

Freshman Year

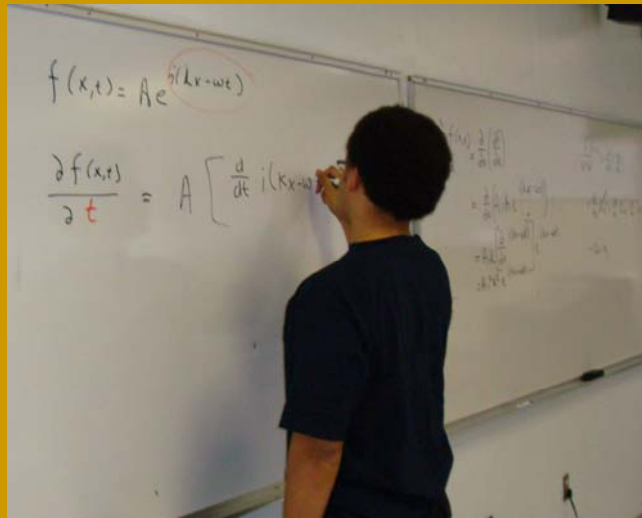
Students attend four physics courses that are coordinated to provide a thorough experience. These include physics theory, mathematical physics, experimental physics and communicating physics.

Introductory Physics with Calculus I & II

Introduction to physics using advanced mathematical approaches including calculus and differential equations.

Computational Physics I & II

Basic techniques for mathematical and computer modeling of physical systems with emphasis on topics in introductory physics.



Freshman student in the computational physics course, working a problem in wave propagation.

Communication in Physics I & II

Provides a discussion of physics topics by students, faculty and invited speakers. Emphasis is placed on developing writing and presentation skills.

Experimental Physics I & II

Introduction to experimental physics, computerized data acquisition, and statistical data analysis.



Freshman students conducting laboratory experiments.

Other Required Freshman Courses

1st Semester

Computer Science 120

English 101

Calculus I PE

University 101

2nd Semester

English 102

Calculus II

Sophomore Year

Students refine their physics skills by taking specialize courses that use the basic principles learned in freshman year, covering the material in greater depth and mathematical complexity. Students are also encouraged to begin working on research projects with physics faculty. Research areas include theoretical physics, laser sciences, nuclear physics, medical physics and solid state physics.

Modern Physics I & II

Introduction to relativity, quantum structure of atoms, atomic spectra, Schroedinger's equation, nuclear models, radioactive decay, solid state physics and elementary particles.

Experimental Physics III & IV

Advanced techniques in experimental physics with emphasis on topics in modern physics.



Sophomore student conducting an experiment designed to measure atomic spectra.

Computational Physics III & IV

Advanced techniques for mathematical and computer modeling of physical systems with emphasis on topics in modern physics, mechanics, thermodynamics, electrodynamics, and quantum physics.

Communication in Physics III & IV

Provides a discussion of physics topics by students, faculty and invited speakers. Emphasis is placed on developing writing and presentation skills.



Sophomore physics major discussing his summer research at the CERN particle accelerator in Geneva, Switzerland.

Other Required Sophomore Courses

1st Semester
Chemistry 201
Calculus III
PE

2nd Semester
Biology 101
Differential Equations
Communications

Junior Year

Students take a year of electrodynamics, mechanics, communications in physics, technical electives and thermodynamics. They also begin the research project that will be the foundation of their senior thesis. Technical electives in science and/or engineering are taken to address students' particular interests. For instance, students planning to attend graduate school in physics typically use the technical electives to obtain a minor in mathematics. Students attending medical school take advanced chemistry and biology courses.

Electrodynamics I & II

Advanced treatment of electrostatics, dielectrics, electric currents, magnetic fields, electromagnetic induction, Maxwell's equations, boundary-value problems, vector wave equation, and electromagnetic radiation from accelerated charges.

Communication in Physics V & VI

Provides a discussion of physics topics by students, faculty and invited speakers. Emphasis is placed on developing writing and presentation skills.



Junior physics major conducting research in laser spectroscopy that will be the topic of her senior Capstone thesis.

Other Required Junior Courses

1st Semester

History

Humanities

Health

2nd Semester

History

Humanities

Mechanics I & II

Advanced treatment of Newton's laws oscillatory motion, central-force problems and Hamiltonian and Lagrangian dynamics.

Thermodynamics (2nd semester)

Introduction to thermodynamic systems, equations of state, first and second laws of thermodynamics, kinetic theory, heat engines, and statistical mechanics.

Technical Electives

Students headed to graduate school in physics use these electives to obtain a minor in mathematics. Other students use these to enhance their knowledge in a variety of fields.



Junior physics major conducting research in laser spectroscopy that will be the topic of her senior Capstone thesis.

