PHYSICS MAJOR

Program Director: Alberto Belloni, Ph.D.

Physics is an exciting and rewarding field of study. Physicists make important discoveries that often change the way we live by examining the way things work, and there are still many discoveries to be made.

At Maryland, physics majors benefit from small class-sizes, outstanding teachers and very talented classmates. However, we believe that the most important physics education occurs outside the classroom, and we encourage all of our majors to participate in cutting-edge research with our internationally recognized faculty. Through participation in research projects, our students learn what it takes to conduct world-class scientific research. Whether students decide to continue to study physics in graduate school or work in fields such as engineering, software development, law, business or education, a bachelor's degree in physics from Maryland provides an excellent foundation.

Program Learning Outcomes

Students are expected to fully engage with the curriculum and the opportunities presented for learning and research. Having completed the degree program, students should have acquired the following knowledge and skills:

1. A thorough knowledge of the core areas of physics, including mechanics, electricity and magnetism, thermal physics, and quantum mechanics at a level compatible with admission to graduate programs in physics at peer institutions.
2. The ability to analyze and interpret quantitative results, both in the core areas of physics and in complex problems that cross multiple core areas.
3. An ability to assess and solve unfamiliar problems in physics using the knowledge and skills acquired.
4. The ability to use contemporary experimental apparatus common to the study of physical phenomena, and have the ability to acquire, analyze and interpret scientific data.
5. The ability to communicate scientific results effectively, both verbally and in writing.

REQUIREMENTS

Course	Title	Credits
Courses Required for All Specializations		
PHYS170	Professional Physics Seminar	1
PHYS171	Introductory Physics: Mechanics	3
PHYS265	Introduction to Scientific Programming [1]	3
PHYS272	Introductory Physics: Electricity and Magnetism	3
PHYS273	Intermediate Oscillations and Waves	3
PHYS275	Experimental Physics I: Mechanics and Waves	2
PHYS276	Experimental Physics II: Analog Circuits	2
MATH140	Calculus I	4
MATH141	Calculus II	4
MATH241	Calculus III	4
MATH243	Introduction to Linear Algebra and Differential Equations	4
or MATH240 & MATH246	Introduction to Linear Algebra and Differential Equations for Scientists and Engineers	
Total Credits		**33**

Additional Courses for Specializations

Complete one of the following specializations: Physics (p. 1), Education Physics (p. 1), Biophysics (p. 2), or Applied Physics (p. 2).

Additional Courses Required for The Physics Major:

Course	Title	Credits
PHYS313	Electricity and Magnetism I	4
PHYS371	Modern Physics	3
PHYS375	Experimental Physics III: Experimental Optics	3
PHYS401	Quantum Physics I	4
PHYS402	Quantum Physics II	3
PHYS404	Introduction to Statistical Thermodynamics	3
PHYS405	Advanced Experiments [2]	3
PHYS410	Classical Mechanics	3
PHYS413	Electricity and Magnetism II	3
PHYS4XX	Advanced Physics Elective [3]	3
PHYS4XY	Advanced Physics Elective [3]	3
Total Credits		**35**

Additional Courses Required for the Education Physics Specialization:

Course	Title	Credits
Introductory Education Courses		
TLPL101	Inquiry Approach to Teaching STEM (Step 1)	1
TLPL102	Inquiry Teaching of STEM in Middle School	2
Upper-level and Supporting Courses		
TLPL401	Student-Centered Curriculum and Instruction	3
TLPL414	Knowing and Learning in Mathematics and Science	3
TLPL415	Perspectives in Science	3
EDHD426	Cognitive and Motivational Literacy Content	3
PHYS313	Electricity and Magnetism I	4
PHYS371	Modern Physics	3
PHYS375	Experimental Physics III: Experimental Optics	3
One of the following:		3-4
PHYS401	Quantum Physics I	
PHYS404	Introduction to Statistical Thermodynamics	
PHYS410	Classical Mechanics	
PHYS413	Electricity and Magnetism II	
PHYS4XY	(Advanced Physics Elective)	3-4
Total Credits		**31-33**

The Education Physics area of concentration is designed to accommodate students obtaining a teaching certificate through the College of Education. However, completing all the courses in the Education Physics area of concentration does not in itself satisfy all requirements for obtaining a teaching certificate. Students pursuing the Education Physics area of concentration who want to also obtain a teaching certificate in secondary education must first apply and be

admitted to the Secondary Education Program in the College of Education and then complete additional courses in that program.

Additional Courses Required for the Biophysics Specialization:

Course	Title	Credits
BSCI170	Principles of Molecular & Cellular Biology	3
BSCI180	Principles Biology Laboratory	1
or BSCI171	Principles of Molecular & Cellular Biology Laboratory	
CHEM131	Chemistry I - Fundamentals of General Chemistry	3
CHEM132	General Chemistry I Laboratory	1
CHEM231	Organic Chemistry I	3
CHEM232	Organic Chemistry Laboratory I	1
CHEM241	Organic Chemistry II	3
CHEM242	Organic Chemistry Laboratory II	1
CHEM271	General Chemistry and Energetics	2
CHEM272	General Bioanalytical Chemistry Laboratory	2
BSCI330	Cell Biology and Physiology	4
BCHM461	Biochemistry I	3
PHYS313	Electricity and Magnetism I	3
PHYS371	Modern Physics	3
PHYS404	Introduction to Statistical Thermodynamics	3
PHYS4XY		3
PHYS483	(Biophysics)	3
One of the following:		3
PHYS375	Experimental Physics III: Experimental Optics	
BSCI4XY - Any Approved 400-level BSCI Elective		
Note: Students interested in medical school should consult a pre-med advisor (prehealth.umd.edu) for additional course recommendations.		
Total Credits		**45**

Additional Courses Required for the Applied Physics Specialization:

Course	Title	Credits
ENME272	Introduction to Computer Aided Design	2
PHYS313	Electricity and Magnetism I	4
PHYS371	Modern Physics	3
PHYS375	Experimental Physics III: Experimental Optics	3
PHYS401	Quantum Physics I	4
PHYS404	Introduction to Statistical Thermodynamics	3
PHYS413	Electricity and Magnetism II	3
PHYS474	Computational Physics	3
PHYS456	Making Physics Experiments	3
One of the following:		3
PHYS485	Electronic Circuits	
PHYS487	Computerized Instrumentation (Computerized Instrumentation)	
PHYS4XY - Any Approved 400-level PHYS Elective		3-4
Total Credits		**34-35**

[1] Students with prior programming experience may take PHYS474, an upper-level, computational physics course, instead of PHYS265. This advanced course may be used for an Advanced Physics Elective as well.

[2] PHYS405 in The Physics Major may be replaced by the two course sequence: PHYS406, PHYS407.

[3] Students completing a second major from a CMNS or Engineering department may use an upper-level course from that program in place of one of the Advanced Physics Electives.

Other Requirements for the Major

Students must complete all courses required for the major with a grade of "C-" or higher.

GRADUATION PLANS

Click here (https://cmns.umd.edu/undergraduate/advising-academic-planning/academic-planning/four-year-plans/four-year-plans-gened/) for roadmaps for graduation plans in the College of Computer, Mathematical, and Natural Sciences.

Additional information on developing a graduation plan can be found on the following pages:

- http://4yearplans.umd.edu
- the Student Academic Success-Degree Completion Policy (https://academiccatalog.umd.edu/undergraduate/registration-academic-requirements-regulations/academic-advising/#success) section of this catalog