligible for the oral exam option.
2. Students intending to take an oral advancement exam must notify the Department (via email to the Director of Graduate Studies and the Graduate Administrator) of their intent to take an oral advancement exam prior to 1 August of the year of their first entry into the graduate program.
3. The oral exam will be administered by an ad hoc committee of three (3) faculty members who have taught one or more of the core subjects within the past ten years. Other faculty, not on the ad hoc committee, may sit in on the exam if desired. The exam will take place prior to the end of the second week of the fall semester, at a mutually agreeable time, and will not exceed two hours.
4. The ad hoc oral exam committee may recommend that the student pass any, or all, of the core physics courses. Such a recommendation will exempt the student from the course(s) and constitutes passing of the Comprehensive Examination(s) (See Section A.5 below) in the course(s).
5. The ad hoc oral exam committee may recommend that the student fail any, or all, of the core physics courses. Such a recommendation will require the student to enroll in the relevant course and to pass the Comprehensive Examination in that course during the first academic year in the program.
6. Oral advancement exam results are final and are not subject to appeal.
7. Students attempting an oral advancement exam may not enroll in the undergraduate

course in that same core subject area.

8. An attempt at an oral advancement exam will be regarded as an attempt to pass the Comprehensive Examination in that subject (see Section A.5 below). Students may only attempt the Comprehensive Examination twice. Therefore, any student that fails the oral advancement exam must pass the Comprehensive Examination in that course during the first academic year in the program. Failure to do so may result in termination from the PhD program in the Department of Physics and Astronomy at the University of Pittsburgh.

A.3 ***PRETESTS AND ADVISING; QPA REQUIREMENT***

The department requires that prior to the start of Fall classes the instructors for the first-year graduate core courses PHYS 2513, PHYS 2541, PHYS 2555, and PHYS 2565 test the incoming students on their mastery of the undergraduate physics prerequisites for these courses. This pre-test is used for **diagnostic purposes only** and does not bear on the standing of the student in the program. The student's academic advisor, in consultation with the core course instructor(s), may advise students who do not perform well on the pre-test(s) to enroll in the advanced undergraduate version(s) of the course(s) before taking the graduate-level core course(s) the following year. In exceptional cases in which the student's academic advisor deems the student to lack sufficient undergraduate background to be in a position to succeed in the graduate courses, the student's academic advisor may **require** the student to take the advanced undergraduate version of the course before taking the graduate version of the course in order to remain in good academic standing. This decision will be based on the student's performance on the diagnostic pre-test and an interview with the student and will be made in consultation with the core course instructor(s).

Graduate students must maintain a QPA of at least 3.00 for all required core courses and for all graduate courses overall. PHYS 1341, 1370, 1371, and 1372 are considered to be substitute core courses for the purpose of QPA calculations and are acceptable for satisfying a portion of the MS course requirement. (For QPA calculations letter grades are assigned the following values: D– = 0.75, D = 1.00, D+ = 1.25, C– = 1.75, C = 2.00, C+ = 2.25, B– = 2.75, B = 3.00, B+ = 3.25, A– = 3.75, A = 4.00, A^+ = 4.00.) The Graduate Bulletin describes the University's regulations regarding grades.

A.4 ***PRELIMINARY EVALUATION***

All graduate students must pass the "Preliminary Evaluation" at the end of their first academic year in the program. As outlined in the "Regulations Governing Graduate Study at the University of Pittsburgh," the decision whether or not a student has passed the Preliminary Evaluation is based on the student's performance in courses taken during the first two terms of study. A graduate student is deemed to have passed the Preliminary Evaluation if he/she has met the QPA requirement (QPA > 3.0) and has obtained final examination scores of at least **50%** in graduate-level (2000-level) courses or at least **75%** in the 1300-level, advanced undergraduate courses in each of the following core subject areas: Dynamical Systems, Statistical Mechanics, Quantum Mechanics, and Electricity and Magnetism. The same standard for final exam performance applies to those students who were exempted from the course. A graduate student who passes the Preliminary Evaluation is also considered to have passed the Comprehensive Examination for the MS degree and may apply for that degree as soon as all other requirements for the MS have been satisfied.

Review process: The Graduate Committee meets at the end of the Fall term to evaluate the course performance of the first-year students during their initial semester. If the Committee finds that a student has failed to perform adequately, it will propose remedial steps to be taken during the second term. The Graduate Committee reviews the performance of all first-year graduate students again at the end of the Spring term to determine whether or not they have passed the Preliminary Evaluation and possibly also the Comprehensive Examination. In making its decision in the event of an inadequate final examination score the Committee may consider all aspects of a student's academic record including other measures of competence. If the Committee concludes that a student has not passed the Preliminary Evaluation at the end of the first year, the Committee may grant that student a time extension of no more than one additional year; in that event the Committee will set specific conditions that the student must fulfill during that time. If the Committee determines that the student has not passed the preliminary evaluation and is not eligible to continue toward the M.S. or Ph.D. degrees, the student is entitled to appeal that decision. In order to appeal the decision, the student must submit a request in writing to the Graduate Committee to reconsider its evaluation within **two weeks** of receiving written notification of the decision of the Graduate Committee. The request must state specifically which decision is being appealed and give detailed reasons why the appeal should be considered. The Graduate Committee is **not** obligated to consider petitions received after this two-week period has expired and will consider such requests at its discretion.

A.5 ***COMPREHENSIVE EXAMINATION REQUIREMENT***

All doctoral students must pass the Comprehensive Examination by the end of their second academic year. As outlined in the "Regulations Governing Graduate Study at the University of Pittsburgh," the decision whether or not a student has met the criteria for passing the Comprehensive Examination is based on the student's performance on the final examinations in the six required graduate core courses listed in Section A.1. A graduate student is deemed to have passed the Comprehensive Examination if the student has met the QPA requirement (**QPA > 3.0** in all classes **and** in the core physics classes) **and** has obtained a final examination score of at least **60%** in each of the **six core courses**. As the Comprehensive Examination must be passed by the end of the second year, this means that each student gets two attempts to pass the Comprehensive Examination. The same standard for final examination grades applies to students who were exempted from the particular course.

Review process: During its meeting at the end of every Spring term, the Graduate Committee reviews in particular the performance of all second-year students who have not yet have passed the Comprehensive Examination. In making its decision in the event of an inadequate final examination score the Committee may consider all aspects of the student's academic record including other measures of competence. If the Graduate Committee concludes that a student has not passed the Comprehensive Examination by the two-year deadline, the Committee may grant that student a time extension of no more than one additional year; in that event the Committee may place the student on probation and it will set specific conditions that the student must fulfill during that time. The Committee will review that student's performance again at the end of that time extension to determine whether or not he/she has passed the Comprehensive Examination. If the Committee determines that the student has not passed and must leave the Ph.D. program, the student is entitled to appeal that decision by promptly submitting a written request along with a statement of the reasons. If the Committee determines that the student has not passed and must leave the Ph.D. program, the student is entitled to appeal that decision. In order to appeal the decision of the Graduate Committee, the student must submit a request in writing to the Graduate Committee to reconsider its evaluation within **two weeks** of receiving written notification of the Graduate Committee's. The request must state specifically which decision is being appealed and give detailed reasons why the appeal should be considered. The Graduate Committee is **not** obligated to consider petitions received after this two-week period has expired and will consider such requests at its discretion.

A.6 *ADVANCED TOPICS COURSES*

All students must take a minimum of four 3000-level physics courses offered in our Department to earn the PhD degree. A 3.0 GPA must be maintained in all 3000-level courses. The 3000-level courses currently being offered are listed below; there will be additions, substitutions, and special courses added to this list over time. The choice of courses should be made in consultation with the student's research advisor who may recommend or require additional courses. In special circumstances, these 3000-level requirements **may** be modified. Any and all modifications to the advanced course (3000-level) requirement is subject to the prior approval of the Graduate Committee and the Director of Graduate Studies. Additional curriculum recommendations may be found in Appendix II.

