

# Graduate Manual

## NIU Department of Physics

April 2021

This manual covers procedures and guidelines for graduate students in the Department of Physics at Northern Illinois University. It is a supplement to the physics section of the Graduate Catalog.

### I. Course Offerings

#### A. Core

PHYS 600 Classical Mechanics – every fall  
PHYS 660 Quantum Mechanics I – every fall  
PHYS 661 Quantum Mechanics II – every spring  
PHYS 663 Statistical Physics – usually every spring  
PHYS 670 Electromagnetic Theory I – every spring  
PHYS 671 Electromagnetic Theory II – every fall

#### B. Distribution (below are likely scenarios, subject to change)

PHYS 666 Solid State Physics I – usually every year  
PHYS 667 Solid State Physics II – every other year as needed  
PHYS 673 Beam Physics I – at least every other year  
PHYS 680 Introduction to Nanophysics – usually every year  
PHYS 683 Beam Physics II – every other year as needed  
PHYS 684 Introduction to High Energy Physics – at least every other year  
PHYS 686 Phenomenology of Particle Physics – every third year  
PHYS 790 Special Topics in Physics – many times each year

Other courses will be offered when appropriate with the distribution courses listed above scheduled more regularly. The PHYS 790 sequence are special topics courses covering (A) condensed matter physics, (B) particle physics, (C) nanophysics, (D) beams physics, and (E) other topics such as medical physics. PHYS 790 can be taken more than once.

Course requirements for different programs are given in the Graduate Catalog. To meet the Ph.D. requirements, a student must take at least five out of the six core courses noted in the list

above. A Ph.D. student is also required to take at least 12 hours of distribution courses from those listed above and others at or above the 600 level that have been approved by his or her thesis advisor. This can include up to 9 hours in courses from engineering, biology, chemistry or geology. The course requirements for the specialization in nanoscience are a subset with the core course requirement essentially the same (660, 661, 663, 670, and either 600 or 671). For the distribution, 680 is required and then three from (PHYS 600, PHYS 666, PHYS 667, PHYS 671, PHYS 768, PHYS 790A, CHEM 600, CHEM 644, CHEM 645, MEE 611, MEE 634, MEE 650, MEE 692). The courses for the M.S. specialization in Applied Physics have also been changed. They now require three from (530, 563, 574, 575, 580, 680, 790) and two from (600, 660, 663, 666, 673).

## II. Assistantships

Students accepted into the program without a Master's degree and offered a full-time assistantship by the department will receive two academic years (9 months each) of support from the department provided they remain in good standing. Summer support is typically provided through research assistantships funded through individual faculty support. A limited amount of summer support is sometimes available through departmental funds. Students entering with a Master's degree in physics need to establish a research program during their first year. A second year of departmental support may be offered only if it is strongly recommended by the research advisor.

Support beyond the first two years is usually provided by research assistantships through the student's thesis advisor. A limited amount of departmental support will sometimes be available for the third year and beyond. A request for such support must be made by a student's advisor. There are also non-departmental sources of funding with the Graduate School providing some information on where a student (and their advisor) can apply.

Research assistant support is primarily left to the discretion of the student's advisor and the availability of funding. However, a student must remain in good standing within the department to receive RA support.

Most students receive full-time assistantships. The graduate school lists both TAs and RAs as 20 hour/week appointments. In the case of TAs, their TA-related responsibilities will be 20 hours per week or less leaving the remainder of their time to their own course work and research. For RAs, the combination of course work and research is their full-time responsibility. In general, students with full-time assistantships should not have additional employment. Any additional NIU employment will need to be approved by both the graduate school and department. It is the student's responsibility to inform the department about employment outside NIU and work with the department on how best to accommodate this. The usual procedure will be a reduction in the TA or RA appointment.

## III. Master's and Ph.D. examinations

Two graduate examinations are administered by the department. Study guides including previous exams are on the department's web page. Calculators will be provided for the Master's exam but are not allowed for the Ph.D. exam. No other electronic devices of any sort are allowed for either

exam and a student possessing one will have their exam be disqualified. Such devices should be given to the exam proctor prior to taking the exam.

