

University of South Dakota

Department of Physics - Ph.D. Program Handbook

2019-2020 Academic Year

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2. Introduction

The university catalog contains general information concerning the graduate education, the Physics Ph.D. Program, graduate degree requirements, and detailed listings of graduate courses. All graduate students should familiarize themselves with pertinent information contained in the catalog. This handbook lists departmental requirements that are in addition to requirements set by the Graduate School. The following guide describes specific requirements of the Physics Ph.D. Program and is intended to supplement the catalog information. All Ph.D. students in this program should carefully study the guide and become familiar with the requirements described herein.

3. Graduate Student Advisor and Program Coordination

The Physics Graduate Coordinator serves as faculty advisor to each new Ph.D. graduate student until a student selects an advisor to supervise their graduate research. The student must select an advisor that is a professor in their department. The Graduate Coordinator will assist all new graduate students with course registration and provides each student with information about the Ph.D. program. In case a student needs to change advisor, the Graduate Coordinator will also serve as their temporary faculty advisor until a new advisor is identified.

4. Teaching Assistantships

Each student is required to serve as a Teaching Assistant (TA) for a minimum of two semesters at a full TA load. A full TA load is typically about 20 hours per week and is defined by the Graduate School as the equivalent of one course per semester, which would translate to assuming full responsibility for two or three laboratory sections of either introductory physics or introductory astronomy per semester.

The primary purposes of a TA position are to provide students with professional experience and the necessary financial resources to attend a graduate program. The TA workload is split between paid work and educational experience. The compensable portion of the Teaching Assistant position, or any graduate assistant position, may not exceed 19 hours per week during the fall and spring semesters (.5 FTE). Therefore, a TA may not report more than 19 hours of work per week in SNAP. Any additional TA work is part of a student's educational experience.

Teaching is a valuable part of a student's graduate education. All students are required to complete a minimum of two semesters as a graduate assistant with a full assistantship load by teaching a lab, course, or by grading. However, with the permission of the graduate committee, a student may serve as a TA at a reduced load for a longer period of time. For example, a student may serve as a TA for 4 semesters at half load (10 hours per week) and receive the rest of her/his stipend from research funds, or receive a reduced stipend during that period. Students must coordinate their research work load with their advisor while a graduate teaching assistant.

Extended Personal Leave

Graduate students responsible for teaching courses are expected to be present and engaged during the fall and spring semesters from one week before the start of the semester until one week following the end of the semester. Graduate students engaged solely in research are expected to be fully engaged in research during the entire time they are paid. During the summer, graduate students are generally report labor on a daily basis; a graduate student wishing to take extended time off should not expect to be paid during their absence.

5. General Program of Study Requirements

The general requirements for Ph.D. degree in physics are:

1. File an initial Program of Study within the first year of study in coordination with your research advisor. In the event that a student does not yet have a research advisor, the Program of Study is filed in coordination with the Graduate Program Coordinator.
2. Satisfactory completion of a Qualifying Exam and a Comprehensive Exam.
3. After completing the Comprehensive Exam, file an updated Program of Study in coordination with your Research Advisor.
4. Completion of all [required Ph.D. coursework](#) at a level that satisfies [USD's academic standards](#).

5. Completion of at least two consecutive semesters as a full-time student.
6. Completion of the TA requirements outlined in [Section 4](#).
7. A dissertation that represents results that are original and relevant to the field of study, and that are publishable in a peer-reviewed publication.
8. Successful oral defense of the student's dissertation.

6. Program of Study

Ph.D. students must file a proposed Program of Study that includes a list of courses the student intends to take. Necessary training for special skills that are needed for the student to fulfill research goals must be indicated and explained. The first Program of Study must be filed with the Graduate Coordinator and then the Office of Graduate Education during the first year of study, and at least once again (after approval by the student's thesis advisor) no later than one month after completion of the Comprehensive Exam. This Program of Study must be given preliminary approval before the Qualifying Examination and final approval before the dissertation defense by the student's dissertation committee, the Physics Ph.D. Program Advisory Council, and the Dean of Graduate Education.

In approving a proposed Program of Study, the Physics Graduate Coordinator will take into account acceptable graduate-level courses taken by the student at other institutions or other demonstrations of competence in a particular area. The student should summarize any previous relevant material, and submit it along with their Program of Study for review. The Program of Study form can be found at the [Graduate School's list of Course/Program Forms](#).

7. Selection of Research Topic

All new students are encouraged to make appointments with faculty in the Department of Physics to discuss possible research topics for their degree project and whether they would be a good fit to join a specific research group as early as possible.