3000-Level Courses

3274 Computational Methods
3542 Advanced Statistical Mechanics
3580 Galactic and Extragalactic Astronomy
3705 Astronomical Techniques
3707 Intro to Many Body Physics
3715 Solid State Physics
3716 Advanced Solid State Physics
3717 Particle Physics
3718 Advanced Particle Physics
3725 General Relativity I
3726 General Relativity II
3750 Stellar Structure
3765 Field Theory 1
3766 Field Theory 2
3785 Cosmology

A **Directed-Study** (PHYS or ASTRON 3902) or **Directed-Research** (PHYS or ASTRON 3907) plan must be supervised by a faculty member. Registering for unsupervised **Independent Study** will be interpreted as registering to study for formal exams or simply to satisfy registration requirements as mandated in the student's individual contract of support.

Students supported with departmental Teaching, Research or Fellowship funds are expected to complete the core course requirements before taking optional or elective courses in other departments. Requests to register for courses outside of the department must be approved by both the student's academic advisor and the graduate director. Students supported by Research funds while completing degree requirements must also receive written approval from their research advisor in order to register for courses outside of the department. A copy of this approval must be provided to the Graduate Coordinator for the students records.

A.7 *RESEARCH AGREEMENT*

Within six months after receiving written notification of having passed the Comprehensive Examination each graduate student must file a completed Research Agreement which indicates that he/she has been accepted as a dissertation student by a research advisor. This form must be filed with the graduate coordinator in accordance with the procedures detailed in Appendix I. The research

advisor and the student are jointly responsible for following these procedures. Only graduate students who have a current executed Research Agreement on file may register for PHYS 3000 (dissertation research).

If the chosen research advisor is from another department within the University, a graduate faculty member of the Department of Physics and Astronomy must serve as the co-advisor. (See APPENDIX III)

A.8 *ADMISSION TO CANDIDACY*

A student who has passed the Comprehensive Examination, has satisfied the required teaching courses, and has submitted a completed Research Agreement should, in consultation with his or her research advisor, file an application for admission to candidacy for the Doctor of Philosophy (PhD) degree. All students must be admitted to candidacy at least eight months before the defense of their dissertation.

A.9 *THE DISSERTATION COMMITTEE*

Once the Research Agreement has been executed, the research advisor and the graduate student should discuss the membership of the student's Dissertation Committee, which must be finalized within eight months after the graduate student has received written notification of having passed the Comprehensive Examination. The composition of the Dissertation Committee must be as follows:

- It consists of five faculty members, at least four of whom must be members of the Graduate Faculty.
- Four of the Dissertation Committee Graduate Faculty members must hold a primary, joint, or secondary faculty appointment in the Department of Physics and Astronomy. This departmental core group must include the student's research advisor (or co-advisor, see Appendix III), who serves as Committee Chair, two other members who work in the same major research area (astrophysics/cosmology, condensed matter physics, particle physics, and physics education research) in which the dissertation research falls, and one member who works in a different major research area. One of the two other members working in the same major research area as the dissertation must be a theorist and the other an experimentalist; if that is not possible, then the group of three members other than the Chair must include both theoretical and experimental

expertise. (Since the Dissertation Committee of a student in the area of physics education research cannot meet all of these conditions, the student's research advisor should first consult with the Director of Graduate Studies and/or the Department Chair regarding the membership of the departmental core group.)

- The fifth member of the Dissertation Committee must be a faculty member with science expertise whose primary appointment is in a department other than Physics and Astronomy. (If this member is from outside the University of Pittsburgh, the proposed individual must be approved in advance by the Department Chair and the Assistant Dean of A&S Graduate Studies. Typically the Assistant Dean requests a current CV and a letter from the student's research advisor explaining the reason for proposing this individual. This proposed individual must have publications, supervised graduate student(s), and taught graduate course(s). Essentially the equivalent of our Graduate Faculty.

Special Requirements for External Committee Members from outside the University of Pittsburgh:

Faculty from outside the University of Pittsburgh may serve as external committee members, but the qualifications of the proposed committee member must be reviewed and their participation approved by the Assistant Dean for Graduate Studies **before** the dissertation proposal/prospectus/overview meeting or defense is scheduled. Such a request should be accompanied by the requested committee member's current C.V. and a brief memo that explains the benefits for the student of the participation of this faculty member on the committee. C.V.s for external committee members who have been approved previously by the Assistant Dean for a particular department's graduate students need only be resubmitted once every five years. In this case, however, the memo accompanying each request for an external member's participation in a new committee must also note the date on which the C.V. was last submitted for this individual. If the date is not known, a new C.V. must be included. Requests for external members must be approved by the Assistant Dean in advance of the requested member's participation on the doctoral committee. The Assistant Dean will review the material and either approve or reject the proposed external member.

Additional Committee Members

Additional members may be added to the doctoral committee in cases where additional expertise is needed. Such additional committee members are expected to have significant involvement with the

graduate student and to attend both the proposal/prospectus/overview meeting and the defense unless prior approval has been received for remote attendance. For additional committee members only, the Graduate Faculty status (or the equivalent at another institution) requirement may be waived if prior approval from the Assistant Dean is requested and granted. Such a request should be accompanied by a brief memo that explains the benefits for the student of the participation of this faculty member on the committee and, in the case of a member who is not from the University of Pittsburgh, a current C.V. The C.V. need only be provided every five years for committee members serving on multiple committees within the same department.

- Information about committee participation by former members or retired members of the University of Pittsburgh, please read here.
- Information about Remote Participation by Candidate and Committee member, Remote Attendance Requirements and Overview of Dietrich School of Arts and Sciences Committee Participation Rules, read here.
- In order to comply with the Graduate Program Assessment Matrix, Committee members complete an individual evaluation form at each doctoral committee meeting. (Appendix IV)

The first meeting of the Dissertation Committee must be held within twelve months after the student has received written notification of having passed the Comprehensive Examination. The University requires that the Committee meets with the student at least once every twelve months after that to assess his/her progress toward the PhD. The Committee has the authority to recommend or deny any extension of the statute of limitations, to require supplementary research, or the rewriting of any portion or all of the dissertation, among other actions, and shall conduct the final oral examination (dissertation defense). (Refer to Appendix I for further details regarding the function of Dissertation Committees.)

A.10 *TEACHING, THE TEACHING REQUIREMENT, AND PRESENTATIONS*

Teaching is an essential element of graduate education. As such, **all graduate students are required to serve as Teaching Assistants** for either two regular academic terms or one regular term plus one six-week summer session. Qualified teaching activities must include contact with students such as teaching in a laboratory course or as recitation instructor. In order to satisfy the teaching requirement, the teaching assistant must have student contact hours (as in a recitation) for at least one semester. The teaching requirement cannot be satisfied under any circumstances through

teaching responsibilities that consist entirely of grading (e.g., homework/exam/lab grading). Exemptions from the teaching requirements may be granted in special cases (for instance, if a graduate student can document substantial prior teaching experience). All graduate students should complete the teaching requirements within their first two years in the program in order to ensure that these requirements are met in a timely manner. The Director of Graduate Studies may approve exceptions; however, teaching assignments in subsequent years will be made based upon availability.

All graduate students should familiarize themselves with the University's Teaching Support (available through The University of Pittsburgh's Center for Teaching and Learning, teaching.pitt.edu) and the following departmental documents which may be found at the Department's web site under Graduate Program:

"Responsibilities of Teaching Assistants and Teaching Fellows"

"TA-Instructor Responsibilities Guidebook"

"Guidelines for Proctoring Exams"

"Resource Room Guidelines"

"Guidelines of Financial Support"

"Contractual Obligations"

Students will be graded on their teaching performances. A committee comprised of the Associate Chair of the Department, the Chair of the Graduate Admissions Committee, and the Director of Graduate Studies will determine teaching grades. Teaching grades will be based upon the recommendations of the professor/instructor in charge of the course(s) in which the teaching assistants are employed **and** the student reviews of TA performance. Credit toward fulfillment of the teaching requirement of the Department of Physics and Astronomy will only be awarded to teaching assistants that receive a teaching grade of **B or better** for the semester or summer session. Repeated, unexcused failure to show up for classes prepared and on time **alone** suffices for teaching assistants to earn a grade below the **B** threshold without regard to any other considerations of teaching performance. Failure to receive a grade of B or better suffices for the Graduate Committee to find the student to not be in good academic standing. The consequences of being in poor academic standing include forfeiture of any funding guarantees, especially through teaching support, made to the student as part of their admissions offer and, possibly, not being permitted to continue in the graduate program in the Department of Physics and Astronomy at the University of Pittsburgh. The Graduate Committee will review such cases individually to render a final decision on the academic status of any student that has not performed teaching duties at an acceptable level. All aspects of the

academic record of the student, especially past teaching performance, will be considered during the deliberations of the Graduate Committee. Teaching Assistants are notified and encouraged to review the results of the Teaching Evaluations at the end of the term.

