Bachelor of Science

Physics (BS)

The Physics major is designed primarily for students preparing to do graduate study in physics and related fields or for students preparing to work professionally upon completion of the BS degree in various technical fields requiring the strongest preparation in physics.

Requirements

Lower-Division General Education

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Communication</td>
<td>6</td>
</tr>
<tr>
<td>Oral Communication</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>Language and Culture</td>
<td>0-6</td>
</tr>
<tr>
<td>Information Literacy and Research</td>
<td>3</td>
</tr>
<tr>
<td>Human Behavior</td>
<td>3</td>
</tr>
<tr>
<td>Human Creativity</td>
<td>3</td>
</tr>
<tr>
<td>Interpreting the Past</td>
<td>3</td>
</tr>
<tr>
<td>Literature</td>
<td>3</td>
</tr>
<tr>
<td>Philosophy and Ethics</td>
<td>3</td>
</tr>
<tr>
<td>The Nature of Science</td>
<td>8</td>
</tr>
<tr>
<td>Impact of Technology</td>
<td>3</td>
</tr>
</tbody>
</table>

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

Physics Major

General Education

Complete lower-division requirements: 30-36

Complete upper-division requirements (minimum of 6 credit hours): 6

Physics Major

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 211 Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 212 Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 312 Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 261N University Physics I</td>
<td>4</td>
</tr>
<tr>
<td>or PHYS 231N University Physics I</td>
<td>3</td>
</tr>
<tr>
<td>or PHYS 226N Honors: University Physics I</td>
<td>4</td>
</tr>
</tbody>
</table>

Select one of the following:

- MATH 316 Introductory Linear Algebra
- MATH 401 Partial Differential Equations
- MATH 421 Applied Mathematics II: Mathematical Modeling
- MATH 422 Applied Complex Variables
- CHEM 121N Foundations of Chemistry I Lecture
- CHEM 122N Foundations of Chemistry I Laboratory
- CHEM 123N Foundations of Chemistry II Lecture
- CHEM 124N Foundations of Chemistry II Laboratory
- PHYS 261N Advanced University Physics I
- or PHYS 231N University Physics I
- or PHYS 226N Honors: University Physics I
- CS 151 Introduction to Programming with Java
- or CS 153 Introduction to Programming with Python
- PHYS 262N Advanced University Physics II
- or PHYS 232N University Physics II
- or PHYS 227N Honors: University Physics II
- PHYS 303 Intermediate Experimental Physics
- PHYS 319 Analytical Mechanics
- PHYS 323 Modern Physics
- PHYS 355 Mathematical Methods of Physics
- PHYS 413 Methods of Experimental Physics
- PHYS 420 Introductory Computational Physics
- PHYS 425 Electromagnetism I
- PHYS 452 Introduction to Quantum Mechanics
- PHYS 453 Electromagnetism II
- PHYS 454 Thermal and Statistical Physics
- PHYS 456 Intermediate Quantum Mechanics
- PHYS 499W Senior Thesis
- or PHYS 489W Senior Thesis I
- & PHYS 490W Senior Thesis II
- PHYS 120 Physics in the 21st Century
- or PHYS 309 Physics on the Back of an Envelope
- or ECE 111 Information Literacy and Research for Electrical and Computer Engineering

Select two of the following: ** 6
ASTP 313  Elements of Astrophysics
PHYS 411  Introduction to Atomic Physics
ASTP 414  Relativity and Cosmology
PHYS 415  Introduction to Nuclear and Particle Physics
PHYS 416  Introduction to Solid State Physics
PHYS 417  Introduction to Particle Accelerator Physics

Total Credit Hours  117-124

*  Grade of C or better required in PHYS 499W or both PHYS 489W and PHYS 490W
**  ECE 111 is for students considering Physics Track D.
***  With at least three credits at the 400-level.

