PHYSICS MAJOR WITH PHYSICS EDUCATION OPTION

Program Curriculum

Code	Title	Credits
Degree Core Requirements		
PHYS 2504	Math Methods in Physics [1]	3
PHYS 3314	Intermediate Laboratory	3
PHYS 3324	Modern Physics [1]	4
PHYS 3355	Intermediate Mechanics [1]	3
PHYS 3405	Intermediate Electricity and Magnetism [1]	3
PHYS 3704	Thermal Physics [1]	3
PHYS 4315	Modern Experimental Physics [1]	2
Subtotal		21
Option Required Courses [2]		
PHYS 2325 & PHYS 2326	Seminar for Physics Majors and Seminar for Physics Majors [1]	2
PHYS 3655	Introduction to Astrophysics [1]	3
or PHYS 3656	Introduction to Astrophysics	
MATH 2114	Introduction to Linear Algebra [1]	3
or MATH 2114H	Introduction to Linear Algebra	
MATH 2204	Introduction to Multivariable Calculus [1]	3
or MATH 2204H	Introduction to Multivariable Calculus	
MATH 3214	Calculus of Several Variables [1]	3
Select one of the following:		2-3
CS 1064	Introduction to Programming in Python	
CS 1114	Introduction to Software Design	
ECE 1574	[1]	
AOE/ESM 2074	Computational Methods [1]	
Subtotal		16-17
Science Courses		
Select 20-22 credit from one of the following four emphases:		20-22
Astronomy Emphasis		
PHYS 1055/1056	Introduction to Astronomy	
PHYS 1155/1156	Astronomy Laboratory	
PHYS 2114	Black Holes	
PHYS 3154	Observational Astrophysics [1]	
PHYS 3655	Introduction to Astrophysics [3]	
or PHYS 3656	Introduction to Astrophysics	
BIOL 1105	Principles of Biology	
CHEM 1035	General Chemistry [1]	
Biology Emphasis		
BIOL 1105 & BIOL 1115	Principles of Biology and Principles of Biology Laboratory	
BIOL 1106 & BIOL 1116	Principles of Biology and Principles of Biology Laboratory	
BIOL course [4]		
BIOL course [4]		
PHYS 1055	Introduction to Astronomy	
or GEOS 1004	Earth Science: Our Past, Present, and Future	
CHEM 1035	General Chemistry [1]	
Chemistry Emphasis		
CHEM 1035 & CHEM 1036	General Chemistry and General Chemistry [1]	
CHEM 1045 & CHEM 1046	General Chemistry Laboratory and General Chemistry Laboratory [1]	
CHEM course [4]		
CHEM course [4]		
PHYS 1055	Introduction to Astronomy	
or GEOS 1004	Earth Science: Our Past, Present, and Future	
BIOL 1105	Principles of Biology	
Geology Emphasis		
GEOS 1004	Earth Science: Our Past, Present, and Future	
GEOS 1104	Introduction to Earth Sciences Laboratory	
GEOS 1024	Earth Resources, Society, and Environment	
GEOS 1124	Earth Resources, Society and Environment Laboratory	
GEOS course [4]		
GEOS course [4]		
BIOL 1105	Principles of Biology	
CHEM 1035	General Chemistry [1]	
Subtotal		20-22
Restricted Electives		
Select one of the following:		3
PHYS 4254	Quantum Information Technologies [1]	
PHYS 4264	Quantum Optics and Qubit Processors [1]	
PHYS 4514	Introduction to Nuclear Physics [1]	
PHYS 4554	Introduction to Solid State Physics [1]	
PHYS 4564	Polymer Physics [1]	
PHYS 4574	Nanotechnology [1]	
PHYS 4614	Optics [1]	
PHYS 4634	Modern Classical Physics [1]	
PHYS 4654	Modern Cosmology [1]	
PHYS 4664	Astroparticle Physics	
PHYS 4674	Introduction to General Relativity [1]	
PHYS 4714	Introduction to Biophysics [1]	
PHYS 4724	Soft Matter Physics [1]	
PHYS 4755	Introduction to Computational Physics [1]	
PHYS 4774	Intro to Physics of Galaxies [1]	
Subtotal		3
Free Electives		
Select 8-11 credits		8-11
Subtotal		8-11
Pathways to General Education		
Pathways Concept 1 - Discourse [5]		
ENGL 1105	First-Year Writing (1F)	3
ENGL 1106	First-Year Writing (1F)	3
Select three credits in Pathway 1a (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G01A)		3
Pathways Concept 2 - Critical Thinking in the Humanities		