Students that have exhibited exceptional teaching performance, as determined by the TA Grading Committee discussed in the previous paragraph, may be deemed, by the TA Grading Committee, to have satisfied their teaching requirement after only a single semester of teaching. In these cases, teaching assistant must have had considerable contact with students and cannot fulfill the teaching requirement if their responsibilities were exclusively grading activities. The decisions of the TA Grading Committee are final and are not subject to appeal.

Faculty supervisors are strongly encouraged to arrange for their graduate students to prepare and deliver a variety of presentations as they progress, from journal club discussions to informal talks at group meetings and formally announced departmental seminars. Advanced students should be encouraged to present results from their dissertation research at professional meetings.

A.11 *ELECTRONIC DISSERTATION*

Information about preparing the dissertation electronically may be found on the Graduate Studies webpage at http://www.pitt.edu/~graduate/dissertation.html.

A.12 *STATUTE OF LIMITATIONS*

All requirements for the PhD degree must be completed within a period of ten years from the student's initial registration, or within eight years if the student was admitted with a Masters degree.

Under exceptional circumstances a candidate may apply for an extension of the statute of limitations. The request form must be approved by the Graduate Committee (currently we have the DGS or Assoc. Chair approve such requests) and submitted to the dean for final action. Requests for an extension must be accompanied by a departmental assessment of the work still required of the student to complete the degree as well as documented evidence of the extenuating circumstances leading to the request for an extension. Students who request an extension of the statute of limitations must demonstrate proper preparation for the completion of all current degree requirements. Arts & Sciences does not extend the seven-year statute of limitations of the Comprehensive Examination for the PhD under any circumstances.

A.13 ***LANGUAGE***

There is no foreign language requirement, but the student must demonstrate English language proficiency in compliance with university policy as described in the University's Graduate Bulletin.

A.14 ***PETITION PROCEDURE***

The Graduate Committee consists of the academic advisors, the core course instructors, the admissions committee, the director of graduate studies, and the department chair. It, or an appropriate subcommittee, is empowered to make reasonable modifications to these requirements on a case-by-case basis in response to a petition by a graduate student. A committee meets to consider proposals for directed study or research, to receive petitions to modify or set aside rules, and/or to redress grievances.

Part B. THE MS DEGREE IN PHYSICS

Any student admitted to the MS or PhD program in Physics and Astronomy prior to Spring 2017 may earn a MS under the previous 24 credit guidelines. See the Graduate Administrator or Director of Graduate Studies for questions.

A minimum of 30 credits (3.0 GPA) is required for the MS for both thesis and non-thesis options. The student must be in compliance with all of the University's degree requirements. At least four physics courses (12 credits) at the graduate 2000-level must be completed with a grade of B (3.00). A 3000-level course can be substituted for one of these, but only with the Academic Advisor's approval. At most, up to 12 credits of 1300-level undergraduate coursework listed in the "Advising" section of this document as acceptable for graduate credit may also be used to satisfy the department's 30-credit requirement. No more than six credits of graduate work completed at another institution may be accepted by the Graduate Committee toward the completion of the residence requirement. Credits earned for PHYS 2997 and PHYS 2998 may not be used to satisfy this requirement. No more than two non-physics graduate-level courses, *approved in advance by the Director of Graduate Studies*, will be considered for credit for the MS degree.

B.1 COURSES:

There are three ways to earn an MS degree:

(1) Submit a thesis and complete at least six courses. Four courses must be at the 2000-level each with a grade of B or better. Courses and directed study/research credit must be accrued to reach the minimum 30 credit hours. Courses may include up to four 1300-level undergraduate classes and/or any number of 3000-level advanced graduate courses.

(2) Submit no thesis and complete at least eight courses. Courses and directed study/research credit must be accrued to reach the minimum 30 credit hours. Four courses must be at the 2000-level each with a grade of B or better. Courses needed to accrue the necessary credit hours may include no more than four 1300-level undergraduate classes and/or any number of 3000-level advanced graduate courses.

(3) Submit no thesis and complete at least six courses at the 2000-level or beyond. In order to accrue the requisite 30 credits for graduation, the student may engage in Directed Study, Directed Research, or take additional, approved courses at the 3000-level.

B.2 GRADES:

The candidate must maintain a GPA of at least 3.00 for all core courses and for all courses overall.

B.3 COMPREHENSIVE EXAMINATION:

The Comprehensive Examination for MS students is equivalent of the Preliminary Evaluation for PhD students. Refer to Section A.3, Preliminary Evaluation.

B.4 THESIS AND THESIS ORAL EXAMINATION:

A thesis for the MS degree must represent either an original research project or a significant survey of some topic of current interest in physics. A student should find it possible, while carrying some course work, to complete the MS thesis in one term. A copy of the final draft of the thesis must be submitted to the department chair, and copies of the thesis must be distributed to the members of the Master's Committee, a group of at least three members of the graduate faculty recommended by the professor guiding the student's research and approved by the department chair.

Information about preparing the thesis electronically may be found on the Graduate Studies webpage at http://www.pitt.edu/~graduate/dissertation.html.

A final oral thesis examination to determine the ability of the student to comprehend and to organize the materials of his or her field will be conducted by the Master's Committee. In addition to the content of the thesis, the examination may cover the subject matter of the courses taken.

B.5 STATUTE OF LIMITATIONS:

All requirements for the MS must be completed within a period of 4 calendar years from the student's initial registration for graduate study.

B.6 LANGUAGE:

There is no foreign language requirement, but the student must demonstrate English language proficiency in compliance with University policy.

B.7 PETITION PROCEDURE

The Graduate Committee consists of the academic advisors, the core course instructors, the admissions committee, the director of graduate studies, and the department chair. It, or an appropriate subcommittee, is empowered to make reasonable modifications to these requirements on a case-by-case basis in response to a petition by a graduate student. The Graduate Committee also meets to consider proposals for directed study, to receive petitions to modify or set aside rules, and/or to redress grievances.

APPENDIX I

NORMAL PROGRESSION BEYOND THE COMPREHENSIVE EXAMINATION

(Revised Version Approved by the Graduate Committee on Aug. 28, 2007)
(PK/DT clarifications Jan. 2009, PK/AL/DT clarifications July 2009)

The majority of the students admitted to our PhD program now satisfy all of the requirements for passing the Comprehensive Examination by the end of their first year. All of them must do so by the end of their second year. This Appendix describes in detail the benchmarks that our PhD students must achieve after passing the Comprehensive Examination and the time scale they are expected to adhere to in order to make satisfactory progress towards the completion of their degree objective.

1. Finding a Research Advisor:

It will generally take time to find a faculty member in the Department who does research in an area that is of interest to a particular graduate student, is willing to serve as that student's research advisor, and is able to support the student. Therefore all PhD students are urged to begin this search as soon as possible and certainly within the first or second month after their arrival. (If you want to request permission to perform your PhD research under the primary guidance of a faculty member outside the Department of Physics and Astronomy, please see Appendix III.)

The decision to work together on a significant research project represents a long-term commitment for both the faculty member and the graduate student and therefore should not be taken lightly. Thus it is standard practice for the faculty member to "try out" the student by assigning some kind of experimental or theoretical project. This trial period will also give the student the opportunity to discover what it is like to work with that faculty member in that specialty area. Graduate students are encouraged to begin research **as soon as possible** after arriving on campus, so long as this work does not compromise performance in the core graduate courses and the Comprehensive Examination. At minimum, all graduate students who complete the first two semesters in good standing should use the summer months following their first year as an opportunity for working in a research group on a trial basis. If necessary, they should continue to search actively for a research advisor during the early part of the fall term of their second year.

