Bachelor of Science

Physics with a Major in Astrophysics (BS)

The Bachelor of Science in physics with a major in astrophysics is designed primarily for students preparing to do graduate study in astrophysics and related fields.

Requirements

Lower-Division General Education

Written Communication (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#written)	6
Oral Communication (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#oral)	3
Mathematics (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#math)	3
Language and Culture (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#language)	0-6
Information Literacy and Research (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#information)	3
Human Behavior (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#behavior)	3
Human Creativity (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#creativity)	3
Interpreting the Past (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#interpret)	3
Literature (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#literature)	3
Philosophy and Ethics (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#philosophy)	3
The Nature of Science (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#nature)	8
Impact of Technology (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#impact)	3

Mathematics: Satisfied by the major

Information Literacy and Research: CS 120G or CS 121G or OEAS 130G

Nature of Science: satisfied by the major

Upper-Division General Education

- Option A. Approved Disciplinary Minor (a minimum of 12 hours determined by the department), or second degree or second major.
- Option B: Interdisciplinary Minor (specifically 12 hours, 3 of which may be in the major)
- Option C. An approved Certification Program such as teaching licensure
- Option D. Two Upper-Division Courses from outside the College of Sciences and not required by the major (6 hours)

Requirements for Graduation

All majors for the BS degree in physics require completion of a minimum of 120 credit hours (150 credit hours for the dual degree in physics and electrical engineering and the dual degree in physics and the Master of Business Administration), which must include both a minimum of 30 credit hours overall and 12 credit hours in upper-level courses in the major program from Old Dominion University, completion of ENGL 110C, ENGL 211C or ENGL 231C, and the writing intensive (W) course in the major with a grade of C or better, and Senior Assessment. Additionally, physics majors require completion of the Physics Exit Exam with a minimum score of 20th percentile, and the astrophysics major requires completion of the Astrophysics Exit Exam with a minimum score of 20th percentile. Additional hours may be required to meet the foreign language requirement. All majors require a minimum grade of C in PHYS 261N-PHYS 262N, PHYS 231N-PHYS 232N, or PHYS 226N-PHYS 227N. Except for the secondary physics education major, physics majors require a minimum cumulative grade point average of 2.00 overall and in the major. The secondary physics education major requires a minimum 2.75 grade point average overall, in the major, and in the professional education core, with no grade less than a C- in the major and professional education core. The professional education core satisfies the upper-level general education requirement.

Math Minor

Astrophysics majors wishing to complete a minor in applied mathematics can do so with just two additional math courses. Please consult the Department of Mathematics section of the Catalog for details.

Astrophysics Major

General Education		
Complete lower-division requirements		30-36
Complete upper-division requirements (minimum of 6 credit hours)		6
Astrophysics		
MATH 211	Calculus I	4
MATH 212	Calculus II	4
MATH 312	Calculus III	4
or MATH 285	Transfer Credit for Calculus III	
MATH 307	Ordinary Differential Equations	3
or MATH 280	Transfer Credit for Ordinary Differential Equations	
Select one of the following:		3
MATH 316	Introductory Linear Algebra	
MATH 401	Partial Differential Equations	
MATH 421	Applied Mathematics II: Mathematical Modeling	
MATH 422	Applied Complex Variables	
CHEM 121N & CHEM 122N	Foundations of Chemistry I Lecture and Foundations of Chemistry I Laboratory	4
CS 151	Introduction to Programming with Java	4
or CS 153	Introduction to Programming with Python	
Select one of the following:		4
ASTP 103N	Introductory Astronomy of the Solar System	
ASTP 104N	Introductory Astronomy of Galaxies and Cosmology	
PHYS 120	Physics in the 21st Century	1
or PHYS 309	Physics on the Back of an Envelope	
PHYS 261N	Advanced University Physics I	4
or PHYS 231N	University Physics I	
or PHYS 226N	Honors: University Physics I	
PHYS 262N	Advanced University Physics II	4
or PHYS 232N	University Physics II	
or PHYS 227N	Honors: University Physics II	
PHYS 303	Intermediate Experimental Physics	3
PHYS 319	Analytical Mechanics	3
PHYS 323	Modern Physics	3
PHYS 355	Mathematical Methods of Physics	3
PHYS 420	Introductory Computational Physics	3
PHYS 425	Electromagnetism I	3
PHYS 452	Introduction to Quantum Mechanics	3
PHYS 454	Thermal and Statistical Physics	3
PHYS 499W	Senior Thesis *	3
or PHYS 489W & PHYS 490W	Senior Thesis I and Senior Thesis II	
ASTP 313	Elements of Astrophysics	3
ASTP 414	Relativity and Cosmology	3

Select two of the following:		6
PHYS 413	Methods of Experimental Physics	
PHYS 453	Electromagnetism II	
PHYS 456	Intermediate Quantum Mechanics	
ASTP 495	Special Topics in Astrophysics (Exoplanets / Atmospheric Spectroscopy / Satellite Remote Sensing)	3
Total Credit Hours		**117-123**

* Grade of C or better required in PHYS 499W or both PHYS 489W and PHYS 490W

Elective Credit

Elective credit may be needed to meet the minimum requirement of 120 credit hours.

