General University Information
President: Gordon Gee
Dean of Graduate School: Robert Jones
University website: http://www.wvu.edu
Control: Public
Setting: Urban
Total Faculty: 1,709
Total Graduate Faculty: 1,100
Total number of Students: 29,707
Total number of Graduate Students: 6,880

Department Information
Department Chairman: David Lederman, Chair
Department Contact: David Lederman, Chair
Total full-time faculty: 22
Total number of full-time equivalent positions: 22
Full-Time Graduate Students: 70
First-Year Graduate Students: 12
Female First-Year Students: 2
Total Post Doctorates: 10

Department Address
135 Willey Street
P.O. Box 6315
Morgantown, WV 26506
Phone: (304) 293-3422
Fax: (304) 293-5727
E-mail: david.lederman@mail.wvu.edu
Website: http://physics.wvu.edu/

ADMISSIONS

Admission Contact Information
Address admission inquiries to: Admissions Committee, Department of Physics and Astronomy, P.O. Box 6315, Morgantown, WV 26506.
Phone: (304) 293-3422
E-mail: physics@wvu.edu
Admissions website: http://physics.wvu.edu

Application deadlines
Fall admission:
U.S. students: February 15
Int’l. students: February 15

Application fee
U.S. students: $60
A personal statement and resume are required.

Admissions information
For Fall of 2014:
Number of applicants: 69
Number admitted: 20
Number enrolled: 12

Admission requirements
Bachelor’s degree requirements: A bachelor’s degree in physics is required.
Minimum undergraduate GPA: 3.0

GRE requirements
The GRE is required.
No minimum score set.

Advanced GRE requirements
The Advanced GRE is required.

TOEFL requirements
The TOEFL exam is required for students from non-English-speaking countries.
PBT score: 550
iBT score: 79
The minimum accepted computer-based exam (CBT) score is 213. The minimum accepted IELTS score is 6.5.

Other admissions information
Additional requirements: No minimum score is specified.
Undergraduate preparation assumed: Intermediate mechanics, electricity and magnetism, atomic and quantum physics, thermodynamics, and mathematics through partial differential equations. Typical physics texts include Davis (mechanics), Wangsness (electricity and magnetism), McIntyre (quantum mechanics), and Sears and Salinger (thermodynamics).

TUITION

Tuition year 2014–15:
Tuition for in-state residents
Full-time students: $4,176 per semester
Part-time students: $464 per credit
Tuition for out-of-state residents
Full-time students: $11,079 per semester
Part-time students: $1,231 per credit
Costs include University tuition, University fees, and College tuition.
Credit hours per semester to be considered full-time: 9
Deferred tuition plan: Yes
Health insurance: Available at the cost of $1,497 per year.
Other academic fees: Fees are included in tuition numbers cited above.
Academic term: Semester
Number of first-year students who received full tuition waivers: 2

Teaching Assistants, Research Assistants, and Fellowships
Number of first-year
Teaching Assistants: 10
Research Assistants: 2
Fellowship students: 2
Average stipend per academic year
Teaching Assistant: $22,500
Research Assistant: $22,500
Fellowship student: $28,000
Teaching assistantships guaranteed to all incoming first year students. Fellowships in specific fields are available; contact faculty or go to http://grad.wvu.edu/funding/fellowships.

FINANCIAL AID

Application deadlines
Fall admission:
U.S. students: February 15
Int’l. students: March 15
Spring admission:
U.S. students: November 1
Int’l. students: November 1
SPECIAL EQUIPMENT, FACILITIES, OR PROGRAMS

The department and associated instrument and electronics shops are housed in White Hall, a six-story building located on the downtown campus. The building renovation was completed in 2011 and houses a 60-seat planetarium, a roof-top observatory, a small radio telescope, and 23 state-of-the-art research laboratories.

The plasma facilities include a triple plasma source, a Q-machine for generating space-like plasmas and waves, two helicon plasma sources, a space simulation chamber, a plasma processing test facility, four laser facilities dedicated to plasma diagnosis, a toroidal experiment for turbulence studies, and a pulsed high-velocity plasma source.

