Department of Physics
306 Oceanography/Physics Bldg.
(757) 683-3468
http://www.odu.edu/physics

Charles I. Sukenik, Chair
Leposava Vuskovic, Graduate Program Director

The Department of Physics offers programs of study leading to both the M.S. degree in physics and the Ph.D. degree in physics. Primary focus is placed on the Ph.D. program, and most students enrolled for graduate study are enrolled in that program. Students have the opportunity to perform research in state-of-the-art facilities under faculty direction. Graduates are prepared for research at the highest levels in academia, government laboratories, and corporate laboratories.

Admission

Applicants for admission to graduate study must have an earned bachelor's degree in physics or a closely related discipline from an accredited institution or an equivalent degree from a foreign institution. The applicant is normally required to have a minimum cumulative grade point average of 3.0 on a 4.0 scale. In addition, the general portion of the Graduate Record Examination (GRE) is required for application to either the master’s or the doctoral program; applicants to the doctoral program are strongly encouraged to take the GRE specialized physics test as well. The Test of English as a Second Language (TOEFL) is required of all nonnative speakers of English who have resided in the U.S. for less than ten years.

It is normally expected that most incoming graduate students will be supported as teaching assistants. Old Dominion University requires that all graduate teaching assistants who do not speak English as a first language pass a test of spoken English.

Admission decisions are based on undergraduate achievement, GRE scores, and personal reference letters. Graduate study may commence at the beginning of any academic term. Decisions regarding financial support for students entering in the fall term are normally made by April 15, so a student’s completed application must be received by January 15. Anyone who applies after January 15 should communicate directly with the Department of Physics concerning the availability of support.

Master of Science - Physics

Requirements

A student may select either the thesis or non-thesis option. For either option, each student’s course of study must have the advance approval of the graduate program director.

Non-Thesis Option

Thirty graduate credits that must include the following courses:

- PHYS 556  Intermediate Quantum Mechanics  3
- or PHYS 621  Quantum Mechanics I  3
- PHYS 603  Classical Mechanics  3
- PHYS 604  Classical Electrodynamics I  3
- PHYS 697  Seminar  1

No more than 12 credits numbered at the 500 level may be used to meet this requirement.

Up to 12 credits from other University departments may be used to meet this requirement if approved by the graduate program director.

Written Comprehensive Examination

In addition to these course requirements, the candidate must pass a written comprehensive examination. It is usually taken just before the student’s third semester of study. If a student fails this examination, he or she is allowed a second attempt, which must be at the time when the Written Exam is next given. In all but the most extraordinary circumstances, a student will not be allowed any additional attempts to pass this examination. Normally, this written examination is the same as the written portion of the Ph.D. Candidacy Examination, graded at the master’s level.

Foreign language requirement

None.

Thesis Option

Thirty graduate credits that must include the following courses:

- PHYS 556  Intermediate Quantum Mechanics  3
- or PHYS 621  Quantum Mechanics I  3
- PHYS 603  Classical Mechanics  3
- PHYS 604  Classical Electrodynamics I  3
- PHYS 697  Seminar  1
- PHYS 698  Research  3
- PHYS 699  Research  3

No more than 12 credits numbered at the 500 level may be used to meet this requirement.

Up to 12 credits from other university departments may be used to meet this requirement if approved by the graduate program director.

Doctor of Philosophy - Physics

Requirements

The broad requirements for the Ph.D. degree are

1. satisfactory performance in a designated core of graduate courses,
2. successful completion of the Ph.D. Candidacy Examination, which has both written and oral parts,
3. successful completion of a teaching requirement, and
4. satisfactory completion of a dissertation.

Each student’s course of study must have the advance approval of the graduate program director.

Course Requirements

Seventy-eight graduate credits beyond the undergraduate degree or 48 graduate credits beyond the master’s degree must be taken and must include the following courses:

- PHYS 601  Mathematical Methods in Physics  3
- PHYS 603  Classical Mechanics  3
- PHYS 604  Classical Electrodynamics I  3
- PHYS 621  Quantum Mechanics I  3
- PHYS 697  Seminar  1
- PHYS 804  Classical Electrodynamics II  3
- PHYS 807  Statistical Mechanics  3
- PHYS 811  Computational Physics  3
- PHYS 821  Quantum Mechanics II  3
- PHYS 831  Advanced Seminar I  1
- PHYS 832  Advanced Seminar II  1

A minimum of six additional credits for specialized full-semester courses at the 800 level must be taken. A student may waive or substitute for any of these courses with the approval of the graduate program director.

Up to 12 credits from other university departments may be used to meet this requirement if approved by the graduate program director. A student may waive PHYS 832, with the approval of the graduate program director, if he or she presents a paper at a scientific meeting. Before formation of his or her dissertation committee, a student is formally advised about these courses and other academic matters by graduate faculty advisors. There is no foreign language requirement.