BS Degree with Honors

Qualified students may receive the BS degree with honors (to be noted on their diplomas) by completing specified additional requirements. At the time of application for this designation, a student must have a GPA of 3.50 or higher in physics, a GPA of 3.25 or higher overall, must have completed two contract honors courses, and must have completed 60 credit hours (of which at least 54 must be in grade-point graded courses) at Old Dominion University. (Contract honors courses are specialized courses of individual study under the direct supervision of a professor. Permission to take these courses is granted jointly by the Department of Physics and the Honors College.)

Degree Program Guide

The Degree Program Guide is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Course	Title	Credit Hours
Freshman		
Fall		
ENGL 110C	English Composition (Grade of C or better required)	3
MATH 211	Calculus I	4
CHEM 121N and CHEM 122N		4
Elective or Language & Culture I (May be waived; See requirement details)		3
	Credit Hours	**14**
Spring		
MATH 212	Calculus II	4
Select one of the following:		4
PHYS 261N	Advanced University Physics I	
PHYS 231N	University Physics I	
PHYS 226N	Honors: University Physics I	
ASTP 103N or ASTP 104N	Introductory Astronomy of the Solar System or Introductory Astronomy of Galaxies and Cosmology	4
ELective or Language & Culture II (May be waived; See requirement details)		0-3
	Credit Hours	**12-15**
Sophomore		
Fall		
ENGL 211C or ENGL 231C (Grade of C or better required)		3
MATH 312 or MATH 285		4
Select one of the following:		4
PHYS 262N	Advanced University Physics II	
PHYS 232N	University Physics II	
PHYS 227N	Honors: University Physics II	
Select one of the following:		3
CS 120G	Introduction to Information Literacy and Research	
CS 121G	Introduction to Information Literacy and Research for Scientists	
OEAS 130G	Research Skills and Information Literacy for the Natural Sciences	
Oral Communication		3
	Credit Hours	**17**
Spring		
PHYS 319	Analytical Mechanics	3
MATH 307 or MATH 280		3
CS 151 or CS 153	Introduction to Programming with Java or Introduction to Programming with Python	4
PHYS 120 or PHYS 309 *		1
Human Creativity		3
Interpreting the Past		3
	Credit Hours	**17**
Junior		
Fall		
PHYS 355	Mathematical Methods of Physics	3
PHYS 303	Intermediate Experimental Physics	3
PHYS 323	Modern Physics	3
PHYS 425	Electromagnetism I	3
Literature		3
	Credit Hours	**15**
Spring		
ASTP 313	Elements of Astrophysics *	3
Select one of the following:		3
PHYS 413	Methods of Experimental Physics	
PHYS 453	Electromagnetism II *	
PHYS 456	Intermediate Quantum Mechanics *	
PHYS 499W or PHYS 489W & PHYS 490W (Grade of C or better required)		3
Select one of the following:		3
MATH 316	Introductory Linear Algebra	
MATH 401	Partial Differential Equations	
MATH 421	Applied Mathematics II: Mathematical Modeling	
MATH 422	Applied Complex Variables	

Human Behavior		3
	Credit Hours	**15**
Senior		
Fall		
PHYS 452	Introduction to Quantum Mechanics	3
PHYS 420	Introductory Computational Physics	3
ASTP 414	Relativity and Cosmology	3
Impact of Technology		3
Upper-Division General Education Course (Option D)		3
	Credit Hours	**15**
Spring		
Select one of the following:		3
PHYS 413	Methods of Experimental Physics	
PHYS 453	Electromagnetism II *	
PHYS 456	Intermediate Quantum Mechanics *	
PHYS 454	Thermal and Statistical Physics	3
Philosophy and Ethics		3
ASTP 495	Special Topics in Astrophysics	3
Upper-Division General Education Course (Option D)		3
	Credit Hours	**15**
	Total Credit Hours	**120-123**

*PHYS 120 and PHYS 420 are offered fall semester only. ASTP 313, PHYS 309, PHYS 453, and PHYS 456 are offered spring semester only.