Information about physics courses, programs, advising . . .

Are you considering a physics major?

Are you interested in physics courses for non-science majors?

Do you want to know about courses that satisfy premedical and other preprofessional requirements?

Would you like to know about the Physics programs at UVa?

This site is designed to help with each of these interests and to link you to more detailed information. Prospective Physics Majors are strongly urged to consult with a Physics Majors Advisor during registration week of their first semester at the University.

This brochure is meant for students enrolled in the College of Arts & Sciences. There is a separate Brochure about the Undergraduate Degree Programs for Engineering Students.

What is Physics?

Physics is concerned with the most basic principles that underlie phenomena in the universe. Physicists ask: "How do things work?" Physicists seek understanding of the behavior of collections of particles ranging from quarks in nuclei and electrons in atoms to stars in galaxies; they strive for insights into the nature of space and time; and they explore the behavior of matter and energy. On a more human scale, physicists explore the behavior of matter and energy including devices of modern electronics, complex biological molecules, the atmosphere, and forms of energy and its uses. The principles of physics are the basis for much of engineering and technology. Studying physics can prepare students to push back the boundaries of knowledge in this most fundamental of the natural sciences; it can provide invaluable training in the concepts and methods of science for application in many professional areas; it can develop one's capacity for clear analytical thought that is crucial in many fields, or it can simply increase one's knowledge and appreciation of the wonders of the world around us.

The department has research programs in high energy physics, nuclear and particle physics, atomic, molecular and optical physics, condensed matter physics, and medical physics. The state-funded Institute for Nuclear and Particle Physics includes a number of faculty members with research related to the electron accelerator at the Thomas Jefferson National Accelerator Facility in Newport News, Virginia. This accelerator was originally conceived and successfully proposed by physics department faculty members, some of whom are now affiliated with this institute.

Majoring in Physics

To serve the wide range of interests of physics majors, the department offers both a BA degree and a BS in Physics, and jointly with the Astronomy Department, a BS in Astronomy/Physics.

The best way to begin a physics major is with our four-semester sequence in introductory physics, PHYS 1710, 1720, 2620, and the laboratory sequence PHYS 2630, 2640. Most students who anticipate a physics major begin with PHYS 1710, 1720 in their first year. However it is possible to begin this sequence in the second year and to complete requirements for either the Bachelor of Arts (BA) or the Bachelor of Science (BS) in Physics.

Another route to the physics major is through PHYS 1425, 2415, the introductory physics for engineering students and PHYS 1429, 2419, the associated workshops.

The basic BA is designed for students interested in physics and planning to enter professional schools in business, education, law, and medicine, and for liberal arts students desiring a strong background in physical science but with career objectives in other areas. A centerpiece of this BA program is the pair of courses, PHYS 3110, Widely Applied Physics, and PHYS 3120, Applied Physics: Energy, which treat principles of physics from the perspective of modern applications.

Students planning graduate study in physics or physics related areas or preparing to enter jobs in a scientific or technical field should elect the BS or the BA with a Distinguished Major course sequence, or for astronomy or astrophysics, the Astronomy/Physics BS. These programs provide intensive preparation in physics. There are also special concentrations in computational physics and in optics.

If you are considering a major in physics, you should take Calculus during your first year. The majority of our physics majors place out of MATH 1310 (Calculus I), and it is no longer required, and not part of the published scheduled. Talk to a Physics Majors Advisor to discuss a personalize schedule if you need to start with Calculus I.

The local Society of Physics Students organizes weekly meetings with invited talks and pizza. The weekly SPS meetings offer special talks on topics related to physics by faculty members from Physics and other departments at the University. There are also presentations devoted to giving advice and commentary on graduate and professional schools, and talks about careers in science. At each meeting there are refreshments and time for students to talk to each other and to faculty members who are invited to attend. Membership in SPS is open to any student interested in physics. Membership in Sigma Pi Sigma recognizes special academic achievement.

Detailed requirements and typical course sequences for these degrees can be found at www.phys.virginia.edu/Education/Programs/MajorBrochure/. A printed version is available in the Physics department office, room 101, Physics Building.

If you have questions about physics courses, programs, advising, or are curious about how a physics major may fit your interests, please contact one of the physics undergraduate advisors

listed below to learn about the various possibilities and to design a program to fit your specific needs. We invite you to visit the department. You can declare a physics major at any time during your studies. Even before the major declaration, contacting an advisor or lecturer might be helpful to discuss the majors, the course sequence, or to find opportunities for your own research.

Physics Major Advisors

Undergraduate Advisors	Office	Office Phone	Email Address
Stefan Baessler	Physics, room 169	243-1024	baessler@virginia.edu
Tom Gallagher	Physics, room 104	924-6599	tfg@virginia.edu
Craig Group	HEP, room 113	243-5552	rcg6p@virginia.edu
Eugene Kolomeisky	Physics, room 322	924-6809	ek6n@virginia.edu
Despina Louca	Physics, room 135	924-7956	op6n@virginia.edu
Cass Sackett	PLSB, room 104	924-6795	cas8m@virginia.edu

Physics building: 382 McCormick Road, Building 41 on this map.[1]
HEP: Building 10 on this map.[2]
PLSB: Physical and Life Sciences Building, see this page.[3]

Overview of Courses in Introductory Physics

The Physics Department offers a wide range of courses and course sequences in introductory physics available to students with no previous preparation in physics. Some satisfy specific requirements for science, engineering and premedical students, while others are intended primarily for liberal arts students. They should be considered in the following three categories:

Courses for Non-Science Majors

There are six courses (PHYS 1010, 1020, 1050, 1060, 1090 and 1110) intended particularly for students who are majoring in disciplines other than physical science. All of them count toward the College science requirement and all of them use only high-school mathematics.

