PHYSICS, BACHELOR OF SCIENCE

Physics Major Requirements (B.S.)

(See also Requirements for a Bachelor's Degree (https://e-catalogue.jhu.edu/ksas-wse/undergraduate-policies/academic-policies/requirements-bachelors-degree/).)

The major program is structured so that nearly all students take the same classes during the first two years and must complete the same list of core upper-level courses during their second two years, but permits a variety of choices in upper-level electives. The total number of credits required for the B.S. in Physics degree is 126. By the end of the four years our students share an understanding of classical mechanics, electromagnetism, statistical physics and quantum mechanics, and have acquired physics lab skills that will support them in graduate school or in a host of other pursuits.

A grade of C- or higher is required for a course to be counted towards major requirements. This includes required math courses. An exception for a single course taken in the year before graduation may be granted by the Director of Undergraduate Studies under extenuating circumstances.

Core Courses

Mathematics

The standard mathematics requirements for all physics majors consist of:

Code	Title	Credits
AS.110.108	Calculus I (Physical Sciences & Engineering)	4
AS.110.109	Calculus II (For Physical Sciences and Engineering)	4
or AS.110.113	Honors Single Variable Calculus	
AS.110.202	Calculus III	4
or AS.110.211	Honors Multivariable Calculus	
AS.110.302	Differential Equations and Applications	4
AS.110.201	Linear Algebra	4
or AS.110.212	Honors Linear Algebra	
Total Credits		**20**

Physics

The standard physics requirements for all physics majors matriculating on or after September 2024 consist of:

Code	Title	Credits
AS.171.105	Classical Mechanics I	4
AS.173.115	Classical Mechanics Laboratory	1
AS.171.106	Electricity and Magnetism I	4
AS.173.116	Electricity and Magnetism Laboratory	1
AS.171.201	Special Relativity/Waves	4
AS.171.204	Classical Mechanics II	4
AS.171.312	Statistical Physics/Thermodynamics	4
AS.172.203	Contemporary Physics Seminar	1
AS.171.301	Electromagnetic Theory II	4
AS.171.303	Quantum Mechanics I	4
AS.171.304	Quantum Mechanics II	4
or AS.171.418	Introduction to Topics in Contemporary Physics	
AS.173.308	Advanced Physics Laboratory	3
Total Credits		**38**

Additional Requirements

Code	Title	Credits
Four Additional Elective Courses		
Three Courses in One Area		9-11
One Additional Course		3
Total Credits		**12-14**

* For the B.S. in Physics four (4) additional courses (at least 3 credits each) at the 200-600 level in the following departments: Physics and Astronomy (171), Biology (020), Biophysics (250), Chemistry (030), Cognitive Science (050), Earth and Planetary Sciences (270), Mathematics (110), Neuroscience (080) and/or the School of Engineering. Focus areas in the School of Engineering allowed are Applied Mathematics & Statistics (553), Biomedical Engineering (580), Chemical & Biomolecular Engineering (540), Civil Engineering (560), Computer Science (601), Electrical Engineering (520), Environmental Engineering (570), Materials Science (510), and Mechanical Engineering (530). These courses must constitute a coherent and rigorous program of study approved by the Departmental Advisor and Director of Undergraduate Studies no later than the registration period for the fall semester of the senior year. At least three (3) of these courses must be taken within a single department or program in the Krieger School of Arts and Sciences or the Whiting School of Engineering (note: called "Department elective" in the Sample Program of Study). One (1) semester of research may be used as one elective.

Note: AS.171.101 General Physics: Physical Science Major I-AS.171.102 General Physics: Physical Science Major II**,** AS.171.103 General Physics I for Biological Science Majors-AS.171.104 General Physics/Biology Majors II **or** AS.171.107 General Physics for Physical Sciences Majors (AL)-AS.171.108 General Physics for Physical Science Majors (AL) **with their labs is acceptable in place of** AS.171.105 Classical Mechanics I-AS.171.106 Electricity and Magnetism I**,** AS.173.115 Classical Mechanics Laboratory-AS.173.116 Electricity and Magnetism Laboratory.

Writing and Communication in the Major

Students must complete at least 6 credits of Writing and Communication foundational ability coursework in one major. For this major, students would be able to fulfill this requirement by completing the two first year laboratory courses AS.173.115 Classical Mechanics Laboratory (1 credit) and AS.173.116 Electricity and Magnetism Laboratory (1 credit), AS.172.203 Contemporary Physics Seminar (1 credit), and AS.173.308 Advanced Physics Laboratory (3 credits). Students who do not take AS.173.115 and/or AS.173.116 may complete this requirement by taking another course within the major that is designated as a Writing and Communication course.

Sample Program of Study

A typical B.S. in Physics program might include the following sequence of courses:

***Note: Because students arrive with a wide range of mathematical preparation, each student should consult the Department of Mathematics to determine the best individual plan.**

First Year			
First Semester	**Credits**	**Second Semester**	**Credits**
AS.171.105	4	AS.171.106	4
AS.173.115	1	AS.173.116	1
AS.110.108	4	AS.110.109	4
	9		**9**
Second Year			
First Semester	**Credits**	**Second Semester**	**Credits**
AS.172.203	1	AS.171.204	4
AS.171.201	4	AS.171.312	4
AS.110.202 or 211	4	AS.110.201 or 212	4
AS.110.302	4		
	13		**12**
Third Year			
First Semester	**Credits**	**Second Semester**	**Credits**
AS.171.301	4	AS.171.304 or 418	4
AS.171.303	4	AS.173.308	3
Department elective #1	3-4	Department elective #2	3-4
	11-12		**10-11**
Fourth Year			
First Semester	**Credits**	**Second Semester**	**Credits**
Department elective #3	3	Additional major elective	3
	3		**3**

Total Credits 70-72

Honors in the Major

Honors in Physics is granted to graduating students who achieve a GPA of 3.5 or higher in all courses taken to fulfill the major requirements.

Senior Thesis

Any student majoring in the department may write a senior thesis, based on original research conducted under the supervision of a member of the faculty. Arrangements for this research will be made on an individual basis. The department views the writing of a senior thesis as an excellent capstone experience to an undergraduate education in physics, and encourages all students to consider it.