Physics

Degrees Offered

• Master of Science
• Doctor of Philosophy

Nature of the Program

The graduate program is designed to provide a solid background in classical and modern physics, a broad understanding of major research fields, and concentrated research experience in one area. Applicants normally enter with a bachelor of science degree in physics. A student whose background is weak in a particular area is encouraged to register for the appropriate undergraduate course. The normal first-year courses include PHYS 611, PHYS 651, PHYS 631, and PHYS 633 plus possible electives. In the courses, no distinction is made between those students who intend a terminal M.S. degree and those who intend a Ph.D. degree. The minimum grade for credit in graduate courses is C, and a grade point average of 3.0 must be maintained.

GRE/TOEFL

Applicants are expected to have a bachelor’s degree in physics with upper-division courses in electricity and magnetism, mechanics, quantum mechanics, thermodynamics, and mathematical methods. Students lacking some of these courses may be admitted provisionally and will be allowed to remedy the deficiencies by taking the appropriate undergraduate courses. Both the GRE General Test and the GRE Physics Subject Test are required. If English is not the student’s native language, TOEFL or IELTS scores are also required. Application deadline is February 15. Contact the department for additional information.

Financial Aid

With rare exceptions, all students who are admitted receive financial support. Beginning students usually receive teaching assistantships; more advanced students receive research assistantships. Several fellowships are available for outstanding students, allowing full-time concentration on coursework and research and a more rapid progress toward the degree.

Faculty

Chair

• Earl E. Scime - Ph.D. (University of Wisconsin)

Associate Chair

• James Lewis - Ph.D.

Professors

• Wathiq Abdul-Razzaq - Ph.D. Physics Education
• Leonardo Golubovic - Ph.D. (University of Belgrade) Condensed Matter Theory and Statistical Physics
• Mark E. Koepke - Ph.D. (University of Maryland) Plasma Physics, Experiment
• David Lederman - Ph.D. (University of California) Carroll Professor, Condensed Matter Physics, Experiment
• Diandra Leslie-Pelecky - Ph.D. Condensed Matter Physics, Experiment
• Earl E. Scime - Ph.D. (University of Wisconsin) Eberly Professor, Chairperson, Plasma Physics, Experiment

Associate Professor

• Paul Cassak - Ph.D. (University of Maryland) Plasma Physics, Theory
• James P. Lewis - Ph.D. Computational Condensed Matter Physics
• Duncan Lorimer - Ph.D. Astrophysics
• Maura McLaughlin - Ph.D. (Cornell University)  
  Astrophysics
• Aldo Romero - Ph.D.  
  Condensed Matter Theory

**Assistant Professor**

• Loren Anderson - Ph.D. (Boston University)  
  Astrophysics
• Alan Bristow - Ph.D. (University of Sheffield)  
  Experimental Condensed Matter, Experiment
• Cheng Cen - Ph.D.  
  Experimental Condensed Matter, Experiment
• Edward Flagg - Ph.D.  
  Experimental Condensed Matter, Experiment
• Mikel Holcomb - Ph.D.  
  Condensed Matter Physics, Experiment
• Sean McWilliams - Ph.D.  
  Astrophysics
• D.J. Pisano - Ph.D. (University of Wisconsin-Madison)  
  Astrophysics
• Tudor Stanescu - Ph.D. (University of Illinois)  
  Condensed Matter Physics, Theory

**Teaching Assistant Professor**

• Paul Miller - Ph.D. (West Virginia University)  
  Physics Education Research

**Research Professor**

• Vladimir Demidov - Ph.D. (St. Petersburg University)  
  Plasma Physics and Plasma Chemistry
• Mohindar Seehra - Ph.D. (University of Rochester)  
  Experimental Condensed Matter, Experiment

**Research Associate Professor**

• Dimitris Vassiliadis - Ph.D.  
  Plasma Physics

**Research Assistant Professor**

• Amy Keesee - Ph.D. (Davidson College)  
  Plasma Physics
• Clayton Simien - Ph.D.  
  Atomic Physics

**Professors Emeriti**

• Benard Cooper - Ph.D. (University of California)
• Martin Ferer - Ph.D. (Univ. of Illinois)
• Larry Halliburton - Ph.D. (University of Missouri-Columbia)
• Richard Treat - Ph.D. (University of California – Riverside)
• H. Arthur Weldon - Ph.D. (Massachusetts Institute of Technology)

**Degree Requirements**

*Degree Requirements*

A minimum GPA of 3.0 is required in all courses.