Senior Year

Students spend their senior year taking quantum mechanics, working on their thesis research, taking technical electives needed for a mathematics minor or related to their research interest, and writing their Capstone thesis. They are also couniled on applying to graduate school and/or interviewing for employment.

Quantum Mechanics I & II

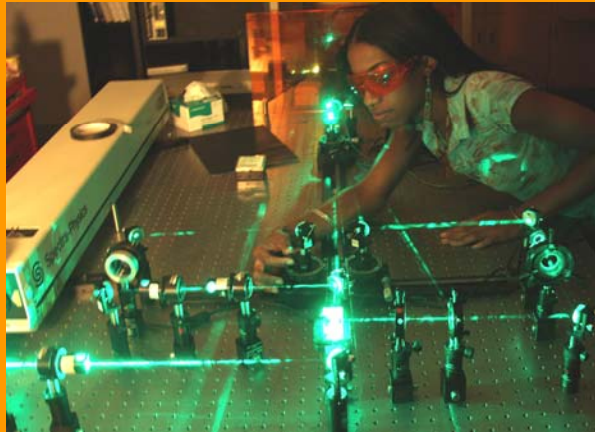
General formalism of quantum mechanics including: state space, Dirac notation, matrix mechanics, angular momentum, ideal particles and the exclusion principle, many electron atoms, the periodic table, Fermi and Bose gases, and perturbation theory.

Communication in Physics V II

Provides a discussion of physics topics by students, faculty and invited speakers. Emphasis is placed on developing writing and presentation skills.

Senior Research Topics in Physics

Designed for senior level undergraduates participating in independent research leading to a Capstone thesis.



Senior student working on her Capstone thesis research in laser spectroscopy.

Capstone Thesis

Students complete an in-depth technical report based on independent physics related research. The thesis is written in standard American Institute of Physics format and bound copies are retained in the university library.



Senior student at her Capstone thesis defense.

Technical Electives

Students headed to graduate school in physics use these electives to obtain a minor in mathematics. Other students use these to enhance their knowledge in a variety of fields.

Other Required Sophomore Courses

1st Semester

Social Science

2nd Semester

Social Science

Student Research

Besides participating in cutting-edge research for four years, physics majors receive many other advantages due to the incredible amount of research going on in the physics department.

National and International Conferences Attended by Physics Majors

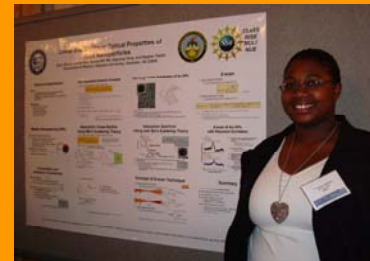
- American Physical Society, New Orleans, LA
- Conference on Lasers and Electrooptics, San Jose, CA
- Laser Remote Sensing Conference, Ontario, Canada
- Materials Research Society, San Francisco, CA
- National Society of Black Physicists Conference, Washington, D.C.
- Quantum Electronics and Laser Science Conference, San Jose, CA
- Virginia Academy of Science, Hampton, VA

Student Funding

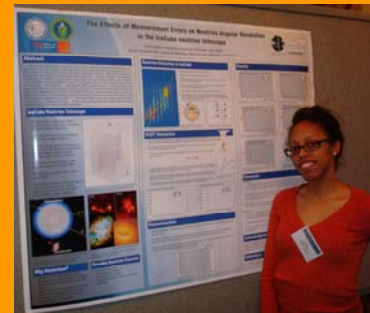
- All students participating in research during the academic year receive a salary.
- All expenses are paid for students traveling to national and international conferences.
- Scholarships are available for academically qualified students through the HU Presidential scholarship.
- Money for books and supplies is available through research grants.
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Physics majors at the opening banquet of the National Society of Black Physicists Conference in Washington, D.C.



Freshman physics major presenting her research results at a national conference



Senior physics major presenting her research results at a national conference

Extracurricular activities

Summer Research Experiences

Physics majors are placed in summer research programs all over the world. Typically, students receive free travel, room and board and a salary between \$3,500 and \$5,000 for the summer. In 2008 students participated in the following programs.

Amherst

Harvard University, Cambridge, MA

LSU, Baton Rouge, LA

Notre Dame,

University of California, Berkley, CA

Hampton University, Hampton, VA

MIT, Cambridge, MA

CERN, Geneva, Switzerland



Junior physics major presenting her work at the Notre Dame Summer Research Program.



Physics majors also participate in a variety of sports activities.



President of the International Association of Physics Students 2001-2002 Term

George Ofori-Boadu was elected the first undergraduate and the first African American President of the international Association of Physics Students.

Physics is Fun Experiences

During the 2007-2008 academic year students participated in several fun activities, all paid for by the department.

- Building and launching model rockets
- Amusement park physics at Busch Gardens
- IMAX shows at the Virginia Air and Space Museum



Physics majors launching rockets with a local elementary school class.