Many of our graduate students are supported by the Department through the first two academic years, typically as Teaching Assistants (TAs), enabling the faculty members to "try out" the students who are interested in working with them for a term without having to support them financially. But all graduate students are expected to be supported as a Graduate Student Researcher (GSR) by their research advisor beginning with the summer that follows their fourth semester in our program. Therefore any student who has not found a research advisor by that time is in danger of being **without financial support**.

2. Executing a Research Agreement:

As soon as a faculty member and a graduate student have reached a mutual agreement to work together as research advisor and dissertation student, this understanding must be formalized by the execution of a Research Agreement (Part A of the Post-Comps Progress Form which is available from the Department's graduate secretary). The upper section of Part A must be completed and signed by both the research advisor and the graduate student. **The graduate student is responsible for filing the completed Research Agreement with the graduate secretary within six (6) months after receiving written notification of having passed the Comprehensive Examination. Only graduate students who have a current executed Research Agreement on file may register for PHYS 3000 (dissertation research). Once 72 credits have been completed, these students must register for Full-time Dissertation Study (FTDB 3999 for 0 credits each term. These students are permitted to take an additional course or two, if the case presents itself, any term they are registered for FTDS.**

Once it has been executed, the Research Agreement should be regarded as binding on both parties. Should unforeseen circumstances arise subsequently that preclude a continuation of productive collaborative research work, the Research Agreement must be formally terminated using the lower section of Part A of the student's Post-Comps Progress Form; a reason must be given and all parties must sign. When a research advisor concludes that a Research Agreement needs to be terminated, it is very important that the affected graduate student be notified in writing as early as possible, especially if the student will lose financial support.

3. Forming a Dissertation Committee:

Soon after the Research Agreement has been executed, the research advisor and the graduate student should begin to discuss the membership of the student's Dissertation Committee. (See Section A.9 of the **Requirements for the MS and PhD Degrees** for the rules regarding the composition of Dissertation Committees.) When all members of the Dissertation Committee have been identified and contacted, and have indicated their willingness to serve, Part B of the graduate student's Post-Comps Progress form must be completed and submitted, along with any required supporting documentation, to the Department Chairperson for review and approval. **The graduate student is responsible for filing her/his PCP Form with Part B completed and approved with the departmental graduate secretary within eight (8) months after receiving written notification of having passed the Comprehensive Examination.**

If it becomes necessary subsequently to change the membership of a Dissertation Committee, a Change in Dissertation Committee form (available from the graduate administrator) must be filled out and submitted by the graduate student.

4. Dissertation Committee Meetings:

Collectively the members of a Dissertation Committee have two principal responsibilities: (1) they serve as a broadly knowledgeable review and advisory board for the purpose of assisting the dissertation research project to progress at a reasonable pace from its beginning stage all the way through to its completion; and (2) they help maintain departmental quality standards in the level of dissertation research.

The first meeting of a graduate student's Dissertation Committee must be held within twelve (12) months after the student received written notification of having passed the Comprehensive Examination. The graduate student is responsible for seeing to it that this is done. The research advisor must remind the student of this responsibility. At the first meeting of the Dissertation Committee the graduate student is expected to make a presentation which demonstrates that he/she has acquired an appropriate level of understanding of the physics concepts and the current state of knowledge in the specific research specialty area of the dissertation and, in that context, of the significance of the question that the dissertation research is setting out to answer. (The material presented by the student at this meeting could later be part of the introductory chapter of the dissertation.) The graduate student will also be expected to present a well-thought-out proposal of how the dissertation research is to be carried out. The proposal should include time estimates for achieving a series of clearly defined milestones that can be used in subsequent meetings to monitor the progress of the project. (The above scenario assumes that the student's dissertation research consists of a single extended project. In dissertations where this is not the case, the graduate student's presentation should be appropriately changed to reflect this difference.) At least one week prior to the meeting the graduate student must furnish each member of her/his Dissertation Committee with a brief written document (3-5 pages of text, not in power point "bullet" format) that summarizes the proposed research project, explains its significance, and provides milestones and time estimates for carrying it out; a copy of this document must also be given to the graduate secretary at that time for inclusion in the graduate student's file. **Within 7 days after the meeting each member of the Dissertation Committee must complete a "Member's Report of Dissertation Committee Meeting" (blue form) and transmit it to the Chair of the student's Dissertation Committee. Based on this input the Chair must then prepare a "Summary Report of Dissertation Committee Meeting" (green form) and use it as the basis of a follow-up meeting with the graduate student which must take place within 2 weeks of the Dissertation Committee meeting. The graduate student's signature on this Summary Report indicates that he/she has received a copy and has had the follow-up meeting with the Committee Chair. The research advisor is responsible for completing the appropriate section of the student's PCP form and returning it to the Department's graduate secretary along with the green form and all of the blue forms. (The PCP form and the green form will be placed in the student's file; all blue forms will be collected by the Department's graduate secretary for future statistical analysis by the Graduate Program Assessment Committee.) The graduate student is responsible for filing an application for Admission to Candidacy for the PhD degree with the Department's graduate secretary at that time.**

In order for a student's Dissertation Committee to be able to meet its mandate, the University of Pittsburgh requires that it is reconvened at least once every 12 months after the first meeting. The graduate student is responsible for seeing to it that this is done. The research advisor must remind the student of this responsibility. At each of these meetings the graduate student is expected to summarize the work that he/she has accomplished since the previous meeting, discuss any significant unanticipated difficulties that have been encountered, review the rate of progress in terms of milestones met and unmet, and identify goals and milestones for the year ahead. **At least one week prior to each meeting the graduate student must furnish each member of her/his Dissertation Committee with a brief written report on the progress of the research project (3-5 pages of text, not in power point "bullet" format) that highlights milestones achieved and problems encountered, discusses actions taken in response to any shortcomings identified by the Dissertation Committee in a prior meeting and, if appropriate, provides a revised set of goals and milestones for the project. The student should also use this write-up to inform the Committee of the titles and status of any papers submitted and of any research talks presented, both within the department and at scientific meetings; a copy of this document must also be given to the graduate secretary at that time for inclusion in the graduate student's file. Within 7 days after the meeting each member of the Dissertation Committee must complete a "Member's Report of Dissertation Committee Meeting" (blue form) and transmit it to the Chair of the student's Dissertation Committee. Based on this input the Chair must then prepare a "Summary Report of Dissertation Committee Meeting" (green form) and use it as the basis of a follow-up meeting with the graduate student which must take place within 2 weeks of the Dissertation Committee meeting. The graduate student's signature on this Summary Report indicates that he/she has received a copy and has had the follow-up meeting with the Committee Chair. The research advisor is responsible for completing the appropriate section of the student's PCP form and returning it to the Department's graduate secretary along with the green form and all of the blue forms. (The PCP form and the green form will be placed in the student's file; all blue forms will be collected by the Department's graduate secretary for future analysis by the Graduate Program Assessment Committee.)**

At the final meeting of the Dissertation Committee the graduate student reports on the completed dissertation project and is examined on the details of her/his work. In contrast to all of the preceding meetings, the date, time, and place of the dissertation defense must be publicly posted in advance and the meeting is open until the Dissertation Committee begins its final deliberation.

No written progress report needs to be prepared prior to the final meeting of the Dissertation Committee, but the graduate student must strictly adhere to the rule that **each member of the Dissertation Committee must be provided with a hard copy of the dissertation (complete with all indexes, chapters, figures, tables, equations, and appendixes) at least four (4) weeks in advance of the meeting date.** Likewise, neither the blue forms nor the green form need to be completed following the final meeting of the Dissertation Committee.

POST-COMPS PROGRESS FORM

Name of Graduate Student: _____

Graduate Study Initiation Date: _____ Date Passed Comprehensive Examination: _____

PART A: RESEARCH AGREEMENT

I, _____, hereby agree to serve as Research Advisor for _____

I expect to support this student financially: Yes / No If no, please explain _____

Area of Research: _____

Preliminary Title of Project: _____

Signature of Research Advisor_____ Date _____

Signature of Student_____ Date _____

Signature of Co-Advisor (if applicable) _____ Date _____

Signature of Dept. Chairperson_____ Date _____

TERMINATION OF RESEARCH AGREEMENT:

In the event that the above agreement is terminated, the advisor and student must complete this section.

