

ENGINEERING PHYSICS MAJOR (B.S.)

<https://ceps.unh.edu/physics/program/bs/engineering-physics-major>

Description

The goal of the UNH BSEP program is to produce broadly-trained engineers who can provide solutions to today's challenging problems in support of a technologically evolving society. The core of the program is based on interdisciplinary training, complemented with a deeper understanding of the physical principles needed to support careers in engineering, engineering research or, perhaps, further training in systems engineering. The program balances depth and breadth in skill development; flexibility and functionality are what drive the program in the sense that 1) the particular focus is based on the student's interests, and 2) the breadth of the course selection is guided by the post-graduation goals of the student (e.g., employment versus graduate school).

Requirements

Degree Requirements

Minimum Credit Requirement: 128 credits

Minimum Residency Requirement: 32 credits must be taken at UNH

Minimum GPA: 2.0 required for conferral*

Core Curriculum Required: Discovery & Writing Program Requirements

Foreign Language Requirement: No

All Major, Option and Elective Requirements as indicated.

*Major GPA requirements as indicated.

Major Requirements

A student must have a minimum grade of C in each 400- or 500-level courses that are part of the core requirements and an overall grade-point average of 2.33 in these courses in order to continue in the program.

Code	Title	Credits
Core Requirements for all tracks:		
CHEM 403 or CHEM 405	General Chemistry I Chemical Principles for Engineers	4
CS 410P or IAM 550	Introduction to Scientific Programming/Python Introduction to Engineering Computing	4
MATH 425	Calculus I	4
MATH 426	Calculus II	4
Choose one:		8-12
MATH 527 & MATH 528 or MATH 525 & MATH 526	Differential Equations with Linear Algebra and Multidimensional Calculus Linearity I and Linearity II	
PHYS 400	Physics Seminar I	1
PHYS 407	General Physics I	4
PHYS 408	General Physics II	4
PHYS 505	General Physics III	3
PHYS 506	General Physics III Laboratory	1
PHYS 508	Thermodynamics and Statistical Mechanics	4
PHYS 615	Classical Mechanics and Mathematical Physics I	4

PHYS 616	Classical Mechanics and Mathematical Physics II	4
PHYS 703	Electricity and Magnetism I	4
Capstone:		4
PHYS 797	Senior Design Project	

Additional courses for Aerospace Track

ECE 541	Electric Circuits	4
ECE 548	Electronic Design I	4
ECE 651	Electronic Design II	4
ME 608	Fluid Dynamics	3
ME 743 or PHYS 712	Satellite Systems, Dynamics, and Control Space Plasma Physics	3-4

Electives in major: choose four from the following

ME 441	Introduction to Engineering Design and Solid Modeling	
ME 603	Heat Transfer	
ME 646	Experimental Measurement and Data Analysis	
ME 670	Systems Modeling, Simulation, and Control	
ME 705	Thermal System Analysis and Design	
ME 707	Analytical Fluid Dynamics	
ME 743	Satellite Systems, Dynamics, and Control	
ME 747	Experimental Measurement and Modeling of Complex Systems	
ME 786	Introduction to Finite Element Analysis	
PHYS 708	Optics	
PHYS 712	Space Plasma Physics	

Additional Courses for the Engineering Research track

ECE 541	Electric Circuits	4
ECE 543	Introduction to Digital Systems	4
ECE 548	Electronic Design I	4
ECE 651	Electronic Design II	4
PHYS 704 or PHYS 708	Electricity and Magnetism II Optics	4
Electives in major: choose four from the following		12

CS 750	Machine Learning	
ECE 633	Signals and Systems I	
ECE 634	Signals and Systems II	
ECE 647	Random Processes and Signals in Engineering	
MATH 644	Statistics for Engineers and Scientists	
ME 441	Introduction to Engineering Design and Solid Modeling	
ME 561	Introduction to Materials Science	
ME 608	Fluid Dynamics	
ME 670	Systems Modeling, Simulation, and Control	
ME 706	Renewable Energy: Physical and Engineering Principles	
ME 712	Waves in Fluids	
ME 743	Satellite Systems, Dynamics, and Control	
PHYS 701	Quantum Mechanics I	
PHYS 702	Quantum Mechanics II	
PHYS 704	Electricity and Magnetism II	
PHYS 705	Experimental Physics II	
PHYS 708	Optics	

