Physics

Physicists are concerned with an extremely broad range of natural phenomena, extending from the submicroscopic world of elementary particles to the vast reaches of the cosmos and the origins of the universe, from the simplest of everyday activities to the behavior of matter at the furthest extremes in energy, temperature, distance and time.

The defining characteristic of physics is the quest for the underlying logic—the theoretical structure that unifies and explains all the different phenomena that we study experimentally. Both the experiments themselves and the theoretical work that goes on at the same time are motivated primarily by this quest. As a by-product of this quest, physicists have pioneered many of the basic ideas on which our modern technology rests. Such developments as transistors, lasers and perhaps someday fusion energy all come directly from research in physics.

Pursuing Physics at Ohio State

The most important preparation for a major in physics is strong high school science and math. Students should have had some calculus, or be prepared to begin calculus upon arrival at Ohio State, in order to begin the physics program without unnecessary delay.

The Department of Physics wants to become involved with students as soon as they know that they intend to become physics majors, which can be as early as their first arrival at Ohio State. Those who intend to major in physics or are interested in exploring that option should contact the Undergraduate Studies Office in the Department of Physics at 614-247-1635 for an appointment.

Students who come to Ohio State majoring in physics enroll in the College of the Arts and Sciences. A major in engineering physics is also available in the College of Engineering. Further information on engineering physics is available at majors.osu.edu.

Program Educational Objectives

- Provide students with the opportunity to master the fundamental areas of physics: classical mechanics, electromagnetism, quantum mechanics and thermodynamics
- Allow students to develop problem-solving skills and the ability to analyze physical systems and to understand the theoretical framework that applies to them
- Provide students with a basic mastery of experimental science, including an understanding of data reduction and error analysis
- Teach students to communicate effectively both orally and in writing
- Provide students with the opportunity to develop a basic knowledge of and facility with computing

Physics Requirements

A student who is interested in majoring in physics should consider carefully whether to choose a program in the College of Arts and Sciences (Bachelor of Science in Physics) or in the College of Engineering (Bachelor of Science in Engineering Physics). The courses of study are very similar and prepare students for a variety of outcomes including graduate school in physics, astronomy, math or engineering; professional school; and employment as engineers, programmers, teachers, technicians and scientists.

Students pursuing a BS in physics can choose from among four options ranging from a rigorous preparation for graduate study in physics to a more flexible option for students who wish to combine a core of physics courses with courses in other areas. In addition to the technical electives unique to each option, all physics majors must complete the core physics and math requirements. Students choose one of the following options based on what they want to do after they finish their undergraduate work:

- **Advanced Physics** is designed for students who wish to pursue an advanced physics degree; this option provides an excellent preparation for graduate school in physics, mathematics or astronomy.
- **Applied Physics** prepares students to begin a full-time job after graduation or to enroll in a graduate program outside of physics including engineering, law, business, journalism, chemistry and biology.
- **Life Sciences** is designed for those intending to attend medical school; this option satisfies all of the medical school admission requirements when combined with the required physics and math courses in the physics core curriculum.
- **Physics Teaching** was created for those seeking secondary level certification in physics (i.e., to be a high school teacher); this option has been designed to satisfy the College of Education Master of Education (physics certification) curriculum.

Co-Curricular Opportunities

The Department of Physics encourages all of its students to become involved in research with a faculty member on one of many active research programs. This is an excellent opportunity to learn about and become involved in cutting edge physics research and discoveries. Areas of research include astrophysics, nuclear and elementary particle physics, string theory, solid state physics, superconductivity, and low temperature physics.

For more information, check these websites:

Physics: physics.osu.edu
College of Arts and Sciences: artsandsciences.osu.edu
Ohio State: osu.edu
Admissions: undergrad.osu.edu
Multicultural Center: multiculturalcenter.osu.edu
First Year Experience: fye.osu.edu
Curriculum Sample *
This is a sample list of classes that a student will take to pursue a Bachelor of Science in Physics. Since university students need more than specific education in a narrow field, they also will take classes to complete General Education (GE) requirements. Because GE courses come from a variety of academic areas of study, this course work helps students develop fundamental skills essential to collegiate success and allows them to tailor these courses toward their interests. Note: This sample curriculum represents courses a student would take for the Advanced Physics option, which is one of several possible paths to a degree in Physics at Ohio State. Visit physics.osu.edu for details on each specific option.