Select six credits in Pathway 2 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02)		6
Pathways Concept 3 - Reasoning in the Social Sciences		
Select six credits in Pathway 3 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03)		6
Pathways Concept 4 - Reasoning in the Natural Sciences [5]		
PHYS 2305 & PHYS 2306	Foundations of Physics and Foundations of Physics [1]	8
Pathways Concept 5 - Quantitative and Computational Thinking [5]		
MATH 1225	Calculus of a Single Variable (5F)	4
MATH 1226	Calculus of a Single Variable (5F)	4
MATH 2214	Introduction to Differential Equations (5A) [1]	3
or MATH 2214H	Introduction to Differential Equations	
Pathways Concept 6 - Critique and Practice in Design and the Arts		
Select 6 credits. 3 in design + 3 in arts, or 6 in integrated design & arts)		6
Pathways Concept 7 - Critical Analysis of Identity and Equity in the United States		
Select three credits Pathway 7 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G07)		3
Subtotal		49
Total Credits		**117-123**

1 Indicates a course with prerequisites or corequisites.

2 MATH 1225 Calculus of a Single Variable-MATH 1226 Calculus of a Single Variable[1] and MATH 2214 Introduction to Differential Equations[1] or MATH 2214H Introduction to Differential Equations[1] and PHYS 2305 Foundations of Physics-PHYS 2306 Foundations of Physics[1] are also required of all Physics Majors within the B.A. Degree Program in Physics. They are listed in Pathways to General Education Requirements.

3 Exclusive of the choice made in Option Required Courses.

4 2000-level or higher. These courses may have prerequisites or corequisites

5 The following course sequence is required of all students majoring in Physics within the B.A. Degree in Physics.

Accepted Substitutions

- PHYS 3355 Intermediate Mechanics: AOE 3154 Astromechanics, **or** ESM 3124 Dynamics II- Analytical and 3-D Motion
- PHYS 3405 Intermediate Electricity and Magnetism: ECE 3105 Electromagnetic Fields
- PHYS 3314 Intermediate Laboratory: AOE 3054 Experimental Methods, **or** ECE 2204 & ECE 2274 Electronic Networks Laboratory I, **or** ESM 3444 Mechanics Laboratory

Foreign Language Requirement

Students who did not successfully complete at least two years of a single foreign, classical, or sign language during high school must successfully complete six credits of a single foreign, classical, or sign language at the college level. Courses taken to meet this requirement do not count toward the credits required for graduation. Please consult the Undergraduate Course Catalog for details.

Satisfactory Progress Toward Degree

A student will be certified as making satisfactory progress toward the B.A. degree in Physics by satisfying the university's academic eligibility requirements, as well as the following requirements:

- Upon having attempted 60 credit hours, the student will have completed Concept 1 requirements, the Mathematics requirements as well as PHYS 2305 Foundations of Physics-PHYS 2306 Foundations of Physics, PHYS 2325 Seminar for Physics Majors-PHYS 2326 Seminar for Physics Majors, PHYS 2504 Math Methods in Physics, and PHYS 3324 Modern Physics.
- Upon having attempted 45 credit hours, the student must have 2.0 overall and in-major GPAs. All PHYS courses attempted are used in the calculation of the in-major GPA. Non-PHYS courses used as Accepted Substitutions are not used in the calculation of the in-major GPA.
- Upon having attempted 72 credit hours, the student will have completed the foreign language requirement by the close of the academic year (spring semester). [College of Science requirement]
- Upon having attempted 96 credit hours, the student will have completed all credits for the Pathways to General Education.

Outcomes Assessment

Each student is required to participate in the department's Outcomes Assessment procedures as determined by each year's Undergraduate Program Committee and approved by the Department Chair.

Minimum Hours and GPA Required for Graduation

A minimum of 120 credit hours must be completed for graduation. A minimum overall and in-major GPA of 2.0 is required for graduation. All PHYS courses attempted are used in the calculation of the in-major GPA. Non-PHYS courses used as Accepted Substitutions are not used in the calculation of the in-major GPA.

Prerequisites and Corequisites

Courses in this checksheet marked with Footnote 1 have prerequisites or corequisites. Please check with your advisor or consult the Undergraduate Course Catalog.