After the research topic is decided, each student should match with an advisor in accordance with the interests of both sides and determine a research topic. Following the guidelines from the graduate school, a dissertation committee, consisting of the advisor and four other faculty members, must be formed to guide the student progress. The dissertation committee must include:

1. At least one professor from the student's home department that is not their advisor
2. At least one professor from the physics department of USD or SDSMT that is not at the same institution as the student (e.g. a USD student must have at least one physics professor from SDSM&T on their committee)
3. At least one professor from the student's institution that is not in the physics department
4. At least one professor, or person of equivalent rank, that is considered an expert in the proposed dissertation topic; it is recommended that this expert be from outside of the

state of South Dakota and that this expert will be chosen after discussion between the student and their advisor.

8. Qualifying and Comprehensive Examinations

Students are required to pass a **Qualifying Exam** that tests their general knowledge in physics as well as a **Comprehensive Exam** that tests their general knowledge of physics, their specific knowledge of the literature in the proposed field of study, and the strength of their dissertation proposal (originality and feasibility). The two exams and their requirements are described in further detail below:

1) **Qualifying Examination:** This exam will be given once a year during the week before the fall semester starts. Students entering the Ph.D. program with a Bachelor's degree are expected to take the Qualifying exam prior to the start of their third year. Students entering with a Master's degree are expected to take it prior to the start of their second year. However, those wishing to take it earlier are encouraged to do so. Students are eligible for a Free Try at the Qualifying Exam as they enter the program and before they begin their first graduate course in the program. The Qualifying Examination consists of three sections. Each three-hour section of the Qualifying Examination covers one of the following three major subjects:

- Classical Mechanics/Thermodynamics/Statistical Physics
- Electromagnetism
- Quantum Mechanics/Nuclear and Particle Physics

A student may obtain a pass, fail, or partial pass on the examination. A partial pass is awarded upon satisfactory performance in less than all three subjects. In the case of a partial pass on the first attempt on the examination, the student may be given the opportunity to re-take the next available Qualifying Exam and complete only the subjects that were not passed. Failing to attempt to pass one of the subjects in the exam, is considered a fail for that subject. Upon a fail or partial pass, the qualifying examination may be repeated the following year, only once, and at the discretion of the graduate committee. In special cases, a student may be advised to terminate the program after only one qualifying exam. The Free Try is designed to help students understand the expectations of the Qualifying Exam and does not count as a student's first attempt at the Qualifying Exam. A student may partially or fully pass the Qualifying Exam on the Free Try.

2) **Comprehensive Examination:** Students must take the comprehensive exam within one year after they pass the Qualifying Exam. The Comprehensive Exam requires that the student submit a **written research proposal** and complete an **oral presentation** of that proposal in the presence of the student's full dissertation committee. The topic of the proposal is to be prepared by the student with the guidance of their advisor. This topic must be related to the student's anticipated dissertation research. Both the research proposal and the presentation must be in clear, concise written and oral English.

The research proposal must be a product of the student, not that of the advisor or the student's dissertation committee. It should be no more than 40 double-spaced, typewritten pages of text, including nomenclature, references, figures, and appendices. It is recommended that the proposal be organized in the form shown in the Appendix of this handbook.

The research proposal must be reviewed by at least two members of the student's dissertation committee before submission to the full committee. The committee members may help the student by pointing out any problems relating to scope and format. However, the final approval of the proposal will only come after the subsequent oral presentation and a vote by all members of the dissertation committee.

The oral presentation should reflect closely the contents of the written proposal and should last no longer than 40-50 minutes without interruptions. The majority of the presentation should be a detailed description of the student's proposed research program. The originality and potential significance of the proposed research should be emphasized. The oral presentation is open to other faculty, researchers, students and guests.

It is intended that students take the Comprehensive Exam only once. In case of failure on the first try, a student may be given a chance to redo the comprehensive exam, at the discretion of the dissertation committee. The Comprehensive Exam must still be finished before one year has elapsed from the successful completion of the Qualifying Exam. Students failing the Comprehensive Exam will be asked to withdraw from the Ph.D. program and may, at the discretion of their dissertation committee, be eligible for an M.S. degree as described in Section 11. In exceptional circumstances, a student's research advisor can petition in writing for an extension for a student to complete the comprehensive exam, subject to the approval of both the Graduate Coordinator and Department Chair.

Copies of the final written research proposal must be submitted at the same time to the student's full dissertation committee and the Graduate Program Coordinator at least two weeks prior to the oral examination. A date will be set for the oral presentation by the student consulting his/her dissertation committee members and with the Graduate Program Coordinator. Following the oral presentation, the student will be expected to respond to questions from the attending faculty, students and guests. Those questions may extend into a broad range of topics to assess the student's breadth of knowledge.

