

# PHYSICS

## What can I do with this major?

### AREAS

Some areas of specialization follow. Most students specialize at the graduate level.

#### ACOUSTICAL PHYSICS

Development  
Testing  
Consulting  
Education

### EMPLOYERS

Colleges and universities  
Government:  
    Department of Defense  
    Naval Research Laboratory  
    Los Alamos National Laboratory  
    Lawrence Livermore National Laboratory  
Industry:  
    Medical instrumentation, bioacoustics,  
    transportation, electronics, architecture,  
    engineering, communication, musical  
Nonprofit research centers

### STRATEGIES

Supplement program with courses in engineering, environmental science, urban planning, remote sensing, physiology, performing arts, audio broadcasting, speech communication, film production, or other areas of interest.  
Seek internship experience in your specialty area.  
Stay abreast of federal, state, and local environmental regulations for the environmental impact positions.  
Become familiar with technologies used to measure/monitor noise levels.  
Obtain a graduate degree for additional opportunities in industry and education.

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#### ASTRONOMY/ASTROPHYSICS

Research  
Education  
Consulting  
Writing  
Public Relations

Colleges and universities  
Government:  
    Department of Defense  
    National Aeronautics and Space Administration  
    National Oceanic and Atmospheric Administration  
    Federal Aviation Administration  
    Naval Observatory  
    Naval Research Laboratory  
Industry:  
    Aerospace, scientific supply, computer software, remote sensing, communications  
Observatories  
Planetariums  
Science museums  
Nonprofit foundations

Plan to supplement a physics major with coursework in astrophysics, observational methods, galaxies and cosmology, computational methods, optics.  
Obtain experience through part-time or voluntary position in a planetarium, observatory, or science museum.  
Cultivate broad knowledge of astronomy and speaking skills for jobs working with the public.  
Develop strong writing skills for preparing scientific reports.  
Seek undergraduate research opportunities with professors in the field.  
Develop a specialty area of expertise such as remote sensing, instrumentation, computer applications, etc.  
Obtain a Ph.D. for teaching and advanced research positions.

**AREAS**

**EMPLOYERS**

**STRATEGIES**

**BIOPHYSICS**

Research  
Development  
Consulting

Colleges and universities  
Government:  
    National Institutes of Health  
    Department of Energy  
Industry:  
    Biotechnology, medical equipment, environmen-  
    tal, pharmaceuticals, food science, toxicology  
Nonprofit research centers  
Medical and dental schools  
Hospitals

Biophysics is considered an interdisciplinary field at the undergraduate level; most students prepare to enter by majoring in physics, chemistry, or mathematics with supplementary courses in biology or by majoring in biology, biochemistry or molecular biology with supplementary courses in chemistry, physics, and mathematics.  
Plan to specialize in an area such as experimental biophysics or computational biophysics and choose courses accordingly.  
Seek research experience through work with a professor or internships.  
Earn a bachelor's degree for most technician positions.  
Obtain advanced degree for higher-level positions in industry or academia.

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**CHEMICAL PHYSICS**

Research  
Development  
Consulting

Colleges and universities  
Government:  
    Department of Energy  
    National Institute of Standards and Technology  
    National Institutes of Health  
Industry:  
    Biotechnology, chemical, electronics, petroleum,  
    pharmaceutical

Pursue a physics, chemistry, or related major (i.e., engineering or mathematics) for preparation in this interdisciplinary field.  
Seek undergraduate research experience to develop laboratory and computer skills.  
Gain experience in physics and chemistry fields, as most researchers practice in both over the course of a career.  
Become familiar with the various forms of spectroscopy.  
Obtain advanced degree for more opportunities in industry, research, or education.

## AREAS

## EMPLOYERS

## STRATEGIES

### CONDENSED MATTER

Research  
Development  
Consulting

Colleges and universities  
Government:  
National Aeronautics and Space Administration  
Department of Defense  
Department of Energy  
Electronics industry:  
Microprocessors, magnetic imaging, communications, automotive, navigation/guidance systems

Condensed matter physics is the largest sub-field of physics and is closely related to other fields including materials science and chemistry. Develop strong mathematical and computer science skills through coursework studying physical, electronic and magnetic properties of matter. Seek research experience through internships or by assisting faculty with projects. Acquire advanced degree for opportunities in industry, research, or education. Become familiar with various forms of characterization techniques such as optical and electron spectroscopy and neutron scattering.

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### ENGINEERING PHYSICS

Engineering (Process and Testing)  
Research  
Quality Control  
Development  
Instrumentation  
Consulting

Colleges and universities  
Government:  
National Aeronautics and Space Administration  
Department of Commerce  
Department of Defense  
Industry:  
High technology, chemical, aerospace, agriculture, energy, fuel, computer, transportation  
Engineering firms  
Manufacturing and processing firms  
Hospitals

Choose a major in engineering physics or supplement physics major with engineering minor, all of which require proficiency in mathematics and problem solving. Seek internship or co-op experience in interest area. Develop strong oral and written communication skills for working on interdisciplinary teams. Complete applicable licensure through professional organizations which is regulated by state in the engineering profession. Pursue advanced degree in engineering, engineering physics, or physics for increased opportunities.

## AREAS

## EMPLOYERS

## STRATEGIES

### **GEOPHYSICS**

Research  
Development  
Environmental Consulting  
Law

Colleges and universities  
Government:  
    State and Federal Geological Survey  
    Army Corps of Engineers  
    National Oceanic and Atmospheric Administration  
    Naval Oceanographic Office  
Industry:  
    Petroleum, mining, hydrogeology  
Nonprofit research centers  
Consulting firms  
Law firms

Specialize in geophysics at the undergraduate level or supplement physics degree with geology major or minor.  
Develop solid mathematics, chemistry, engineering, and physics knowledge.  
Plan to develop skills in computer modeling, data analysis, digital mapping. Oral and written communication competence is integral for sharing reports with interdisciplinary teammates/clients.  
Seek experience with national labs or industry researching specializations of interest.  
Take business classes for increased marketability in advanced prospecting positions (risk analysis for drilling, mining, exploration).  
Maintain physical condition and be open to travel.