PHYS 1010, 1020 – The Physical Universe [credits: 3,3] Science is becoming more and more central to our everyday life. In these two courses we want to prepare non-science major students to deal with the changing world, both at home and on the job, and to make informed choices about our environment. We hope students will experience the joy of understanding the few great principles upon which the physical sciences are based. PHYS 1010 covers physical science topics including motion, energy, waves, electricity, magnetism, and atoms, molecules, and the

[1] http://www.virginia.edu/webmap/GMcCormickRoadArea.html
[2] http://www.virginia.edu/webmap/HStadiumHereford.html
[3] https://www.facebook.com/pages/Physical-and-Life-Sciences-Building/185411224909105

nucleus. The use of math is limited, but a wide range of applications is discussed: rockets, satellites, nuclear reactors, lasers. PHYS 1020 covers physical science topics including chemistry, meteorology, geophysics, solar system, stars, and cosmology; applications are the periodic table, climate change, earthquakes, plate tectonics, fossil fuels, telescopes, solar energy, origin of universe. We expect the students to appreciate that science is a crowning achievement of the human mind that helps us to understand and shape our world.

PHYS 1050, 1060 - The Physics of How Things Work [credits 3,3] A practical introduction to physics and science in everyday life. These two courses consider objects from our daily environment and focus on their principles of operation, history and relationships to one another. In contrast to most physics courses, which are taught from the perspective of the basic laws of physics, these courses begin with the examples and develop the physical principles in the context of the examples. The courses can be taken in either order.

PHYS 1090 - Galileo and Einstein [credits: 3] This course explores two revolutions in our perception of the universe. The first, in which Galileo played the leading role, was the realization that what we see in the heavens -- the moon, the planets, the sun and stars -- are physical objects. For example, the moon has a rocky surface, not unlike some parts of earth, and is not made of some exotic ethereal substance, as had been generally believed before Galileo. This discovery led to the realization that the motions of the moon and planets obeyed the same physical laws as ordinary things moving on earth. Newton put this all together to give the first unified picture of the universe. The second revolution was Einstein's realization that this was not the whole truth -- space and time are not as straightforward as they first appear, but are related to each other in a simple but unexpected way. Among other results, this leads to the surprising consequence that mass and energy are different aspects of the same thing.

PHYS 1110 - Energy on our world and elsewhere [credits: 3] This course explores the concept of energy from a physicist's perspective. The course begins by examining the different forms that energy can assume, and moves on to examine the role that energy plays in our society. Topics will include the role that energy places in space travel and the potential colonization of space. Physics 111 is meant for students at all levels who are interested in science but hope to avoid excessive mathematics.

Introductory Physics Courses that satisfy pre-health requirements

The two-semester sequence, PHYS 2010-2020, provides a comprehensive introduction to physics without the use of calculus. These courses, together with the workshops 2030-2040, satisfy the usual requirements of medical schools. This sequence is normally taken by students who do not expect to take more advanced courses in physics.

PHYS 2010, 2020 - Principles of Physics [credits: 3,3] These courses provide an introduction to mechanics, heat, electricity and magnetism, optics and topics in modern physics. They do not require calculus, but they assume knowledge of algebra and trigonometry. Taken with the associated laboratory courses, Physics 2030, 2040, they satisfy the physics requirements for medical and dental schools.

Introductory Physics Courses for Science and Engineering

Any one of the following course sequences provides the basis for taking more advanced courses in physics and for entering a physics major or minor:

PHYS 1710, 1720, 2620 - Introductory Physics [credits: 5,5,4] This three-semester calculus-based sequence is designed to provide a broad background in introductory physics for potential physics and other science majors. This sequence is particularly appropriate for students ready to begin the study of physics during their first semester. Calculus (MATH 1320, 2310) is taken concurrently with Physics 1710, 1720. The associated laboratory courses, PHYS 2630 and PHYS 2640, are usually taken in the second year. Topics covered in PHYS 1710, 1720 include kinematics and Newton's laws, conservation principles, gravitation, frames of reference, thermodynamics, waves, sound and optics, electricity and magnetism, special relativity, elementary quantum theory, atomic and nuclear physics.

PHYS 1425, 2415 - General Physics [credits: 3,3] This is a two-semester calculus-based introductory sequence for engineering students. It covers mechanics, electricity and magnetism, heat and thermodynamics, and optics. One semester of calculus is prerequisite for PHYS 1425; the second semester of calculus is usually taken concurrently with PHYS 2415. A workshop, PHYS 1429 and 2419, is designed to be taken concurrently with Physics 1425 and 2415, respectively. Students desiring a third course covering modern physics (special relativity, quantum physics, atomic and nuclear physics) should enroll in PHYS 2620.