Signature of Research Advisor_____ Date _____

Signature of Student_____ Date _____

Signature of Co-Advisor (if applicable) _____ Date _____

Reason for termination:

Signature of Dept. Chairperson _____ Date _____

PART B: PROPOSED DISSERTATION COMMITTEE

(Department Chairperson's Approval Required)

	Name	*Theorist or Experimentalist*	*Subfield of Physics*	*Department (if other than Physics and Astronomy)*
1				
2				
3				
4				
5				

Approved by Dept. Chairperson: _____Date:_____

FIRST MEETING OF DISSERTATION COMMITTEE

Meeting Date _____ Expected date of dissertation defense_____

Changes in Committee ? yes / no If yes, elaborate _____

Members Present_____

_____

Comments _____

_____

_____

Signature of Student _____ Date _____

Signature of Research Advisor _____ Date _____

Signature of Co-Advisor (if applicable) _____ Date _____

SECOND MEETING OF DISSERTATION COMMITTEE – DUE DATE _____

Meeting Date _____ Expected date of dissertation defense_____

Changes in Committee? yes / no If yes, elaborate _____

Members Present_____

_____

Comments _____

_____

_____

Signature of Student _____ Date _____

Signature of Research Advisor _____ Date _____

Signature of Co-Advisor (if applicable) _____ Date _____

THIRD MEETING OF DISSERTATION COMMITTEE –DUE DATE _____

Meeting Date _____ Expected date of dissertation defense_____

Changes in Committee? yes / no If yes, elaborate _____

Members Present_____

_____

Comments _____

_____

_____

Signature of Student _____ Date _____

Signature of Research Advisor _____ Date _____

Signature of Co-Advisor (if applicable) _____ Date _____

FOURTH MEETING OF DISSERTATION COMMITTEE – DUE DATE _____

Meeting Date _____ Expected date of dissertation defense_____

Changes in Committee ? yes / no If yes, elaborate _____

Members Present_____

_____

Comments _____

_____

_____

Signature of Student _____ Date _____

Signature of Research Advisor _____ Date _____

Signature of Co-Advisor (if applicable) _____ Date _____

FIFTH MEETING OF DISSERTATION COMMITTEE – DUE DATE _____

Meeting Date _____ Expected date of dissertation defense_____

Changes in Committee? yes / no If yes, elaborate _____

Members Present_____

_____

Comments _____

_____

_____

Signature of Student _____ Date _____

Signature of Research Advisor _____ Date _____

Signature of Co-Advisor (if applicable) _____ Date _____

FINAL MEETING OF DISSERTATION COMMITTEE (DEFENSE)

Meeting Date _____

Changes in Committee? yes / no If yes, elaborate _____

Members Present_____

_____

Comments _____

_____

_____

Signature of Student _____ Date _____

Signature of Research Advisor _____ Date _____

Signature of Co-Advisor (if applicable) _____ Date _____

APPENDIX II

Curriculum Recommendations by Research Specialty from the Graduate Curriculum Committee

University of Pittsburgh

Kenneth P. Dietrich School of Arts and Sciences
Graduate Studies Office

5141 Sennott Square
210 South Bouquet Street
Pittsburgh, PA 15260
412-624-6094
Fax: 412-624-6855

REQUEST FOR A CHANGE IN DOCTORAL DISSERTATION COMMITTEE

Student Name: _____ Peoplesoft #: _____

Address: _____ Apt. #: _____

City: _____ State: _____ Zip Code: _____

Department: _____ Pitt Email: _____

Major Advisor(s): _____

Requested Change(s) in Dissertation Committee:

_____

_____

_____

_____

_____

Reasons for Change(s):

_____

_____

_____

_____

_____

Student Signature: _____ Date: _____

Advisor Signature: _____ Date: _____

Department Chair Signature: _____ Date: _____

RETURN TO 5141 SENNONTT SQUARE WITH ALL RELEVANT PAPERWORK

University of Pittsburgh

Kenneth P. Dietrich School of Arts and Sciences
Department of Physics and Astronomy

Pittsburgh, PA 15260
412-624-9000
Fax: 412-624-9163
www.physicsandastronomy.pitt.edu

TO: Graduate Students, Graduate Student Advisors, and Other Department Faculty

FROM: David Turnshek, Department Chair

DATE: 25 August 2010

SUBJECT: Curriculum Recommendations from the Graduate Curriculum Committee (Tony Duncan, Committee Chair, David Jasnow, Rainer Johnsen, Arthur Kosowsky, Adam Leibovich, Vittorio Paolone)

During the last academic year (2009/2010) the department's Graduate Curriculum Committee provided me with curriculum recommendations for our graduate students according to eight different research specialties. This memo summarizes the Committee's recommendations. It is important for graduate students and advisors to be aware of these recommendations. By following these recommendations a student will become well-prepared for a future career in their chosen specialty area. In addition, within the various specialties, there are ample opportunities for students to take possible elective/special topics courses to further deepen their graduate education.

Another reason for this memo is to clarify, as much as possible, the schedule for offering courses, which can be confusing. Some recommended 3000-level courses are offered only every other year. Other 3000-level courses are shared with CMU, so students would have to put up with the minor inconvenience of making the short walk to CMU to take a particular course. With regard to courses offered at CMU, students should know that eventually the course will be offered in this department, but it is often not wise to wait for that to happen, and it is usually better for a student to take recommended courses on schedule. In addition to some courses, the Monday Colloquia and many seminars are also shared between the Pitt and CMU departments.

Example recommended schedules for eight research specialties are given for "first-year" students entering our graduate program in the fall 2010 term (i.e., the 2010/2011 academic year). For courses offered every other year, "second-year" students, who entered in the fall 2009 term, will have to adapt their schedules by substituting appropriate courses to take this year, etc. Please pay close attention to these recommendations.

The course schedule for each graduate student in the department is generally unique during their graduate career, and it is understood that it is often not possible to rigorously follow recommended schedules on a term-by-term basis. However, graduate students should understand that the role of graduate student advisors is to work with students to settle on an appropriate schedule each term, so that students can become proficient in their chosen specialties.

Department of Physics and Astronomy, University of Pittsburgh

Recommended Non-Core Graduate Courses for Department Specialty Areas

The following are **recommended** curricula for various sub-disciplines within the Department. It should be understood that individual students often implement curricula that are unique. Individual students should select courses in consultation with their thesis advisor and their thesis committee. In all cases, students must choose courses such that they satisfy the **requirement of at least 4, 3000-level, advanced courses in the Department of Physics and Astronomy** in order to earn the Ph.D. in Physics. Deviations from this requirement may be made in exceptional circumstances, but only with prior approval from The Graduate Committee and the Director of Graduate Studies. These recommendations are intended to serve as a basis for a course of study in each sub-discipline as well as a basis for discussions regarding course selection between student and advisor/committee. The following curricula are **recommendations** only and not **requirements**.

1 Areas of Research Specialization in the Department of Physics and Astronomy

1. Astronomy/Astrophysics/Cosmology.
2. Elementary Particle Experiment.
3. Elementary Particle Theory.
4. Condensed Matter/Nano Experiment.
5. Condensed Matter Experiment/Soft Condensed Matter.
6. Biophysics.
7. Condensed Matter Theory.
8. Physics Education.

2 Standard Post-Core 3000-level Courses in Physics and Astronomy

1. Astron 3550: Stellar Structure (co-listed as Phys 3550) – Spring of Odd Years
2. Astron 3580: Galactic & Extragalactic Astronomy (co-listed as Phys 3580) – Spring of Even Years
3. Astron 3705: Astronomical Techniques – Fall of Even Years
4. Astron 3785: Cosmology (co-listed as Phys 3785) – Fall of Odd Years
5. Phys 3540: Introduction to Astrophysics & Cosmology
6. Phys 3542: Advanced Statistical Physics – Spring of Even Years
7. Phys 3707: Introduction to Many-Body Physics – Fall of Even Years
8. Phys 3715: Solid State Physics

9. Phys 3716: Advanced Solid State Physics – Spring of Odd Years
10. Phys 3717: Particle Physics
11. Phys 3718: Advanced Particle Physics
12. Phys 3725: Introduction to General Relativity – Fall of Odd Years
13. Phys 3726: General Relativity 2 – Spring of Even Years
14. Phys 3730: Introduction to Biophysics
15. Phys 3765: Field Theory 1
16. Phys 3766: Field Theory 2
17. Phys 3790: Particle Astrophysics – Even Years

In addition, in two specialty areas (Biophysics and Physics Education) we recommend courses outside of the department. These courses are not on the above list. These courses cannot be substituted for courses within the Department of Physics and Astronomy without prior approval of the Director of Graduate Studies and the Graduate Committee.

