

# DOCTOR OF PHILOSOPHY IN THE FIELD OF PHYSICS (STEM)

## OVERVIEW

Graduate students in physics gain knowledge of advanced physics concepts, including advanced mechanics, electromagnetic theory, advanced quantum mechanics, and statistical mechanics, along with mathematical methods in physics and computational physics. Additional courses in quantum field theory, solid-state physics, nuclear physics, astrophysics, and biophysics are offered. An integral part of the program involves students in active and frontier research.

For students interested in experimental, observational, and applied physics, the department's association with national and international laboratories allows hands-on training and original research. The department maintains research affiliations and collaborations with researchers at the National Institute of Standards and Technology, U.S. Naval Research Laboratory, Thomas Jefferson National Accelerator Facility, and NASA. The department also has ties with international research institutions.

Concentrations include nuclear physics, astrophysics, and condensed-matter physics as well as interdisciplinary studies in materials science and biophysics.

This is a STEM designated program.

Visit the program website (<https://physics.columbian.gwu.edu/phd-physics/>) for additional information.

## ADMISSIONS

### Admission deadlines:

Fall – January 15

Spring – October 1\*

### Standardized test scores:

GRE general test not required;  
GRE subject test recommended  
(institutional code 5246).

The Test of English as a Foreign Language (TOEFL), the academic International English Language Testing System (IELTS), or the PTE Academic is required of all applicants except those who hold a bachelor's, master's, or doctoral degree from a college or university in the United States or from an institution located in a country in which English is the official language, provided English was the language of instruction.

Minimum scores for the program are:

- Academic IELTS: an overall band score of 7.0 with no individual score below 6.0; or
- TOEFL: 600 on paper-based or 100 on Internet-based; or
- PTE Academic: 68

**Recommendations required:** Three (3) recommendations

### Prior academic records:

Transcripts are required from all colleges and universities attended, whether or not credit was earned, the program was completed, or the credit appears as transfer credit on another transcript. Unofficial transcripts from all colleges and universities attended must be uploaded to your online application. Official transcripts are required only of applicants who are offered admission.

If transcripts are in a language other than English, English language translations must be provided. The English translation alone should be uploaded into your application.

**Statement of purpose:**

In an essay of 250 – 500 words, state your purpose in undertaking graduate study in your chosen field. Include your academic objectives, research interests, and career plans. Also discuss your related qualifications, including collegiate, professional, and community activities, and any other substantial accomplishments not already mentioned on the application. If you are applying for an assistantship or fellowship, you should also describe any teaching experience you have had.

**International applicants only:**

Please review International Applicant Information (<https://columbian.gwu.edu/international-graduate-applicants/>) carefully for details on required documents, earlier deadlines for applicants requiring an I-20 or DS-2019 from GW, and English language requirements.

\* Spring admission to Ph.D. program is not always offered. Check with department for availability.

Supporting documents not submitted online should be mailed to:

Columbian College of Arts and Sciences, Office of Graduate Studies  
The George Washington University  
801 22nd Street NW, Phillips Hall 107  
Washington DC 20052

For additional information about the admissions process visit the Columbian College of Arts and Sciences Frequently Asked Questions (<https://columbian.gwu.edu/graduate-admissions-faq/>) page.

**Contact:**

askccas@gwu.edu  
202-994-6210 (phone)

Hours: 9:00 am to 5:00 pm, Monday through Friday

## REQUIREMENTS

The following requirements must be fulfilled:

The general requirements stated under Columbian College of Arts and Sciences, Graduate Programs (<https://bulletin.gwu.edu/arts-sciences/#degreeregulationtext>).

The requirements for the Doctor of Philosophy program (<https://bulletin.gwu.edu/arts-sciences/#doctoraltext>).

A minimum of 72 credits in graduate coursework, including at least 45 credits in required and selected courses taken at the pre-candidacy stage and at least 6 and at most 27 credits in dissertation. Up to 12 of these credits may be taken in courses offered by the other affiliated members of the Consortium of Universities of the Washington Metropolitan Area (<https://www.consortium.org/>). Successful completion of a general examination, satisfactory progress toward the degree (documented in the annual student reports and faculty feedback), and an oral defense of the doctoral thesis are also required.

Code	Title	Credits
<b>Required *</b>		
PHYS 6110	Mathematical Methods of Theoretical Physics	
PHYS 6120	Advanced Mechanics	
PHYS 6210	Electrodynamics and Classical Field Theory	
PHYS 6220	Quantum Mechanics I	
PHYS 6310	Statistical Mechanics	
PHYS 6320	Quantum Mechanics II	
PHYS 6130	Computational Physics I	
PHYS 6230	Computational Physics II	
PHYS 6330	Computational Physics III	
Completion of one of the following options:		
<b>Option A</b>		
PHYS 6610	Nuclear and Particle Physics I	
PHYS 6710	Nuclear and Particle Physics II	
<b>Option B</b>		
PHYS 6620	Biophysics I	
PHYS 6720	Biophysics II	
<b>Option C</b>		
PHYS 6630	Radiative Processes in Astrophysics	
PHYS 6730	High-Energy Astrophysics	

**Additional course requirements**

6 additional credits in graduate-level PHYS courses.

6 credits in graduate-level courses related to the student's field(s) of study, which may be taken outside the department, subject to the advisor's approval.

\*Specific course requirements can be waived on a case-by-case basis upon approval of the department's graduate advisor.

### **Research fields**

- Nuclear physics—experimental and theoretical studies on the structure, electromagnetic, weak and strong interactions, and scattering of few-body systems at low and intermediate energies;
- Biophysics and condensed-matter physics—experimental, theoretical, and computational studies of structures and functions of cells, biological networks and biomolecules, deciphering information encoded in genome;
- Theoretical and observational astrophysics—high-energy astrophysics, multi-wavelength studies of extreme energy-density environments and huge energy releases in astrophysical objects;
- Interdisciplinary physics, including energy research and physics education research.

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