Freshmen Year:
Survey course 1
Calculus I and II 10
Introductory Physics* I and II 10
C++ Computer Programming 3
GE courses 6
Total hours 30

Sophomore Year:
Calculus III 4
Differential Equations and Linear Algebra 3
Dynamics of Particles and Waves I and II 8
Physics Seminar 1
Data Analysis Physics Lab 3
GE courses 12
Total hours 31

Junior Year:
Intermediate Electricity and Magnetism I and II 8
Quantum Mechanics I and II 8
Physics Laboratory Elective 3
GE courses 9
Total hours 28

Senior Year:
Statistical Physics 4
Theoretical Mechanics 4
Advanced Physics Lab 3
Elective courses 8
GE courses 12
Total hours 31

* Well-qualified students are encouraged to start the Honors version of the introductory physics sequence autumn semester of their first year.

In addition, undergraduate physics student organizations have many activities, including hosting guest physicists who speak about their research.

Honors & Scholars Programs
Ohio State offers the Honors and Scholars Programs to create an environment of intellectual support and stimulation within a close-knit community of high-ability undergraduate students. Through these programs, students have access to smaller classes, undergraduate research opportunities, close working relationships with faculty, priority scheduling and unique housing options. For more information about these opportunities, visit honors-scholars.osu.edu.

Career Prospects in Physics
Recent graduates of the physics program have gone on to study physics, engineering and astronomy at top universities such as Cornell University, Harvard University, Massachusetts Institute of Technology, Princeton University, Stanford University, University of Cambridge, University of Pennsylvania, University of Oxford, University of Hawaii and University of Chicago.

Graduates of the physics program have a variety of careers open to them. As workers in basic research, physicists may help expand the frontiers of the knowledge of the physical universe; as teachers in high schools, colleges or universities, they may help to transmit to others knowledge and appreciation of that universe and of scientific methods of investigating and understanding it. In an industrial laboratory or government agency, physicists may deal with the application of fundamental knowledge to the development of solutions for a wide range of practical problems, or they may be managers of large scientific or technical programs. In collaboration with colleagues in other disciplines, physicists may help attack problems spanning a number of important areas, many of which—such as energy usage, radiation hazards and environmental issues—are of current public concern.

Recent graduates in physics have been employed at salaries in the range of $40,000 to $65,000.

The Department of Physics distinctions
Faculty and staff have earned the following awards and distinctions:

- OSU Alumni Award for Distinguished Teaching
- OSU Distinguished Undergraduate Research Mentor Award
- National Science Foundation Young investigator awards
- Sloan Research Fellows American Association for the Advancement of Science (AAAS) Fellows
- American Physical Society (APS) Fellows
- Distinguished Scholar Award
- Faculty Award for Distinguished Service
- OSU Distinguished Staff Award
- Guggenheim Fellow
- NSF CAREER Award

Distinguished students:
- 12 Goldwater Scholarship recipients in the past 10 years
- 11 National Science Foundation (NSF) Fellowship recipients in the past 10 years
- 2007 Rhodes Scholar
- 2011 Churchill Scholar
- Two 2009 Gates-Cambridge Scholarship Finalists
- Fulbright Scholars in 2010 and 2013
- 1st, 2nd, 3rd, and 4th place winners of the Denman Research Forum

Revised December 2013. Information subject to change. For the most up-to-date information on the physics program, please visit physics.osu.edu.

Contact information:
Undergraduate Studies Office | Department of Physics
1142 Physics Research Building | 191 West Woodruff Avenue
Columbus, Ohio 43210-1168 | 614-247-1635