E 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
Oral Communication 3
Language & Culture I (May be waived; See requirement details) 0-3

Credit Hours 14-17

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
CHEM 123N and CHEM 124N 4
Philosophy and Ethics 3
Language & Culture II (May be waived; See requirement details) 0-3

Credit Hours 15-18

Sophomore
Fall
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
ENGL 211C or ENGL 231C (Grade of C or better required) 3
Impact of Technology 3
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

Credit Hours 17

Spring
PHYS 319 Analytical Mechanics 3
CS 151 or CS 153 Introduction to Programming with Java or Introduction to Programming with Python 4
MATH 307 or MATH 280 3
Select one of the following: 1-2
PHYS 120 Physics in the 21st Century *
PHYS 309 Physics on the Back of an Envelope *
ECE 111 Information Literacy and Research for Electrical and Computer Engineering

Human Creativity 3

Credit Hours 14-15

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
PHYS 413 Methods of Experimental Physics 3
PHYS 453 Electromagnetism II * 3
Select one of the following: 3
ASTP 313 Elements of Astrophysics *
PHYS 411 Introduction to Atomic Physics
PHYS 415 Introduction to Nuclear and Particle Physics
PHYS 416 Introduction to Solid State Physics

Credit Hours
### Physics (BS)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 417</td>
<td>Introduction to Particle Accelerator Physics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 316</td>
<td>Introductory Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 401</td>
<td>Partial Differential Equations</td>
<td></td>
</tr>
<tr>
<td>MATH 421</td>
<td>Applied Mathematics II: Mathematical Modeling</td>
<td></td>
</tr>
<tr>
<td>MATH 422</td>
<td>Applied Complex Variables</td>
<td></td>
</tr>
<tr>
<td>Human Behavior</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

**Senior**

**Fall**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 420</td>
<td>Introductory Computational Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 452</td>
<td>Introduction to Quantum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 489W or PHYS 499W</td>
<td>1-3</td>
<td></td>
</tr>
</tbody>
</table>

Interpreting the Past | 3

Upper-Division General Education Course (Option D) | 3

Elective (if needed) | 3

**Spring**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 456</td>
<td>Intermediate Quantum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 454</td>
<td>Thermal and Statistical Physics</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one of the following: | 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTP 414</td>
<td>Relativity and Cosmology</td>
<td></td>
</tr>
<tr>
<td>PHYS 411</td>
<td>Introduction to Atomic Physics</td>
<td></td>
</tr>
<tr>
<td>PHYS 415</td>
<td>Introduction to Nuclear and Particle Physics</td>
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<tr>
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<td></td>
</tr>
<tr>
<td>PHYS 417</td>
<td>Introduction to Particle Accelerator Physics</td>
<td></td>
</tr>
<tr>
<td>PHYS 499W or PHYS 499W</td>
<td>2-3</td>
<td></td>
</tr>
</tbody>
</table>

Upper-Division General Education Course (Option D) | 3

**Credit Hours**

- **Fall**: 15
- **Spring**: 16-18
- **Total Credit Hours**: 120-130

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

### BA or BS to MPA (Master of Public Administration) Linked Program

The linked BA/MPA or BS/MPA program provides qualified Old Dominion University undergraduate students with the opportunity to earn a master's degree in public administration while taking credits in the MPA program as an undergraduate student. The program is designed for highly motivated students with the desire to immediately continue their education after the bachelor's degree. The program is especially relevant to individuals seeking to work (or currently working) in the public or non-profit sectors, but is suitable for students from any undergraduate major. Graduate courses may be taken during the fall and spring semester of the student's senior undergraduate year. Up to 12 graduate credits can count toward both the undergraduate and graduate degree and can meet upper-level General Education requirements. After receiving the undergraduate degree, a student will continue with the MPA program, taking MPA courses until completing the required 39 credit hours. Students in the linked program must earn a minimum of 150 credit hours (120 discrete credit hours for the undergraduate degree and 30 discrete credit hours for the graduate degree).

Requirements for admission to the graduate program can be found in the School of Public Service section of the Graduate Catalog ([http://catalog.odu.edu/graduate/business/public-service/](http://catalog.odu.edu/graduate/business/public-service/)). For additional information, please contact the School of Public Service in the Strome College of Business.