Bachelor of Science

Physics with a Major in Physics and Electrical Engineering (BS, BSEE)

The dual degree program in physics and electrical engineering is a five-year program. Students will receive a BS degree and a BSEE degree upon graduation. The dual degree program provides the highest level of preparation for both graduate school and positions in industry.

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

General education requirements for mathematics, nature of science, information literacy and research, impact of technology, and philosophy and ethics are met through the major. Additional information can be found in the Electrical and Computer Engineering section of the College of Engineering and Technology.

Upper-Division General Education

The Upper-Division General Education requirement is met by the dual degree requirements.

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.

Dual Degree in Physics and Electrical Engineering

Students in this major must earn a minimum of 150 credit hours.

General Education		
Complete lower-division requirements		21-27
Complete upper-division requirements (met by dual degree requirements)		
Physics and Electrical Engineering		
Common Course Requirements		
CHEM 121N & CHEM 122N	Foundations of Chemistry I Lecture and Foundations of Chemistry I Laboratory	4
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	
ENGN 150	Computer Programming for Engineering Problem Solving	4
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	
Physics Course Requirements		
CHEM 123N & CHEM 124N	Foundations of Chemistry II Lecture and Foundations of Chemistry II Laboratory	4
PHYS 319	Analytical Mechanics	3
PHYS 323	Modern Physics	3
PHYS 355	Mathematical Methods of Physics	3
PHYS 413	Methods of Experimental Physics	3
PHYS 420	Introductory Computational Physics	3
PHYS 425	Electromagnetism I	3
PHYS 452	Introduction to Quantum Mechanics	3
PHYS 453	Electromagnetism II	3
or ECE 323	Electromagnetics	
PHYS 454	Thermal and Statistical Physics	3
PHYS 456	Intermediate Quantum Mechanics	3
PHYS 499W	Senior Thesis *	3
or PHYS 489W & PHYS 490W	Senior Thesis I and Senior Thesis II	
Select one of the following:		3
PHYS 411	Introduction to Atomic Physics	
PHYS 415	Introduction to Nuclear and Particle Physics	
PHYS 416	Introduction to Solid State Physics	
PHYS 417	Introduction to Particle Accelerator Physics	
Engineering Course Requirements		
ENGN 110	Explore Engineering and Technology	2
ECE 111	Information Literacy and Research for Electrical and Computer Engineering	2
ECE 201	Circuit Analysis I	3

ECE 202	Circuit Analysis II	3
ECE 241	Fundamentals of Computer Engineering	4
ECE 287	Fundamental Electric Circuit Laboratory	2
ECE 302	Linear System Analysis	3
ECE 303	Introduction to Electrical Power	3
ECE 304	Probability, Statistics, and Reliability	3
ECE 313	Electronic Circuits	4
ECE 332	Microelectronic Materials and Processes	3
ECE 381	Introduction to Discrete-time Signal Processing	3
ECE 387	Microelectronics Fabrication Laboratory	3
ECE 485W	Electrical Engineering Design I	3
ECE 486	Preparatory ECE Senior Design II	2
ECE 487	ECE Senior Design II	2
ECE Tech Elective I, II, III, IV		12
ENMA 480	Ethics and Philosophy in Engineering Applications (meets philosophy and ethics requirement)	3
Total Credit Hours		**152-158**

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

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		
ENGN 110	Explore Engineering and Technology [1]	2
CHEM 121N	Foundations of Chemistry I Lecture	3
CHEM 122N	Foundations of Chemistry I Laboratory	1
MATH 211	Calculus I	4
ENGL 110C	English Composition (Grade of C or better required)	3
COMM 101R	Public Speaking	3
	Credit Hours	**16**
Spring		
PHYS 261N or PHYS 231N or PHYS 226N	Advanced University Physics I or University Physics I or Honors: University Physics I	4
ECE 111	Information Literacy and Research for Electrical and Computer Engineering [2]	2
CHEM 123N	Foundations of Chemistry II Lecture	3
CHEM 124N	Foundations of Chemistry II Laboratory	1
MATH 212	Calculus II	4
	Credit Hours	**14**
Sophomore		
Fall		
PHYS 262N or PHYS 232N or PHYS 227N	Advanced University Physics II or University Physics II or Honors: University Physics II	4
ECE 201	Circuit Analysis I	3
ENGN 150	Computer Programming for Engineering Problem Solving	4
MATH 307 or MATH 280	Ordinary Differential Equations or Transfer Credit for Ordinary Differential Equations	3
ENGL 231C or ENGL 211C	Writing, Rhetoric, and Research: Special Topics or Writing, Rhetoric, and Research	3
	Credit Hours	**17**
Spring		
PHYS 319	Analytical Mechanics	3
ECE 202	Circuit Analysis II	3
ECE 287	Fundamental Electric Circuit Laboratory [3]	2
ECE 241	Fundamentals of Computer Engineering	4
MATH 312 or MATH 285	Calculus III or Transfer Credit for Calculus III	4
	Credit Hours	**16**
Junior		
Fall		
PHYS 323	Modern Physics	3
PHYS 355	Mathematical Methods of Physics	3
PHYS 425	Electromagnetism I [4]	3
ECE 302	Linear System Analysis	3
ECE 303	Introduction to Electrical Power	3
	Credit Hours	**15**
Spring		
ECE 313	Electronic Circuits	4
ECE 381	Introduction to Discrete-time Signal Processing	3
ECE 323 or PHYS 453	Electromagnetics [5] or Electromagnetism II	3
PHYS 411 or PHYS 415 or PHYS 416 or PHYS 417		3
Literature Way of Knowing		3
	Credit Hours	**16**