The condensed matter physics facilities include four molecular beam epitaxy (MBE) growth facilities, magnetic resonance laboratory (EPR, ENDOR), SQUID magnetometer with magnetoresistance probe, QD PPMs system, rotating anode x-ray source, x-ray diffractometers, an e-beam writer, a scanning probe microscope, an atomic force microscope, Hall effect apparatus, an optical spectrophotometer, an FTIR spectrophotometer, a high-temperature graphite furnace, ultrasonic, thermogravimetry, and differential scanning calorimetry; characterization capabilities for thermoluminescence, optical absorption, photoreflectance, photoconductance, and photoluminescence of materials, two-dimensional Fourier transform spectroscopy, second harmonic generation system for interface studies, and a sputtering system for thin-film deposition.

Laser facilities include four cw argon ion lasers, three dye lasers, three tunable diode lasers, three cw and Q-switched Nd:YAG lasers, and three femtosecond lasers.

Departmental computing facilities include two dedicated cluster facilities for development of new computational resources and two large computer clusters. Cooperative research programs with National Energy Technology Laboratory and Pittsburgh Supercomputing Center are possible. University-wide shared research facilities that include sophisticated materials characterization and device fabrication tools, as well as high-performance computing, are available (http://sharedresearchfacilities.wvu.edu). A nanotechnology program focusing on bionanotechnology (NanoSAFE, http://nanosafe.wvu.edu) engages students in interdisciplinary research. A comprehensive astrophysics program, teaming with the National Radio Astronomy Observatory in Green Bank, WV, gives students the opportunity to work with a wide array of world-class researchers in the field (http://astro.wvu.edu).

**Table A—Faculty, Enrollments, and Degrees Granted**

<table>
<thead>
<tr>
<th>Research Specialty</th>
<th>2014-15 Faculty</th>
<th>Enrollments</th>
<th>Number of Degrees Granted</th>
<th>Master’s</th>
<th>Doctorate</th>
<th>Master’s</th>
<th>Doctorate</th>
<th>Master’s</th>
<th>Doctorate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astrophysics</td>
<td>5</td>
<td>16</td>
<td>2(7)</td>
<td>5(8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical Physics</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–(1)</td>
<td></td>
<td>–(1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condensed Matter Physics</td>
<td>9</td>
<td>32</td>
<td>2(14)</td>
<td>–(4)</td>
<td>3(24)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluids, Rheology</td>
<td>1</td>
<td>–</td>
<td>–(2)</td>
<td>–</td>
<td>1(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical, Health Physics</td>
<td>2</td>
<td>–</td>
<td>–(2)</td>
<td>–</td>
<td>–</td>
<td></td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics and other</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science Education</td>
<td>3</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasma and Fusion</td>
<td>6</td>
<td>14</td>
<td>1(12)</td>
<td>–(1)</td>
<td>4(8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistical &amp; Thermal Physics</td>
<td>2</td>
<td>–</td>
<td>1</td>
<td>–(1)</td>
<td>–</td>
<td>1(1)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>64</td>
<td>5(38)</td>
<td>–(5)</td>
<td>13(36)</td>
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<td></td>
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</tr>
</tbody>
</table>

**GRADUATE DEGREE REQUIREMENTS**

**Master’s:** Approved courses with a minimum GPA of 3.0 are required. There is no residence or language requirement. For a degree with a thesis, 24 credits are required. For a degree without a thesis, 30 credits are required.

**Doctorate:** A minimum of 36 hours of course work in an approved program with a minimum GPA of 3.0 are required. A written comprehensive exam, oral research exam, dissertation, and oral dissertation defense are required.

**Thesis:** Thesis may be written in absentia.

**Housing**

**Availability of on-campus housing**

*Single students:* Yes

*Married students:* Yes

For further information

**Address housing inquiries to:** University Apartments, PO Box 6430, Morgantown, WV 26505.

**Phone:** (304) 293-5840 or (304) 293-054e

**E-mail:** wvumedcenterapt@mail.wvu.edu

**Housing aid website:** http://housing.wvu.edu/graduate_student_faculty_and_staff_housing

**Table B—Separately Budgeted Research Expenditures by Source of Support**

<table>
<thead>
<tr>
<th>Source of Support</th>
<th>Departmental Research</th>
<th>Physics-related Research Outside Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal government</td>
<td>$5,000,000</td>
<td></td>
</tr>
<tr>
<td>State/local government</td>
<td>$500,000</td>
<td></td>
</tr>
<tr>
<td>Non-profit organizations</td>
<td>$100,000</td>
<td></td>
</tr>
<tr>
<td>Business and industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$5,600,000</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Table C—Separately Budgeted Research Expenditures by Research Specialty**