Ph.D. Candidacy Examination

A student admitted to the Ph.D. program in physics becomes a bona fide candidate for the Ph.D. degree by passing the Ph.D. Candidacy Examination.
The purpose of this comprehensive examination is to determine if a student has the foundation and maturity to begin research in physics. A student who does not pass the Ph.D. Candidacy Examination within the allowed number of attempts explained below will be dismissed from the Ph.D. program. However, that student would still have the opportunity to satisfy the requirements for the M.S. degree in physics.

The Ph.D. Candidacy Examination consists of two parts—the Written Examination and the Oral Examination. Each part must be passed independently in order to pass the Ph.D. Candidacy Examination.

Written Examination
The written examination is given two times each year—in late August and early January. A student admitted to the Ph.D. program must take this examination by the beginning of his or her third semester of graduate study. In circumstances such that the student has not had the appropriate courses to meet this deadline, he or she may petition the Graduate Program Committee for an extension. If a student fails this examination, he or she is allowed a second attempt, which must be at the time when the Written Examination is next given. In all but the most extraordinary circumstances, a student is dismissed from the Ph.D. program after failing the written examination twice.

Oral Examination
The Oral Examination is a one-hour presentation given by a student to an oral examination committee (normally consisting of his or her dissertation committee, minus the external member), meeting in closed session, normally on a topic relevant to the student’s dissertation research. This presentation must be made within one year after a student passes the written examination. A request for extension of the deadline must be made in writing to the Graduate Program Committee.

A student’s dissertation advisor, in consultation with the student, may choose from two possible formats for this presentation:
1. a presentation by the student directly on his or her dissertation research or
2. a presentation on a specific topic that the student has been assigned to investigate for several months.

For either option, the student must write a short paper of 10 or fewer pages on his or her presentation topic and give it to all members of the oral examining committee at least two weeks before the scheduled date of the examination. The committee will determine whether the student passes or fails the oral examination. More than one negative vote from the examining committee will result in failure. A student who fails the oral examination will be allowed a second attempt. The student’s dissertation advisor will decide the format and timing of such a second attempt, with the provision that the second attempt must be completed within six months of the first attempt.

Teaching Requirement
Each candidate for the Ph.D. degree must earn a minimum of four teaching credits, which are defined in the following way:

- One such credit is awarded for teaching a one-hour recitation for one semester in the Department of Physics, and
- two such credits are awarded for teaching a one-semester laboratory course in the Department of Physics.

The graduate program director may approve the substitution of an equivalent amount of teaching experience in the Department of Physics for this requirement.

Dissertation
The dissertation is the final and most important requirement that must be completed by a candidate for the Ph.D. degree in physics. It must be based on original research in physics that makes a contribution to existing knowledge and be of sufficient quality and interest to merit publication in a refereed physics journal. Research that is classified by the U. S. Government (in a way that restricts its distribution) is not a suitable basis for a dissertation, as one essential characteristic of a dissertation is that its contents must be disseminated freely.

The candidate’s dissertation research is supervised generally by his or her dissertation committee. Close supervision is provided by the candidate’s research advisor, who is a member of the dissertation committee and may be a tenured, tenure-track, research, or adjunct member of the graduate-certified faculty of the Department of Physics. If the research advisor is a tenured or tenure-track member of the faculty, he or she is the chair of the candidate’s dissertation committee. If the research advisor is an adjunct or research faculty member, a tenured or tenure-track graduate-certified faculty member must serve as co-advisor and also serve as chair of the dissertation committee. The dissertation committee is composed of five members, a majority of whom must be tenured or tenure-track members of the graduate-certified faculty of the Department of Physics and one of whom must be a tenured or tenure-track faculty member of the graduate-certified faculty in a department of Old Dominion University other than the Department of Physics. It is the responsibility of the research advisor and the candidate to nominate prospective members for the dissertation committee to the graduate program director, who must formally approve the membership of the dissertation committee.

The format of the dissertation is specified by the Guide for Preparation of Theses and Dissertations, and variations allowed within the Department of Physics are specified by the graduate program director.

Dissertation Defense
The final examination that a candidate must pass in order to receive the Ph.D. is an oral examination by the dissertation committee based on the candidate’s public presentation of the results contained in his or her dissertation. This defense is conducted in two phases:

1. a public presentation in front of the dissertation committee that is open to any person who may wish to attend and direct relevant questions to the candidate and
2. a closed session between the candidate and the dissertation committee in which the candidate is questioned further by that committee.

The dissertation committee determines by majority vote whether the candidate passes or fails this final oral defense. If the candidate fails, he or she is allowed only one additional attempt to pass at a later time.

Applied Physics Endorsement
Students that are interested in the Applied Physics Endorsement should contact the graduate program director for more information.