A *Master's proficiency examination* (also called the *Master's comprehensive examination* or the *Ph.D. qualifying examination*) is required for all students in the Master's program, and for all students in the Ph.D. program who have not received a Master's degree in physics. The department will administer an examination at least once per year, and typically twice per year. The student may substitute an outstanding performance (the present standard is 50th percentile or higher, but may be adjusted in the future) on the GRE physics subject examination, taken either prior to NIU or while at NIU, for the departmental Master's proficiency exam. Students in the physics teaching emphasis may substitute course work in a related science for one area on the examination.

Graduate School regulations allow only two attempts to pass this examination. However, examinations taken during the student's first year are considered by the department to be "practice" and a failing score does not count against the two attempts, but a passing grade can be awarded. A full-time student is required to pass the examination within their first two years in the program.

A *Ph.D. candidacy examination* (also called the *preliminary examination*) is required for all students in the Ph.D. program. The department will typically administer an examination twice a year. The examination consists of four sections: classical mechanics, quantum mechanics, electricity and magnetism, and modern and statistical physics. A collection of previous exam is listed on the department's web page, and practicing these previous questions is the best way to study and prepare for the exams. A student may take the examination as many times as it is offered during the time periods described below. Full-time students entering the program without a Master's degree in physics are first required to pass the Master's proficiency examination before the end of their second year in the program and are then required to pass the Ph.D. candidacy examination before the end of their third year in the program. Full-time students entering the program with a Master's degree in physics do not have to take the Master's proficiency examination, but are required to take the Ph.D. candidacy examination during their first year, and pass it before the end of their second year in the program. Students with a Master's degree in a related field enrolled in the Ph.D. program follow the same regulations as those entering with a Bachelor's degree in physics and are required to take the Master's proficiency examination unless they receive a waiver from the department.

Full-time students who have not passed the relevant examinations during the time periods described above may only take the examinations in succeeding years if they have written permission from the Chair of the department or Director of Graduate Studies. Part-time students must pass the same examinations but the requirements for how long they are given to do this are handled on an individual basis.

#### IV. Advising and Thesis Advisor

All incoming students have as their initial advisor the current Director of Graduate Studies. Each student should try and find their own advisor as soon as possible, ideally by their second semester in the department. This advisor should be the person the student wants to primarily work with while a student in physics at NIU. The advisor can give guidance on both course selection and how

a student should proceed to complete the other aspects of his/her degree.

All courses have prerequisites and it is primarily the student's responsibility to be sure they have the background to take a particular course. If they are uncertain, they can discuss this with a professor who has recently taught the course (or look at their web pages), their advisor, the department chair, or the Director of Graduate Studies. Students who are lacking some undergraduate physics skills may need to take PHYS 383, 300 and 370 without receiving graduate credit.

## V. Program of Courses and Degree Completion

A program of courses does not need to be submitted to the graduate school and a student can see their progress to degree completion on MyNIU. However it is strongly recommended that a student confer with the Director of Graduate Studies prior to the end of their second semester at NIU for students in the Master's program, and upon the completion of the core courses for Ph.D. students. If a student wishes to substitute for required courses, this can occasionally be allowed with permission of the Physics Director of Graduate Studies and the graduate school.

Students planning on completing their degrees should contact the department office a semester prior to the anticipated graduation term and obtain a list of the items needed for this. Requests for graduation must be made to the Graduate School a semester prior to graduation.

## VI. Ph.D. Committees

Master's and Ph.D. degree candidates have a Dissertation Committee appointed at the time of their thesis defense per the regulations in the Graduate Catalog. In addition, Ph.D. students will have a Ph.D. Progress Review Committee to monitor their progress leading up to the dissertation.

All full-time students entering the Ph.D. program with a Master's in physics are required to have identified a thesis advisor by the end of their second year in the program. Those entering without a Master's degree must do the same by the end of the third year.