Senior		
Fall		
PHYS 452	Introduction to Quantum Mechanics	3
ECE 304	Probability, Statistics, and Reliability	3
ECE 332	Microelectronic Materials and Processes	3
ECE Technical Elective I [6]		3
ENMA 480	Ethics and Philosophy in Engineering Applications [7]	3
	Credit Hours	**15**
Spring		
PHYS 413	Methods of Experimental Physics	3
PHYS 456	Intermediate Quantum Mechanics [5]	3
PHYS 499W or PHYS 489W and PHYS 490W		3
ECE 387	Microelectronics Fabrication Laboratory	3
Human Behavior Way of Knowing		3
	Credit Hours	**15**
Fifth Year		
Fall		
PHYS 420	Introductory Computational Physics	3
ECE 485W	Electrical Engineering Design I (C or better required)	3
ECE 486	Preparatory ECE Senior Design II	2
ECE Technical Elective II		3
Human Creativity Way of Knowing		3
	Credit Hours	**14**
Spring		
PHYS 454	Thermal and Statistical Physics	3
ECE 487	ECE Senior Design II	2
ECE Technical elective III		3
ECE Technical elective IV		3
Interpreting the Past Way of Knowing		3
	Credit Hours	**14**
	Total Credit Hours	**152**

* Does not include the University's General Education language and culture requirement. Additional hours may be required.

1 ENGN 110 satisfies the Physics Approved Seminar requirement in the Physics curriculum.

2 ECE 111 satisfies the PHYS Information Literacy & Research requirement in the Physics curriculum.

3 ECE 287 satisfies the PHYS 303 requirement in the Physics curriculum.

4 PHYS 425 satisfies the Nonmajor Engineering Elective requirement in the Electrical Engineering curriculum.

5 PHYS 453 and PHYS 456 offered spring semester only.

6 Electrical Engineering students need four technical elective courses selected from one of two options: (1) four 400-level ECE technical elective courses; (2) three 400-level ECE technical elective courses and one 300-level ECE technical elective course or one approved 300- or 400-level CS/MATH/Engineering course.

7 ENMA 480 satisfies the PHYS Philosophy & Ethics requirement in the Physics curriculum.

The General Education requirements in information literacy and research, impact of technology, and philosophy and ethics are met through the Electrical Engineering major/degree. The upper-division General Education requirement is met through the completion of a second major/degree.

Electrical engineering majors must earn a grade of C or better in all 200-level ECE courses prior to taking the next course in the sequence.

Any ECE course registration issues are to be resolved with the ECE Academic Coordinator and Program Manager.

BA or BS to MBA (Master of Business Administration) Linked Program

The linked BA/MBA or BS/MBA program is an early entry to the MBA program of study. The early-entry program is designed for well qualified non-business undergraduate ODU students to start their MBA program prior to completing their undergraduate degree. Well qualified non-business undergraduate students may take MBA-level courses as early as three semesters prior to graduation and count up to 12 graduate credits toward their undergraduate degree. Students participating in the early-entry 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). Early-entry program students should carefully consider their undergraduate degree program requirements when planning their course of study. Students in the early-entry program work in close consultation with the MBA Program Office and should refer to information in the Strome College of Business section in the graduate catalog (http://catalog.odu.edu/graduate/stromecollegeofbusiness/) to develop an individualized plan of study based on the required coursework.

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/). For additional information, please contact the School of Public Service in the Strome College of Business.