Advancement to Candidacy

A student who has successfully completed the Comprehensive Exam will have made sufficient progress in their graduate studies to be considered to have Advanced to Candidacy and has earned the title of "PhD Candidate" or "Doctoral Candidate". Note: some external grants are available only to students who have Advanced to Candidacy.

9. Dissertation

The student's research and the resulting dissertation are of major importance in the awarding of a Ph.D. The written research results are expected to be of publishable quality. The student's advisor may specifically require publication of one or more peer-reviewed journal articles based on the student's research results. The time necessary to complete the Ph.D. requirements will necessarily depend on the student's effort in their research. Instructions concerning the dissertation and the time schedule that must be followed during the semester of intended completion of the Ph.D. requirements are given in the graduate catalog.

Information on guidelines for writing and formatting a Doctoral Dissertation are available from the Office of Graduate Education. Student should obtain a free copy of "Instruction for the Preparation of Thesis and Dissertation" from the Office of Graduate Education. All students are expected to follow the guidelines in the manual. [The Graduate School provides resources for writing your dissertation at this link.](#) The final version of the dissertation must be submitted by the candidate to each member of his/her dissertation committee no later than three weeks before the scheduled dissertation defense date. Students are encouraged to provide a final copy of their thesis to their dissertation committee as early as possible. Students are encouraged to provide copies of their thesis to their advisor as early as possible.

10. Defense of Dissertation

The student will be required to give an oral presentation (40-50 minutes) on the major findings of his/her research. An oral examination will follow the presentation and questions from the public. It will be conducted by the student's advisor with only the student's dissertation committee members in attendance. The student's dissertation committee members will question the student to test both the quality and completeness of the research and the student's mastery of the her/his thesis topic. Upon successful completion of the dissertation defense and incorporation recommended dissertation changes, the student will both file a Graduation Approval Form and submit the thesis to ProQuest. Submission of the thesis to ProQuest is required for graduation.

11. Master of Science Degree

The physics Ph.D. program is designed with the premise that the Ph.D. is the terminal degree for completion of the program. However, under circumstances in which a student either fails the Qualifying Exam, Comprehensive Exam, or cannot complete the research and dissertation portion of the Ph.D. program, but has obtained a minimum of 32 credit hours of coursework and research in physics, either a non-thesis Masters of Science (MS) or a thesis MS may be conferred.

During a Ph.D. student's studies, she/he will complete a sufficient number of credits to be eligible for a [Plan B Master's degree](#). The Plan B Master's degree requires fewer (32) credits

from a similar selection of courses than the Ph.D. The department strongly encourages students to talk with their advisor or the Graduate Coordinator about taking advantage of this opportunity to obtain to obtain an advanced physics degree before completion of their Ph.D.

12. Standard of Conduct

The University of South Dakota and the Graduate Program strive to foster a positive environment that enables all students to have their best opportunity for a successful and positive graduate experience. Students are expected to be courteous and respectful to other students, faculty and other members of the USD community. The Graduate Program expects students to at a minimum abide by the University of South Dakota's [Code of Student Conduct](#). In addition, graduate students are training and working within the community of professional physicists and are expected to adhere to the [Ethics and Values of the physics community as stated by the American Physical Society](#).

Appendix A - Recommended Outline for the Written Portion of the Research Proposal

The written proposal should be no longer than 40 double-spaced, typewritten pages of text, including nomenclature, references, figures, and appendices.

1. Cover page
2. Summary including:
 - 2.1 Research objectives
 - 2.2 Significance of the proposed research
 - 2.3 Student's original contributions
3. Literature survey including:
 - 3.1 The general literature in the field
 - 3.2 Specific literature on the proposed topic
 - 3.3 Up-to-date status in the field
4. Proposed research program, including:
 - 4.1 Research objectives
 - 4.2 Expected significance
 - 4.3 Broad design of experiments and/or modeling to be undertaken
 - 4.4 Description of proposed experimental and/or numerical methods
 - 4.5 Relation of the proposed program to the goals of the research cited in the literature survey
5. Extension of the research to future work
6. A clear and concise statement of the student's original contributions
 - 6.1 Work scope on experiment, analysis, calculation, data, simulation and service
 - 6.2 Schedule for completion of research
 - 6.3 Expected conference presentations and journal publications
7. Nomenclature

8. References
9. Appendices (if necessary)
 - A-1. Copy of the reference most pertinent to the proposed research program
 - A-2. Other relevant materials