3 Recommendations for Individual Research Areas

3.1 Area 1: Astronomy/Astrophysics/Cosmology

1. Astron 3550 (Stellar Structure)
2. Astron 3580 (Galactic & Extragalactic Astronomy)
3. Astron 3705 (Astronomical Techniques)
4. Astron 3785 (Cosmology)
5. Phys 3540 (Introduction to Astrophysics & Cosmology)
6. Phys 3725 (Introduction to General Relativity)
7. Phys 3790 (Particle Astrophysics)

3.2 Area 2: Elementary Particle Experiment

1. Phys 3717 (Particle Physics)
2. Phys 3718 (Advanced Particle Physics)
3. Phys 3765 (Field Theory 1)

and one of the following four courses:

1. Phys 3725 (Introduction to General Relativity)
2. Phys 3766 (Field Theory 2)
3. Phys 3785 (Cosmology)
4. Phys 3790 (Particle Astrophysics)

3.3 Area 3: Elementary Particle Theory

1. Phys 3717 (Particle Physics)
2. Phys 3718 (Advanced Particle Physics)
3. Phys 3725 (Introduction to General Relativity)
4. Phys 3726 (General Relativity 2)
5. Phys 3765 (Field Theory 1)
6. Phys 3766 (Field Theory 2)
7. Phys 3785 (Cosmology)
8. Phys 3790 (Particle Astrophysics)

3.4 Area 4: Condensed Matter/Nano Experiment

1. Phys 3542 (Advanced Statistical Physics)
2. Phys 3707(Introduction to Many-Body Physics)
3. Phys 3715 (Solid State Physics)
4. Phys 3716 (Advanced Solid State Physics)

and two of the following four courses:

1. Phys 3540 (Introduction to Astrophysics & Cosmology)
2. Phys 3717 (Particle Physics)
3. Phys 3725 (Introduction to General Relativity)
4. Phys 3730 (Introduction to Biophysics)

3.5 Area 5: Condensed Matter Experiment/Soft Condensed Matter

1. Phys 3542 (Advanced Statistical Physics)
2. Phys 3707 (Introduction to Many-Body Physics)
3. Phys 3715 (Solid State Physics)
4. Phys 3730 (Introduction to Biophysics)

and two of the following four courses:

1. Phys 3540 (Introduction to Astrophysics & Cosmology)
2. Phys 3716 (Advanced Solid State Physics)
3. Phys 3717 (Particle Physics)
4. Phys 3725 (Introduction to General Relativity)

3.6 Area 6: Biophysics

1. Phys 3542 (Advanced Statistical Physics)
2. Phys 3707 (Introduction to Many-Body Physics)
3. Phys 3715 (Solid State Physics)
4. Phys 3730 (Introduction to Biophysics)

and two of the following four courses:

1. Biosc 1290 (Genetic Engineering Lab) – usually offered in the spring
2. Biosc 1470 (Biological Chemistry) – usually offered in the spring
3. Biosc 1540 (Computational Biology) – usually offered in the fall
4. Biosc 1940 (Molecular Biology) – usually offered in the fall

3.7 Area 7: Condensed Matter Theory

1. Phys 3542 (Advanced Statistical Physics)
2. Phys 3707 (Introduction to Many-Body Physics)
3. Phys 3715 (Solid State Physics)
4. Phys 3716 (Advanced Solid State Physics)
5. Phys 3765 (Field Theory 1)
6. Phys 3766 (Field Theory 2)

and two of the following four courses:

1. Phys 3540 (Introduction to Astrophysics & Cosmology)
2. Phys 3717 (Particle Physics)
3. Phys 3725 (Introduction to General Relativity)
4. Phys 3730 (Introduction to Biophysics)

3.8 Area 8: Physics Education

Three of the following five courses:

1. Phys 3540 (Introduction to Astrophysics & Cosmology)
2. Phys 3542 (Advanced Statistical Physics)
3. Phys 3715 (Solid State Physics)
4. Phys 3717 (Particle Physics)
5. Phys 3730 (Introduction to Biophysics)

and two of the following three courses:

1. PsyEd 2019 (Stat2: Analysis of Variance)
2. PsyEd 2030 (Experimental Design)
3. Psy 2476 (Seminar in Cognitive Psychology)

Recommended Curriculum for a Specialization in Astronomy/Astrophysics/Cosmology[#]

Year 1 (Even Year, e.g. 2016/2017)	
Fall	**Spring**
Phys 2373: Math Methods in Physics (3 cr) Phys 2513: Dynamical Systems (3 cr) Phys 2565: Non-Rel Quantum Mech 1 (3 cr) Phys 2997: Teaching of Physics (1 cr) Phys 2999: Phys & Astron Colloq (1 cr)	Phys 2541: Thermo & Stat Mech (3 cr) Phys 2555: Adv Electricity & Magnetism (4 cr) Phys 2566: Non-Rel Quantum Mech 2 (3 cr) Phys 2999: Phys & Astron Colloq (1 cr)
Year 2 (Odd Year, courses noted with a * are offered every other year and might be taken in Year 3)	
Phys 2274: Computational Methods (3 cr) *Phys 3725: Intro to General Relativity (3 cr) *Astron 3580: Gal & Extragal Astron (3 cr)	Astron 2900: Research Internship (3 cr) *Astron 3785: Cosmology (3 cr) Phys 3540: Intro to Astrophysics & Cosmo (3 cr)
Year 3 (courses noted with a * are offered every other year and might be taken in Year 2)	
*Astron 3705: Astronomical Techniques (3 cr) *Phys 3790: Particle Astrophysics (3 cr) Astron 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3 cr)	*Astron 3550: Stellar Structure (3 cr) Optional Elective/Special Topics Course (3 cr) Astron 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 4	
Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Astron 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Astron 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 5	
Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)	Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)

#Two terms of Astron 2998 and/or Phys 2998 (Teaching Practicum) are required for graduation.

Recommended Curriculum for a Specialization in Elementary Particle Experiment[#]

Year 1 (Even Year, e.g. 2016/2017)	
Fall	**Spring**
Phys 2373: Math Methods in Physics (3 cr) Phys 2513: Dynamical Systems (3 cr) Phys 2565: Non-Rel Quantum Mech 1 (3 cr) Phys 2997: Teaching of Physics (1 cr) Phys 2999: Phys & Astron Colloq (1 cr)	Phys 2541: Thermo & Stat Mech (3 cr) Phys 2555: Adv Electricity & Magnetism (4 cr) Phys 2566: Non-Rel Quantum Mech 2 (3 cr) Phys 2999: Phys & Astron Colloq (1 cr)
Year 2 (Odd Year, e.g. 2017/2018)	
Phys 2274: Computational Methods (3 cr) Phys 3717: Particle Physics (3 cr) Phys 3765: Field Theory 1 (3 cr) Elective Courses (0-3 cr)+ (Phys 3725: Intro to General Relativity, Phys 3790: Particle Astrophysics, both offered in alternate yrs)	Phys 2900: Research Internship (3 cr) Phys 3718: Adv Particle Physics (3 cr) Elective Courses (0-3 cr)+ (Astron 3785: Cosmology, offered in alternate yrs, or Phys 3766: Field Theory 2)
Year 3	
Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 4	
Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 5	
Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)	Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)

#Two terms of Astron 2998 and/or Phys 2998 (Teaching Practicum) are required for graduation.
+At least one of four specific courses is recommended during a student's graduate career.