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### **MEDICAL/HEALTH PHYSICS**

Research  
Development  
Clinical Service  
Consulting  
Monitoring  
Enforcement

Colleges and universities  
Hospitals, clinics, medical centers  
Government:  
    Department of Defense  
    Department of Energy  
    Nuclear Regulatory Commission  
    Department of Health and Human Services  
Industry:  
    Medical instrumentation, nuclear power, waste management/disposal, food irradiation, petroleum  
Nonprofit research centers  
Environmental firms

Gain experience with air/water testing techniques and analysis and radiation detection instruments.  
Develop strong communication skills for training, protecting and collaborating with radiation workers, members of the general public and with physicians in healthcare settings. Seek certification from the National Registry of Radiation Protection Technologists for some positions.  
Maintain current knowledge of government standards and regulations.  
Learn medical uses of radiation for work in the healthcare industry involving the protection, education, training of others.  
Pursue medical physics certification offered by the American board of Radiology or the American Board of Medical Physics or health physics certification offered by the American Board of Health Physics, depending on your specialty.  
Earn a master's degree or Ph.D. for university teaching, research, and healthcare positions.  
Gain experience at a hospital or clinic to prepare for work in healthcare settings; clinical residency or postdoctoral work in a hospital may be required.

<b>AREAS</b>	<b>EMPLOYERS</b>	<b>STRATEGIES</b>
<b><u>NUCLEAR PHYSICS</u></b> Research Development Consulting Instrumentation	Colleges and universities Government: Department of Defense Department of Energy Department of Homeland Security Industry: Security/weapons, nuclear accelerators, nuclear reactors, nuclear instrumentation, radioisotope products, healthcare, environmental protection, food irradiation	Acquire a strong background of physics, mathematics, and computer science knowledge. Develop competence in experimental design, data collection, and data analysis. Choose a theoretical or experimental track and seek internship experience in industry, government, or academic settings alongside scientists and faculty. Pursue master's degree or Ph.D. for advanced positions in industry.
<b><u>OPTICAL PHYSICS</u></b> Research Development Consulting	Colleges and universities Government: National Aeronautical and Space Administration Department of Energy Department of Defense Industry: Medical scanners, eyeglasses, binoculars, microscopes, lasers, holography, display technologies, X-ray, ultraviolet spectra, fiber optics Nonprofit research centers	Prepare to study the behavior and properties of light including the generation and detection, linear and nonlinear optical processes, and spectroscopy. Supplement physics program with courses in electricity, magnetism, quantum mechanics, and electronics. Gain experience in the optics field through internships in industry or research with professors. Obtain a master's degree for positions in industry which largely consists of the design and manufacturing of devices.
<b><u>PARTICLE/HIGH ENERGY PHYSICS</u></b> Research Consulting Instrumentation Operations and Maintenance	Colleges and universities Government: Department of Energy Lawrence Berkeley National Lab Nonprofit research centers	Plan to study the most fundamental aspects of the universe if pursuing this physics specialty. Acquire a strong mathematics and computer science background. Scientific computing and data analysis skills are essential. Choose a theoretical or experimental track and seek research experience through work at national labs or with faculty. Pursue Ph.D. for advanced positions in academia and research.

## AREAS

## EMPLOYERS

## STRATEGIES

### **SCIENCE EDUCATION**

Teaching  
Computer Software Development  
Educational Research  
Writing and Editing  
Library and Information Sciences

Public school systems, K-12  
Private schools, K-12  
Publishing companies:  
    Books, magazines, videos  
Software developers  
Libraries

Develop excellent communication skills, verbal and written, for interacting with students, colleagues, and parents.  
Gain experience working with age group of interest through volunteering and tutoring.  
Become skilled in the use of computers and laboratory equipment.  
Join the American Association of Physics Teachers for current information on the field and networking opportunities.  
Acquire appropriate certification for K-12 teaching opportunities. Due to a shortage of physical science teachers, there are alternative certification programs across the country for those with science and mathematics backgrounds.  
Seek advanced degree required for specialists, education administration, college teaching, and other professional positions.

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### **GENERAL INFORMATION**

- Physicists are interested in solving complex, technical problems, often extending for long periods of time.
- Visit government laboratories or research centers to learn more about opportunities in the field. Schedule informational interviews to learn about the profession and specific career paths.
- Join relevant professional associations. Attend meetings and stay up-to-date on research/publications.
- Acquire excellent oral, written, and interpersonal skills for sharing findings and collaborating with interdisciplinary teams
- Gain experience using scientific instruments and equipment. Computer skills are critical.
- Participate in summer research institutes. Submit research to local poster competitions or research symposiums.
- A willingness to relocate is helpful due to limited opportunities in specialized areas.
- A bachelor's degree will qualify for positions as research assistants, high-level technicians, or computer specialists, as well as nontechnical work in publishing or sales.
- An undergraduate degree also provides a solid background for pursuing advanced degrees in other employment areas such as law, business, or accounting.
- A graduate degree and post-graduate experience will allow for more responsibility and advancement in the field of physics.
- An earned doctorate is required for college or university teaching, advanced research, and administrative positions.
- Become familiar with the government job application process for positions in federal, state, or local government. Seek assistance from your career center professionals.