Degree Plan

Sample Degree Plan Aerospace Track

First Year

		Credits
Fall		
PHYS 407H	Honors/General Physics I	4
MATH 425H	Honors/Calculus I	4
PHYS 400	Physics Seminar I	1
ENGL 401	First-Year Writing	4
Discovery Course		4

Credits **17**

Spring		
PHYS 408H	Honors/General Physics II	4
MATH 426H	Honors/Calculus II	4
CHEM 405	Chemical Principles for Engineers	4
IAM 550	Introduction to Engineering Computing	4
Credits		16

Second Year		
Fall		
PHYS 505	General Physics III	3
PHYS 506	General Physics III Laboratory	1
PHYS 508	Thermodynamics and Statistical Mechanics	4
MATH 528	Multidimensional Calculus	4
Discovery Course		4
Credits		16

Spring		
PHYS 615	Classical Mechanics and Mathematical Physics I	4
MATH 527	Differential Equations with Linear Algebra	4
Elective in Major		4
Discovery Course		4
Credits		16

Third Year		
Fall		
PHYS 616	Classical Mechanics and Mathematical Physics II	4
ME 608	Fluid Dynamics	3
ECE 541	Electric Circuits	4
Discovery Course		4
Credits		15

Spring		
PHYS 703	Electricity and Magnetism I	4
ECE 548	Electronic Design I	4
Elective in Major		3-4
Discovery Course		4
Credits		15-16

Fourth Year		
Fall		
PHYS 797	Senior Design Project	2
ECE 651	Electronic Design II	4
Elective in Major		3-4
Discovery Course		4
Free Elective		4
Credits		17-18

Spring		
PHYS 797	Senior Design Project	2
ME 743 or PHYS 712	Satellite Systems, Dynamics, and Control or Space Plasma Physics	3-4
Elective in Major		4
Discovery Course		4

Free Elective	4
Credits	17-18
Total Credits	129-132

Engineering Research Track

First Year		
Fall		
PHYS 407H	Honors/General Physics I	4
MATH 425H	Honors/Calculus I	4
CHEM 405	Chemical Principles for Engineers	4
PHYS 400	Physics Seminar I	1
Discovery Course		4
Credits		17

Spring		
PHYS 408H	Honors/General Physics II	4
MATH 426H	Honors/Calculus II	4
IAM 550	Introduction to Engineering Computing	4
ENGL 401	First-Year Writing	4
Credits		16

Second Year		
Fall		
PHYS 505	General Physics III	3
PHYS 506	General Physics III Laboratory	1
MATH 528	Multidimensional Calculus	4
ECE 541	Electric Circuits	4
Discovery Course		4
Credits		16

Spring		
PHYS 615	Classical Mechanics and Mathematical Physics I	4
MATH 527	Differential Equations with Linear Algebra	4
ECE 548	Electronic Design I	4
Discovery Course		4
Credits		16

Third Year		
Fall		
PHYS 508	Thermodynamics and Statistical Mechanics	4
ECE 651	Electronic Design II	4
PHYS 616	Classical Mechanics and Mathematical Physics II	4
Discovery Course		4
Credits		16

Spring		
PHYS 703	Electricity and Magnetism I	4
ECE 543	Introduction to Digital Systems	4
Elective in Major		3-4
Discovery Course		4
Credits		15-16

Fourth Year		
Fall		
PHYS 797	Senior Design Project	2

PHYS 704 or PHYS 708	Electricity and Magnetism II or Optics	4
Elective in Major		3-4
Free Elective		4
Discovery Course		4
Credits		17-18
Spring		
PHYS 797	Senior Design Project	2
Elective in Major		3-4
Elective in Major		3-4
Free Elective		4
Discovery Course		4
Credits		16-18
Total Credits		129-133

Student Learning Outcomes

Students are expected to achieve the outcomes below upon graduation.

- Students will master the fundamentals of a broad set of physics subjects (e.g., mechanics, electricity and magnetism, quantum mechanics, thermodynamics, optics).
- Students will have a solid understanding of mathematics (e.g., calculus, differential equations, linear algebra).
- Students will be able to solve physics and engineering problems using computational methods.
- Students will have excellent knowledge of the principles and practice of their chosen engineering disciplines.
- Students will be able to use physical principles to design systems, apparatuses, experiments or models; collect and analyze data; and develop conclusions.
- Students will be able to identify and solve complex engineering and physics problems by applying physical principles and mathematical tools.
- Students will be able to communicate technical content effectively to a range of audiences.