Within one year of the date that a student has both identified an advisor and passed the Ph.D. Candidacy Exam, the student must have the initial progress review performed by a Ph.D. Progress Review Committee chosen by the student and his advisor. The subject of the initial review should include a plan of the proposed thesis research. If this committee has not been formed, the DGS will not sign off on any necessary registration for the student. The Ph.D. Progress Review Committee is responsible for monitoring the progress of the student, and will conduct further reviews of the student's progress at least once within every one year time period thereafter. This committee will consist of the advisor and at least two other faculty members. If the advisor is not a full-time tenured or tenure-track faculty member in the NIU Physics department, then at least one other member of the committee must be. The composition of the Ph.D. Progress Review Committee must be approved by the Physics department. Note that the student's Dissertation Committee for the final thesis defense may be the same, but has the stronger requirement of including at least three graduate faculty members, as required by the catalog. The mode of the progress reviews is to be decided between the Ph.D. Progress Review Committee and the student, but will typically entail a presentation by the student and questions from the committee. After each review, the

committee will submit a short report to the department, with copies to the student and his/her advisor. The report will include an assessment of progress as either satisfactory or unsatisfactory, goals to be achieved before the next review, and, optionally, recommendations. If the committee review concludes that progress has been unsatisfactory, a second review will be scheduled to take place within 6 months.

## VII. Good Standing

A student's standing in the department of Physics is determined using the standards of the Graduate School supplemented by departmental requirements. A student must be in good standing within the department in order to receive teaching or research assistantship. It is not used for any other purpose. The following criteria are used to determine if a student is in good standing.

- The Graduate School will place a student on probation if their GPA falls below 3.00 and have one term (9 credit hours) to raise their GPA to 3.00 or be academically dismissed. The department of Physics has the same 3.00 requirement for graduate courses taken in physics with a similar one semester period should it fall below 3.00. Students who do not raise their physics GPA to 3.00 after nine credit hours will lose their good standing.
- To maintain good standing in the department, a full-time student must satisfy all the applicable requirements on taking and passing the relevant proficiency, qualifying, and candidacy examinations, as described in Section III. above.
- For Ph.D. students only, a determination by the student's Ph.D. Progress Review Committee of two consecutive unsatisfactory progress reviews, or a failure to complete a review within any one year time period after having identified an advisor and passed the Ph.D. candidacy exam, will result in the student losing her/his good standing status. In such an event, the student will be given a written explanation from the Ph.D. Progress Review Committee and be allowed to respond either in writing or in a meeting (or both) within a one month period. A final determination that a student is not in good standing status must be agreed upon by the student's Ph.D. Progress Review Committee, the department Chair, and the Director of Graduate Studies.
- Students taking courses outside the department without approval can lose their good standing in the department if it is found to be detrimental to their progress in the degree program.

## VIII. Courses Outside the Department

Students may take courses outside the department, but must obtain approval from their thesis advisor and the Director of Graduate Studies before doing so.

## IX. Departmental Colloquium

Students in the M.S. program are required to take PHYS 798, Physics Seminar, each semester (as an audit after the first semester) unless they receive written waiver from the department. All Ph.D. students are required to register for PHYS 798 for two semesters. A passing grade is given for attendance of at least 75% of the semester's colloquia.

## X. Course Load

The Graduate School's policy on academic load is described in the graduate catalog. The normal full-time load for graduate students is 9-12 credit hours for the academic year and six hours for the summer. Students with a TA or RA appointment must register for this or receive permission as described below for an underload. Students without a TA or RA may register for fewer hours with permission. Students wishing to register for more hours need the department's approval for an overload.

International students are required to register for nine hours during the academic year except for the semester they are graduating. They are allowed to reduce their summer enrollment in the same manner as domestic students. See the graduate catalog for additional information. Domestic students may reduce their load as described below.

Students taking only research credits in the summer may reduce their load to 1-3 credits with departmental permission. After obtaining at least 18 credit hours at NIU, students may reduce their load to six credits for the Fall or Spring term with the department's permission.

Any reduction to lower than six credits for the Fall or Spring term or three credits for the summer term requires the permission of both the department and the graduate school. Students must submit requests for this to the department prior to the start of the semester. Summer underloads will be approved by the department upon condition of having a clear path towards obtaining the necessary credits. Otherwise, students graduating in a given term may request to take only one credit of PHYS 699/799 in that term provided she/he has satisfied all other requirements or has a path to doing so. For both Ph.D. and M.S. students, once they have 90 credits including transfer credits, they may reduce their load to one credit of PHYS 699 or PHYS 799 per term. It is always up to the graduate school to approve such requests. Note that consent of the department is a prerequisite for both PHYS 699 and PHYS 799.