

# DOCTOR OF PHILOSOPHY IN NATURAL SCIENCES: PHYSICS

## Student Learning Outcomes

Students graduating from this program will:

- Demonstrate a thorough degree of knowledge in the disciplines
- Demonstrate an ability to use proper investigation techniques for the disciplines
- Use oral and written forms of communication to convey their ideas

## Program Structure

**Total Credits Required for Graduation: 42\***

**Residency requirements:** Ph.D. students must satisfy the doctoral residency requirement by satisfactory completion of at least 18 credits in no more than 24 consecutive months. When satisfying the residency requirement, all Ph.D. students are subject to the following restrictions:

- The doctoral residency requirement must be satisfied no later than the end of the semester in which the student completes his or her comprehensive examinations.
- Students must achieve a cumulative graduate grade-point average of at least 3.0 in all courses counted toward satisfying the residency requirement.

\* *Specific disciplines may require more credit hours for graduation. See discipline specific coursework requirements for more information on total credit hours required for graduation.*

## Program Requirements

The coursework requirements encompass:

- A minimum of 12 credit hours of coursework within the primary area, accompanied by at least 12 dissertation hours. The primary disciplines retain the flexibility to potentially request more than the minimum credit hours.
- A minimum of 9 credit hours within a secondary discipline area, with the secondary discipline also having the option to specify additional credit hours beyond the minimum.
- A minimum of 30 classroom credits is required beyond the baccalaureate, including fundamental and advanced courses along with seminars.
- Any primary area discipline can be combined with any secondary area discipline.

## Participating Disciplines

Participating disciplines encompass a range of fields, including:

- Biomedical and Health Informatics
- Cell Biology and Biophysics
- Chemistry
- Geosciences
- Mathematics
- Molecular Biology and Biochemistry
- Oral and Craniofacial Sciences
- Pharmaceutical Science
- Pharmacology
- Physics

## Student Learning Outcomes

Students graduating from this program will:

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- Demonstrate an ability to use proper investigation techniques for the discipline
- Use oral and written forms of communication to convey their ideas

## Physics

### Primary Discipline Program Requirements

Code	Title	Credits
A minimum of 15 primary discipline hours, including five of the six courses below, and at least 12 dissertation hours.		
PHYSICS 5510	Theoretical Mechanics I	15

PHYSICS 5520	Electromagnetic Theory And Applications I	
PHYSICS 5521	Electromagnetic Theory And Applications II	
PHYSICS 5530	Quantum Mechanics I	
PHYSICS 5531	Quantum Mechanics II	
PHYSICS 5540	Statistical Physics I	
Dissertation		12

**Total Credit Hours: 42**

### Secondary Discipline Program Requirements

Code	Title	Credits
Minimum of 9 credit hours in Physics at the 300-level or above. At least 3 hours must be at the 5500-level or above.		9
<b>Total Credits</b>		<b>9</b>

### Admission Requirements

For admission to the program, an applicant must meet the requirements of the School of Graduate Studies, the International Student Affairs Office (if applicable), and specific Physics and Astronomy admission requirements described below. The Faculty of Physics and Astronomy does not require general or subject-specific GRE scores as part of the Ph.D. application.

The graduate studies committee of the Faculty of Physics and Astronomy will review applications and make admission recommendations to the School of Graduate Studies. The basic criterion for admission is the likelihood that an applicant will be successful in the Ph.D. program, particularly in the research component of the program. All applicants must satisfy the graduate studies committee that they meet this criterion through evidence such as transcripts, letters of recommendation, statements of purpose, performance on a written Ph.D. qualifying examination, etc. Furthermore, a member of the doctoral faculty must be willing to accept the applicant as a research student.

### Retention in Program

Ph.D. students with Physics as their primary discipline must maintain a 3.25 grade-point average. Students with Physics as a co-discipline must maintain a 3.0 GPA in Physics courses. A student's failure to maintain the minimum GPA will result in a probationary status for the following semester. A failure to remove the GPA deficiency during the probationary semester will then result in the student's dismissal from the Interdisciplinary Ph.D. program.

### Appeals

Exceptions to any of the discipline-specific regulations must be approved by the student's supervisory committee and by the physics doctoral studies committee. In the event of disputes or special requests concerning a student's Ph.D. program, written appeals and/or documentation must first be submitted to the student's supervisory committee. If a resolution of the problem cannot be affected at that level, the written appeals process must then progress through the following levels: (1) Doctoral studies committee of the Faculty of Physics and Astronomy; (2) Interdisciplinary Ph.D. Program Director; (3) Dean of the School of Graduate Studies.

### Ph.D. Examination Guidelines

#### Physics as Primary Discipline

#### Written Examination (a.k.a. Ph.D. Qualifying Exam)

During January of each year, the Faculty of Physics and Astronomy will administer a written, Ph.D. Qualifying examination of all Interdisciplinary Ph.D. students with Physics as their primary discipline that have not yet passed the exam. The two-part examination will be given during two sessions (morning and afternoon) of three hours each on the first Saturday after the start of the Spring Semester. Each part of the exam will contain approximately six questions at varying levels of difficulty (advanced undergraduate to introductory graduate). The following subject areas will be addressed in the given order by the two examination sessions:

1. Mechanics and Electromagnetism.
2. Quantum Mechanics and Thermodynamics.

Students must pass the written examination at the Ph.D. Qualifying level before being invited to take the comprehensive examination in fulfillment of the Ph.D. program requirements.

Students need only pass the written examination once. However, all graduate students in the Ph.D. program or who intend to enroll in the Ph.D. program must attempt the exam every year until they pass it. Under a limited set of extenuating circumstances (serious personal or family health issues, visa issues, etc.) a student may be granted an exception to not take the exam in a given year via a petition to the Faculty of Physics and Astronomy.

A maximum of two attempts will be permitted, and any student who does not attempt the exam when required to do so will be deemed to have failed the exam on that attempt, unless they have been given prior permission to delay taking the exam. Students who are required to take this exam are

encouraged to consult with the Department of Physics and Astronomy Graduate Advisors (Profs. Paul Rulis (rulisp@umkc.edu; 816-235-5223) and Mark Brodwin (brodwinm@umkc.edu; 816-235-5975)) for detailed information concerning procedures and regulations for the exam.

**Ph.D. Comprehensive Exam**

Ph.D. seeking students who have passed the Written Exam must pass a Ph.D. Comprehensive Exam to advance to Ph.D. Candidacy. The Ph.D. Comprehensive Exam consists of a proposal of the Ph.D. research topic written in the format of a National Science Foundation proposal narrative with an oral presentation to the student's full Ph.D. committee. This exam must be completed within 12 months of completing the coursework and the qualifying exam degree requirements. The exact timing and topic of this written and oral comprehensive exam will be determined by the student and their supervisory committee.

**Physics as a Secondary Discipline**

There are no formal qualifying or Comprehensive Examination requirements for students whose secondary discipline is Physics.