Recommended Curriculum for a Specialization in Elementary Particle Theory[#]

Year 1 (Even Year, e.g. 2016/2017)	
Fall	**Spring**
Phys 2373: Math Methods in Physics (3 cr) Phys 2513: Dynamical Systems (3 cr) Phys 2565: Non-Rel Quantum Mech 1 (3 cr) Phys 2997: Teaching of Physics (1 cr) Phys 2999: Phys & Astron Colloq (1 cr)	Phys 2541: Thermo & Stat Mech (3 cr) Phys 2555: Adv Electricity & Magnetism (4 cr) Phys 2566: Non-Rel Quantum Mech 2 (3 cr) Phys 2999: Phys & Astron Colloq (1 cr)
Year 2 (courses noted with a * are offered every other year and might be taken in Year 3)	
Phys 2274: Computational Methods (3 cr)§ Phys 3717: Particle Physics (3 cr) Phys 3765: Field Theory 1 (3 cr)	Phys 3718: Adv Particle Physics (3 cr) Phys 3766: Field Theory 2 (3 cr) *Astron 3785: Cosmology (3 cr)§
Year 3 (courses noted with a * are offered every other year and might be taken in Year 2)	
*Phys 3790: Particle Astrophysics (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3 cr)	Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 4 (courses noted with a * are offered every other year)	
*Phys 3725: Intro to General Relativity (3 cr) § Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	*Phys 3726: Adv Gen Relativity, if offered (3 cr)§ Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 5	
Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)	Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)

#Two terms of Astron 2998 and/or Phys 2998 (Teaching Practicum) are required for graduation.
§Depending on the students' experience and interests Phys 2274 (Comp Meth) and Astron 3785 (Cosmology) in Yr 2 might be switched with Phys 3725 (Intro to Gen Relativ.) and Phys 3726 (Adv Gen Relativ.) in Yr 4.

Recommended Curriculum for a Specialization in Condensed Matter/Nano Experiment[#]

Year 1 (Even Year, e.g., 2016/2017)	
Fall	**Spring**
Phys 2373: Math Methods in Physics (3 cr) Phys 2513: Dynamical Systems (3 cr) Phys 2565: Non-Rel Quantum Mech 1 (3 cr) Phys 2997: Teaching of Physics (1 cr) Phys 2999: Phys & Astron Colloq (1 cr)	Phys 2541: Thermo & Stat Mech (3 cr) Phys 2555: Adv Electricity & Magnetism (4 cr) Phys 2566: Non-Rel Quantum Mech 2 (3 cr) Phys 2999: Phys & Astron Colloq (1 cr)
Year 2 (courses noted with a * are offered every other year and might be taken in Year 3)	
Phys 2274: Computational Methods (3 cr) Phys 3707: Intro to Many-Body Physics (3 cr) Phys 3715: Solid State Physics (3 cr)	Phys 2900: Research Internship (3 cr) *Phys 3542: Adv Statistical Physics (3 cr) Elective Course (0-6 cr)+ (Phys 3730: Intro to Biophysics, Phys 3540: Intro to Astrophysics & Cosmology)
Year 3 (courses noted with a * are offered every other year and might be taken in Year 2)	
Elective Course (0-6 cr)+ (Phys 3725: Intro to General Relativity, offered in alternate yrs, Phys 3717: Particle Physics) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	*Phys 3716: Adv Solid State Physics (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 4	
Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 5	
Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)	Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)

#Two terms of Astron 2998 and/or Phys 2998 (Teaching Practicum) are required for graduation.

Recommended Curriculum for a Specialization in Condensed Matter Experiment/Soft Condensed Matter

Year 1 (Even Year, e.g., 2016/2017)	
Fall	**Spring**
Phys 2373: Math Methods in Physics (3 cr) Phys 2513: Dynamical Systems (3 cr) Phys 2565: Non-Rel Quantum Mech 1 (3 cr) Phys 2997: Teaching of Physics (1 cr) Phys 2999: Phys & Astron Colloq (1 cr)	Phys 2541: Thermo & Stat Mech (3 cr) Phys 2555: Adv Electricity & Magnetism (4 cr) Phys 2566: Non-Rel Quantum Mech 2 (3 cr) Phys 2999: Phys & Astron Colloq (1 cr)
Year 2 (courses noted with a * are offered every other year and might be taken in Year 3)	
Phys 2274: Computational Methods (3 cr) Phys 3707: Intro to Many-Body Physics (3 cr) Phys 3715: Solid State Physics (3 cr)	Phys 2900: Research Internship (3 cr) *Phys 3542: Adv Statistical Physics (3 cr) Phys 3730: Intro to Biophysics (3 cr)
Year 3	
Elective Courses (0-6 cr)+ (Phys 3725: Intro to General Relativity, offered in alternate yrs, Phys: 3717 Particle Physics) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	Elective Courses (0-6 cr)+ (Phys 3716: Adv Solid State Physics, offered in alternate yrs, Phys 3540: Intro to Astrophysics & Cosmology) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 4	
Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 5	
Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)	Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)

#Two terms of Astron 2998 and/or Phys 2998 (Teaching Practicum) are required for graduation.
+At least two of four specific courses are recommended during a student's graduate career.

Recommended Curriculum for a Specialization in Biophysics

Year 1 (Even Year, e.g., 2016/2017)	
Fall	**Spring**
Phys 2373: Math Methods in Physics (3 cr) Phys 2513: Dynamical Systems (3 cr) Phys 2565: Non-Rel Quantum Mech 1 (3 cr) Phys 2997: Teaching of Physics (1 cr) Phys 2999: Phys & Astron Colloq (1 cr)	Phys 2541: Thermo & Stat Mech (3 cr) Phys 2555: Adv Electricity & Magnetism (4 cr) Phys 2566: Non-Rel Quantum Mech 2 (3 cr) Phys 2999: Phys & Astron Colloq (1 cr)
Year 2 (**Odd Year, e.g., 2017/2018**, courses with a * are offered every other year and might be taken in Year 3)	
Phys 2274: Computational Methods (3 cr) Phys 3707: Intro to Many-Body Physics (3 cr) Phys 3715: Solid State Physics (3 cr)	Phys 2900: Research Internship (3 cr) *Phys 3542: Adv Statistical Physics (3 cr) Phys 3730: Intro to Biophysics (3 cr)
Year 3	
Elective Courses (0-6 cr)+ (Biosc 1540: Computational Biology, Biosc 1940: Molecular Biology) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	Elective Courses (0-6 cr)+ (Biosc 1290: Genetic Eng Lab, Biosc 1470: Biological Chemistry) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 4	
Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 5	
Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)	Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)

#Two terms of Astron 2998 and/or Phys 2998 (Teaching Practicum) are required for graduation.
+At least two of four specific courses are recommended during a student's graduate career.

Recommended Curriculum for a Specialization in Condensed Matter Theory

Year 1	
Fall	**Spring**
Phys 2373: Math Methods in Physics (3 cr) Phys 2513: Dynamical Systems (3 cr) Phys 2565: Non-Rel Quantum Mech 1 (3 cr) Phys 2997: Teaching of Physics (1 cr) Phys 2999: Phys & Astron Colloq (1 cr)	Phys 2541: Thermo & Stat Mech (3 cr) Phys 2555: Adv Electricity & Magnetism (4 cr) Phys 2566: Non-Rel Quantum Mech 2 (3 cr) Phys 2999: Phys & Astron Colloq (1 cr)
Year 2 (courses noted with a * are offered every other year and might be taken in Year 3)	
Phys 2274: Computational Methods (3 cr) Phys 3707: Intro to Many-Body Physics (3 cr) Phys 3715: Solid State Physics (3 cr)	Phys 2900: Research Internship (3 cr) *Phys 3542: Adv Statistical Physics (3 cr) Elective Course (0-6 cr)+ (Phys 3730: Intro to Biophysics, Phys 3540: Intro to Astrophysics & Cosmology)
Year 3 (courses noted with a * are offered every other year and might be taken in Year 2)	
Phys 3765: Field Theory 1 (3 cr) Elective Course (0-6 cr)+ (Phys 3725: Intro to General Relativity, offered in alternate yrs, Phys 3717: Particle Physics) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	*Phys. 3716: Adv. Solid State Physics (3 cr) Phys 3766: Field Theory 2 (3 cr) Optional Elective/Special Topics Course (3 cr) **OR** Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 4	
Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 5	
Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)	Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)

#Two terms of Astron 2998 and/or Phys 2998 (Teaching Practicum) are required for graduation.

