PHYSICS (BS)

CIP: 40.0801

Program Description

Physics is a broad discipline, ranging from fundamental scientific questions to sophisticated technological applications. At its most basic, it is the study of matter and energy and their manifold interactions. Physicists study topics as wide-ranging as the underlying nature of space and time; the origins, large-scale structure, and future evolution of the universe; the behavior of stars and galaxies; the fundamental constituents of matter; the many different patterns in which matter is organized, including superconductivity, liquid crystals, or the various forms of magnetism in solids; the workings of biological matter, whether in molecules such as DNA, or cellular structures, or the transport of matter and energy in and across cells; and many others. Basic physics research has led to myriad technological advances, which have transformed society in the 20th century through the present day; a small list includes: radio and television; computers; lasers; X-rays; magnetic resonance imaging and CAT scans; and the World Wide Web.

Physics is a hands-on discipline, and our students gain expertise not only in the classroom but also in the laboratory. They may participate in activities ranging from the writing of realistic computer modeling of fundamental physical principles to the modeling of financial activities, as well as the more traditional activities of physicists and mathematicians. Those trained in physics are found in many occupations, such as various fields of engineering, computer technology, health, environmental and earth sciences, communications, finance, and science writing. A higher degree opens the possibility of creative research in industry, or teaching and research in colleges and universities. Outstanding and highly motivated students are offered special opportunities for honors work, independent study, summer laboratory research, internships, and other enhancements. Our interdisciplinary approach and experimental work is geared to meet the current demand for scientists with well-integrated backgrounds who became the leaders in modern scientific scholarship and who pursue careers in research, education, industry, health care, business, and publishing.

Admissions

New York University's Office of Undergraduate Admissions supports the application process for all undergraduate programs at NYU. For additional information about undergraduate admissions, including application requirements, see How to Apply (https://www.nyu.edu/admissions/undergraduate-admissions/how-to-apply.html).

Program Requirements

Course	Title	Credits
Core Courses		
Social and Cultural Foundations		
CCSF-SHU 101L	Global Perspectives on Society	4
Interdisciplinary Perspectives on China (Two Courses)		8
Writing		
WRIT-SHU 102	Writing as Inquiry	4
WRIT-SHU 201	Perspectives on the Humanities	4
Language		
Language Courses		8-16
Mathematics		
MATH-SHU 131	Calculus	4
Algorithmic Thinking		
Algorithmic Thinking Course		4
Science		
Experimental Discovery in the Natural World Requirement Fulfilled by Major Coursework		
Science, Technology, and Society Requirement Fulfilled by Major Coursework		
Major Requirements		
Foundational Courses		
CHEM-SHU 125	Foundations of Chemistry I	3
CHEM-SHU 126	Foundations of Chemistry II	3
CHEM-SHU 127	Foundations of Chemistry I Lab	2
or CHEM-SHU 128	Foundations of Chemistry II Lab	
PHYS-SHU 11	General Physics I	3
or PHYS-SHU 91	Foundations of Physics I Honors	
PHYS-SHU 93	Foundations of Physics II Honors	3
PHYS-SHU 95	Foundations of Physics III Honors	3
PHYS-SHU 96	Foundations of Physics IV Honors	3
PHYS-SHU 71	Foundations of Physics Lab I	2
PHYS-SHU 94	Foundations of Physics Lab II	2
Required Courses		
MATH-SHU 140	Linear Algebra	4
MATH-SHU 151	Multivariable Calculus	4
MATH-SHU 235	Probability and Statistics	4
PHYS-SHU 106	Mathematical Physics	4
PHYS-SHU 251	Electricity and Magnetism	4
PHYS-SHU 302	Statistical Mechanics and Thermodynamics	4
PHYS-UA 123	Quantum Mechanics I	3
PHYS-SHU 303	Advanced Physics Laboratory	4
PHYS-SHU 998	Integrated Science Capstone	4
Physics Electives		
Select three of the following:		11
PHYS-SHU 135	Solid-State Physics	
PHYS-SHU 201	Introduction to Quantum Computing	
PHYS-GA 7001	Introduction to Quantum Communication	
Other Elective Credits		16-25
Total Credits		**128**

Sample Plan of Study

Course	Title	Credits
1st Semester/Term		
CCSF-SHU 101L	Global Perspectives on Society	4
MATH-SHU 131	Calculus	4
PHYS-SHU 91	Foundations of Physics I Honors	3
PHYS-SHU 71	Foundations of Physics Lab I	2
CHEM-SHU 125	Foundations of Chemistry I or Core Language Course	3 or 4
	Credits	**16-17**
2nd Semester/Term		
WRIT-SHU 102	Writing as Inquiry	4