<table>
<thead>
<tr>
<th>Research Specialty</th>
<th>No. of Grants</th>
<th>Expenditures ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astrophysics</td>
<td>10</td>
<td>$1,500,000</td>
</tr>
<tr>
<td>Condensed Matter Physics</td>
<td>18</td>
<td>$2,650,000</td>
</tr>
<tr>
<td>Plasma and Fusion</td>
<td>10</td>
<td>$2,000,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>38</strong></td>
<td><strong>$6,100,000</strong></td>
</tr>
</tbody>
</table>
**FACULTY**

**Professor**
Abdul-Razzaq, Wathiq, Ph.D., University of Illinois at Chicago, 1986. *Condensed Matter Physics, Physics and other Science Education*. Experimental solid state; magnetism of nanoparticles; particulate matter in the environment.


**Associate Professor**


**Assistant Professor**


**Emeritus**


Treat, Richard P., Ph.D., University of California, Riverside, 1967. Quantum field theory.


**Research Professor**


**Research Assistant Professor**


**Teaching Assistant Professor**

**Adjunct Professor**
Frayer, D., Ph.D., University of Virginia, 1996. Extragalactic astronomy.


**DEPARTMENTAL RESEARCH SPECIALTIES AND STAFF**

**Theoretical**
West Virginia

Astrophysics. Interstellar medium; galactic structure; stellar evolution; compact objects; general relativity; pulsars. Anderson, Lorimer, McLaughlin, McWilliams, Pisano.

Condensed Matter Physics. Surface and interface phenomena; lattice stability and relaxation; molecular dynamics; properties of disordered materials; biomaterials; complex fluids and membranes; fracture; transport in random media; thin-film growth; optical properties of materials. Abdul-Razzaq, Borisov, Bristow, Cen, Flagg, Glinka, Golubovic, Holcomb, Lederman, Lewis, Romero, Stanescu.

Plasma and Fusion. Plasma instabilities; simulations applicable to space and laboratory plasmas; low-temperature plasmas; fusion diagnostics; space plasma instrumentation; space plasma modeling and data analysis. Cassak, Ganguli, Keesee, Koepke, Schulze, Scime.

Statistical & Thermal Physics. Fractals; percolation theory; chaos; phase transitions and critical phenomena; nonequilibrium growth and pattern formation. Golubovic, Lederman, Smith.

Experimental

Applied Physics. Preparation and characterization of nanoparticles; iron-based catalysts; properties of air-borne particulate matter; coal-based high-purity carbons and carbon fibers; electrochemical detection of Hg and other trace metals using boron-doped diamond films; visible and UV light emitters and sensors; nonlinear optical and photorefractive materials. Bristow, Flagg, Halliburton, Lederman, Seehra.

Astrophysics. Radio astronomy; x-ray astronomy; pulsars; tests of strong-field gravity; digital signal processing; computational astrophysics. Anderson, Frayer, Lockman, Lorimer, McLaughlin, McWilliams, O’Neil, Pisano, Rosen.

Condensed Matter Physics. Electronic structure and magnetic properties of artificially grown surfaces and superlattices and nanoscale particles; spin transport; properties of magnetic ions and clusters; elementary excitations in antiferromagnets; magnetic susceptibility; magnetostriction; electrical, structural, and electro-optic properties of semiconductors; optical and magnetic resonance characterization of point defects. Abdul-Razzaq, Borisov, Bristow, Cen, Flagg, Glinka, Golubovic, Halliburton, Lederman, Pavlovic, Seehra.

Materials Science, Metallurgy. X-ray scattering from disordered systems; Auger and x-ray photoelectron spectroscopy deposition physics; molecular beam epitaxy; properties of monolayer and multilayer thin films; optical properties of quantum-confined systems and semiconductors. Borisov, Holcomb, Lederman, Seehra.


Physics and other Science Education. K-12 teacher training; development of GTA training programs; curriculum development. Abdul-Razzaq, Keesee, Miller, Gay Stewart, John Stewart.

Plasma and Fusion. Plasma waves and instabilities; nonlinear interactions; turbulence and chaos; space plasma instrument design; space plasma data analysis and instrument (sensor) development; magnetic reconnection; plasma processing. Demidov, Ganguli, Keesee, Koepke, Miller, Schulze, Scime.

West Virginia U., Phys. & Astro.