Recommended Curriculum for a Specialization in Physics Education Research[#]

Year 1	
Fall	**Spring**
Phys 2373: Math Methods in Physics (3 cr) Phys 2513: Dynamical Systems (3 cr) Phys 2565: Non-Rel Quantum Mech 1 (3 cr) Phys 2997: Teaching of Physics (1 cr) Phys 2999: Phys & Astron Colloq (1 cr)	Phys 2541: Thermo & Stat Mech (3 cr) Phys 2555: Adv Electricity & Magnetism (4 cr) Phys 2566: Non-Rel Quantum Mech 2 (3 cr) Phys 2999: Phys & Astron Colloq (1 cr)
Year 2 (courses noted with a * are offered every other year and might be taken in Year 3)	
Phys 2274 Computational Methods (3 cr) Elective Courses (0-6 cr)+ (Phys 3717:Particle Phys, Phys 3715:Solid State Phys) Elective Course (3-6 cr)$ (Psy 2476: Seminar in Cognitive Psychology, PsyEd 2019: Analysis of Variance)	Phys 2900: Research Internship (3 cr) Elective Courses (0-9 cr)+ (Phys 3540: Intro to Astrophys & Cosmo, *Phys 3542: Adv Statistical Physics, Phys 3730: Intro to Biophys) Elective Course (0-3 cr)$ (PsyEd 2030: Experimental Design)
Year 3	
Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 4	
Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)	Optional Elective/Special Topics Course (3 cr) Optional Elective/Special Topics Course (3 cr) Phys 3900: Directed Study (3 cr) **OR** Phys 3000: Research & Dissertation (3-6 cr)
Year 5	
Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)	Phys 3000: Research & Dissertation (3-6 cr) **OR** FTDS (Full-time dissertation study)

#Two terms of Astron 2998 and/or Phys 2998 (Teaching Practicum) are required for graduation.

+At least three of five specific courses are recommended during a student's graduate career.

$At least two of thee specific courses are recommended during a student's graduate career.

APPENDIX III

TO: Faculty and Graduate Students

FROM: Chairperson, Department of Physics and Astronomy

DATE: Current

SUBJECT: PhD research conducted outside the department

This document replaces the previous statement on this subject published in December 2002.

The Department of Physics and Astronomy has faculty engaged in internationally recognized programs of research in a wide range of fields. Research activities are described in our brochure, on the departmental web site and through links to material maintained by our individual faculty members and/or groups. Graduate students can also learn about current research activities through the "research talks" which take place during the academic year.

Students entering our program, after completing their "core" education requirements, are expected to find a research advisor within the department and to form a graduate committee to guide their PhD research. The graduate advisor has prime responsibility for mentoring the student and supervising the research. The chairperson of the department as well as the Associate Dean for Graduate Studies must both approve the selection of all graduate thesis committees.

In rare occasions a student, to satisfy specific research goals or interests, may request permission to perform PhD research under the primary guidance of a faculty member outside the Department of Physics and Astronomy. The chairperson of the Department of Physics and Astronomy will consider such requests on a case-by-case basis in consultation with the Director of the department's graduate program and others. Below are some guidelines the chairperson may use in deciding whether or not to approve the formation of a particular thesis committee when the primary research advisor is not in the Department of Physics and Astronomy.

GUIDELINES

- The "primary" research advisor from another department or school within the University will serve as co-chair of the thesis committee. He or she must be a member of the graduate faculty, must have substantial training in graduate-level physics or astronomy, and must have a record of physics or astronomy related research activities.

- A member of the graduate faculty within the Department of Physics and Astronomy must agree to serve as co-chair of the thesis committee.

- It is essential that the departmental co-chair of the thesis committee takes an active interest and commits to active participation and, ideally, collaboration in the research project.

- Thesis committees will not be approved if the departmental co-chair acts merely as a "formal" advisor without active involvement.

- The department chairperson may limit the number of students working outside the department if, in his or her judgment, a further increase is inconsistent with the research goals of the department.

- The "primary" research advisor takes primary responsibility for the financial support of the student. Any GSR contract should conform to university policies described at http://www.pitt.edu/~graduate/gsr.html. Before signing, it is the student's responsibility to bring a copy to the graduate secretary in the Department of Physics and Astronomy to initiate the appropriate review.

PROCEDURES

- A graduate student wishing to conduct his or her PhD research under the supervision of a primary advisor outside the department should inform the Graduate Secretary as soon as possible of intentions. After discussions with the respective faculty members, the student should identify the proposed primary advisor from outside the department and the proposed co-advisor from within the Department of Physics and Astronomy. The student will be informed in writing if there are potential problems based on the guidelines above.

- In consultation with the primary advisor and the departmental co-chair, the student must submit a written proposal describing the nature of his or her anticipated PhD research as soon as possible, but no later than 4 months after the beginning of an arrangement for joint supervision. A provisional thesis committee must approve the proposed research as suitable for a PhD issuing from the Department of Physics and Astronomy. The primary advisor may be requested to submit a CV and list of publications.

- It will be expected that the primary advisor and the departmental co-chair submit a brief statement outlining the plan for advising and mentoring the student and the nature of the anticipated research collaboration.

(original document December of 2002: updated 2004)

APPENDIX IV

SUMMARY REPORT OF DISSERTATION COMMITTEE MEETING

Name of Graduate Student: _____Meeting Date:_____

Dissertation Topic: _____

Meeting Number: 1 2 3 4 5 6 Expected date of dissertation defense (MM/YYYY):____/_____

Name of Dissertation Committee Chair: _____

The Dissertation Committee rated your performance as follows, on a scale of 1 (very low) to 5 (very high):	
1. Did the student display an appropriate general understanding of how the dissertation topic addresses broader physics questions?	1 2 3 4 5
2. Did the student display an appropriately detailed understanding of the physics (experiment and theory) involved in the dissertation topic?	1 2 3 4 5
3. Did the student display appropriate mastery of the technical skills (theoretical, experimental, computational) needed to carry out this project?	1 2 3 4 5
4. Was the student's progress on the dissertation project consistent with the Goals/milestones stated at the previous meeting? (Skip for 1st meeting)	1 2 3 4 5
5. Did the student display appropriate oral communication skills in her/his presentation during the meeting?	1 2 3 4 5
6. Did the student display appropriate written communication skills in the materials he/she prepared for this meeting?	1 2 3 4 5
7. Additional comments/concerns expressed by the Committee regarding your progress (use back if needed):	
8. Specific items/issues identified by the Committee that you need to address before the next meeting: 9. Is it possible that the <u>next committee meeting</u> can be the thesis defense? *(Note: if more than 1 committee member answers "no" to this question, another committee meeting must take place prior to the defense.)*	

Signature of Committee Chair: _____Date _____

Signature of Graduate Student: _____Date _____

(Q 9 added January of 2013)

MEMBER'S REPORT OF DISSERTATION COMMITTEE MEETING

Name of Committee Member: _____Chair? YES NO

Name of Graduate Student: _____Meeting Date:_____

Dissertation Topic: _____

Meeting Number: 1 2 3 4 5 6 Expected date of dissertation defense (MM/YYYY):____/_____

Rate the student's performance in the following five categories on a scale of 1 (very low) to 5 (very high):	
1. Did the student display an appropriate general understanding of how the dissertation topic addresses broader physics questions?	1 2 3 4 5
2. Did the student display an appropriately detailed understanding of the physics (experiment and theory) involved in the dissertation topic?	1 2 3 4 5
3. Did the student display appropriate mastery of the technical skills (theoretical, experimental, computational) needed to carry out this project?	1 2 3 4 5
4. How do you rate the student's progress on the dissertation project relative t the goals/milestones stated at the previous meeting? (Skip for 1st meeting)	1 2 3 4 5
5. How do you rate the student's oral communication skills as displayed during this meeting?	1 2 3 4 5
6. How do you rate the student's written communication skills as displayed in the materials the student prepared for this meeting?	1 2 3 4 5
7. If you have additional comments/concerns regarding the student's progress, express them here:	
8. If you think the student should address certain items/issues before the next meeting, specify them here: 9. Is it possible that the <u>next committee meeting</u> can be the thesis defense? *(Note: if more than 1 committee member answers "no" to this question, another committee meeting must take place prior to the defense.)*	

Signature of Committee Member: _____Date _____

Q9 – added January 2013