<table>
<thead>
<tr>
<th>Major Requirements</th>
<th>24-30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Hours</td>
<td>24-30</td>
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</tbody>
</table>
Major Requirements

**Major Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 611</td>
<td>Intro Mathematical Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 631</td>
<td>Advanced Classical Mechanics 1</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 633</td>
<td>Electromagnetism 1</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 651</td>
<td>Quantum Mechanics 1</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 761</td>
<td>Statistical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Physics Electives *</td>
<td></td>
<td>9-15</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td></td>
<td>24-30</td>
</tr>
</tbody>
</table>

* Non-Thesis Option:
Thirty credit hours of Physics courses at the 600 or 700 level are required to complete a M.S. in physics without a thesis.

* Thesis Option:
Students may earn a M.S. degree by performing research under the direction of a faculty advisor. The research results must be presented in a written thesis that is defended before a faculty committee. Twenty-four credit hours of physics courses at the 600 or 700 level are required to complete a M.S. in physics with a thesis.

Ph.D. Candidacy Examinations

To be admitted to candidacy for the Ph.D., a student must pass both a written and an oral candidacy examination. The written examination consists of three parts: a quantum mechanics exam in May, an electromagnetism exam in August, and a classical mechanics exam in January. To be eligible to take any candidacy exam, the student must be in good standing (see below).

The oral part of the candidacy exam is a presentation to the five faculty on the student’s doctoral committee. The student gives a lecture on some published research that has been assigned by his or her research advisor.

Requirements for Remaining in the Graduate Program

To be a graduate student in good standing requires the following:

- Maintain a GPA of 3.0 or better in graduate physics courses taken at WVU, excluding PHYS 797.
- Pass two sections of the written candidacy examination by the end of three years.
- Pass the remaining third section of the written candidacy examination by the end of four years.
- Select a Ph.D. committee of five faculty.
- Complete the oral candidacy examination within three semesters (after completing the third section of the written candidacy examination).

Students admitted as M.S. degree candidates are not expected to take the graduate qualifying exams but must maintain a GPA of 3.0 and complete their M.S. degree within three years.

Doctor of Philosophy

Course requirements: The Ph.D. requires thirty-six hours of courses at the 600 or 700-levels with a GPA of 3.0 or better. These twelve courses must include seven of the following basic courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 611</td>
<td>Intro Mathematical Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 631</td>
<td>Advanced Classical Mechanics 1</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 633</td>
<td>Electromagnetism 1</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 634</td>
<td>Electromagnetism 2</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 651</td>
<td>Quantum Mechanics 1</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 652</td>
<td>Quantum Mechanics 2</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 761</td>
<td>Statistical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td><strong>Select at least two from the following:</strong></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>PHYS 772</td>
<td>Semiconductor Physics</td>
<td></td>
</tr>
<tr>
<td>PHYS 773</td>
<td>Collective Phenomena in Solids</td>
<td></td>
</tr>
<tr>
<td>PHYS 774</td>
<td>Optical Properties of Solids</td>
<td></td>
</tr>
<tr>
<td>PHYS 783</td>
<td>Adv Kinetic Theory of Plasmas</td>
<td></td>
</tr>
<tr>
<td>PHYS 784</td>
<td>Adv Mgntohydrodnmc Thry-Plasma</td>
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</tbody>
</table>
PHYS 791  Advanced Topics
and/or
ASTR 702  Stellar Structure & Evolution
ASTR 703  Galactic Astronomy
ASTR 704  General Relativity
Plus three additional graduate courses in physics or astronomy 9
Total Hours 36

**Research requirements**

Research is the central focus of the degree and is directed by a faculty advisor over a period of several years. When the research is completed, the student must write a dissertation and defend it before the doctoral committee of five faculty. The average completion time for the Ph.D. is five years beyond the B.S. Research specialties within the department include astrophysics, computational physics, condensed matter physics, fluid mechanics, nonlinear dynamics, and plasma physics.