MATH-SHU 151	Multivariable Calculus	4
PHYS-SHU 93	Foundations of Physics II Honors	3
PHYS-SHU 94	Foundations of Physics Lab II	2
CHEM-SHU 126	Foundations of Chemistry II or Core Language Course	3 or 4
	Credits	**16-17**
3rd Semester/Term		
WRIT-SHU 201	Perspectives on the Humanities	4
MATH-SHU 140	Linear Algebra	4
PHYS-SHU 95	Foundations of Physics III Honors	3
CHEM-SHU 127 or CHEM-SHU 125	Foundations of Chemistry I Lab or Foundations of Chemistry I	2 or 3
MATH-SHU 235	Probability and Statistics	4
	Credits	**17-18**
4th Semester/Term		
PHYS-SHU 96	Foundations of Physics IV Honors	3
PHYS-SHU 106	Mathematical Physics	4
CHEM-SHU 126	Foundations of Chemistry II	3
Chinese or EAP		4
	Credits	**14**
5th Semester/Term		
PHYS-SHU 251	Electricity and Magnetism	4
PHYS-UA 123	Quantum Mechanics I	3
Physics Elective		4
Chinese or General Elective		4
	Credits	**15**
6th Semester/Term		
PHYS-SHU 302	Statistical Mechanics and Thermodynamics	4
Physics Elective		4
General Elective		4
Chinese or General Elective		4
	Credits	**16**
7th Semester/Term		
PHYS-SHU 998	Integrated Science Capstone	4
Physics Elective		4
Core Course or General Elective		4
Core Course or General Elective		4
	Credits	**16**
8th Semester/Term		
PHYS-SHU 303	Advanced Physics Laboratory	4
Core Course or General Elective		4
General Elective		4
General Elective		4
General Elective		2
	Credits	**18**
	Total Credits	**128-131**

Learning Outcomes

Upon successful completion of this program, students will:

1. Demonstrate an understanding of core knowledge in physics and also apply these concepts, knowledge and numerical techniques to new situations or datasets to solve problems.
2. Synthesize data (e.g., from experiments or observations) by designing and executing scientific experiments, and conducting relevant statistical tests.
3. Construct models that describe how physical phenomena occur by analyzing scientific data.
4. Effectively communicate their problem-solving rationale or research work in spoken, visual and written form.
5. Critically evaluate their own works, as well as those of their peers and works from the current literature in physical sciences.
6. Display routine practice of laboratory safety, including performing risk assessments, following established safety protocols, using appropriate personal protective equipment, and maintaining detailed laboratory notebooks.

Policies

Program Policies

1. Students who did not attend a Chinese-medium high school fulfill the Core language requirement by demonstrating proficiency of the Chinese language through the Intermediate level. Chinese speakers who did not attend an English-medium high school fulfill the Core language requirement through completion of EAP-SHU 100 English for Academic Purposes I and EAP-SHU 101 English for Academic Purposes II . Additional information can be found on the NYU Shanghai Core Curriculum page (https://bulletins.nyu.edu/undergraduate/shanghai/core-curriculum/#text).
2. A note on the relationship between General Physics and Foundations of Physics Honors: General Physics I & II is a calculus-based course for pre-meds, engineers and others who want a broad introduction and survey of basic physics including classical mechanics, electricity and magnetism, optics and waves, and thermal and statistical physics. Foundations of Physics I-IV Honors covers a similar set of topics in considerably greater depth, plus special relativity and an introduction to quantum mechanics, over four semesters. It should be emphasized that Foundations of Physics I & II Honors alone do not include some important topics, such as optics, thermal and statistical physics, which are included in Foundations of Physics III Honors, and introduction to quantum mechanics and condensed matter physics in Foundations of Physics IV Honors. Therefore, students electing to take the Honors Physics track are highly recommended to take Foundations of Physics III Honors and Foundations of Physics IV Honors as well.
3. Students who have taken General Physics I and received a B+ or better grade also satisfy the prerequisite to take Foundations of Physics II Honors. Such students may also become Physics Majors and do not have to retake Foundations of Physics I Honors. However, students who already are interested in majoring in Physics, as well as those interested in the honors track, or those with a strong high-school background in physics and mathematics are strongly recommended to take Foundations of Physics I-IV Honors.

Prerequisite Courses for Declaring a Major

Final grade of C/ current semester midterm grade of B or higher in Foundations of Physics II.

Minimum GPA

Physics, Chemistry and Electrical Engineering majors' students must achieve and maintain a minimum 3.0 cumulative and major GPA in order to declare the major. Since they are required to study away in NY or AD for their junior year in order to complete major coursework offered at those campuses, they must complete all of the prerequisite courses at NYU Shanghai for the junior year major classes they need to take in New York or AD before they will be admitted to study away. If declared majors fail to maintain a 3.0 GPA or do not complete the required courses during study away, they may be required to declare a different major to be able to graduate.

NYU Policies

University-wide policies can be found on the New York University Policy pages (https://bulletins.nyu.edu/nyu/policies/).

NYU Shanghai Policies

Additional academic policies can be found on the NYU Shanghai Academic Policies page (https://bulletins.nyu.edu/undergraduate/shanghai/academic-policies/).