# MATHEMATICS AND PHYSICS (BS)

Department Website (https://engineering.nyu.edu/academics/departments/applied-physics/)

**NYSED:** 08862 **HEGIS:** 1701.00 **CIP:** 27.0301

## Program Description

Mathematics deals with abstraction, logic, and quantitative reasoning. Because it has applications to nearly every branch of science and engineering, it's essential for mathematicians to think about how their work infiltrates other branches of learning. Advances in physics — for example, those in electromagnetism and thermodynamics — often resonate deeply with mathematics.

At the School of Engineering, the BS in Applied Physics and Mathematics program serves as a means to bridge these 2 disciplines. The dual major allows students to gain a foothold in separate but substantial fields. In addition to learning the fundamentals of physics and math, students pursue a specialized course of study that a minor in either field just can't match.

But it's important that these skills transfer over to the real world. That's why this program provides internship opportunities at major financial, insurance, and technology firms in the New York area.

Students with experience in both mathematics and physics enjoy diverse and interesting careers. Graduates have the freedom to explore such stimulating fields as chemistry, biology, medicine, and engineering. They're also qualified for positions in software design, economics, aerospace engineering, law, and business.

## Admissions

New York University's Office of Undergraduate Admissions supports the application process for all undergraduate programs at NYU. For additional information about undergraduate admissions, including application requirements, see How to Apply (https://www.nyu.edu/admissions/undergraduate-admissions/how-to-apply.html).

## Program Requirements

The program requires the completion of 128 credits, comprised of the following:

| Course | Title | Credits |
|---|---|---|
| **Major Requirements** | | |
| *Physics* | | |
| PH-UY 1013 | Mechanics | 3 |
| PH-UY 2121 | General Physics Laboratory I | 1 |
| PH-UY 2023 | Electricity, Magnetism, & Fluids | 3 |
| PH-UY 2131 | General Physics Laboratory II | 1 |
| PH-UY 2033 | Waves, Optics, & Thermodynamics | 3 |
| PH-UY 2104 | Analytical Mechanics | 4 |
| PH-UY 2344 | Introduction to Modern and Solid State Physics | 4 |
| PH-UY 3002 | Junior Physics Laboratory | 2 |
| PH-UY 3234 | Electricity and Magnetism | 4 |
| PH-UY 4124 | Thermodynamics and Statistical Physics | 4 |
| PH-GY 6673 | Quantum Mechanics I | 3 |
| PH-UY 3801 | Guided Studies in Physics | 1 |
| *Mathematics* | | |
| MA-UY 1024 | Calculus I for Engineers | 4 |
| MA-UY 1124 | Calculus II for Engineers | 4 |
| MA-UY 2114 | Calculus III: Multi-Dimensional Calculus | 4 |
| or MA-UY 2514 | Honors Calculus III | |
| MA-UY 2224 | Probability and Statistics for Engineers | 4 |
| MA-UY 2034 | Linear Algebra and Differential Equations | 4 |
| MA-UY 3113 | Advanced Linear Algebra and Complex Variables | 3 |
| MA-UY 4414 | Applied Partial Differential Equations | 4 |
| MA-UY 4424 | Intro Numerical Analysis | 4 |
| or MA-UY 4524 | Honors Numerical Analysis | |
| **Other Major Requirements** | | |
| PH-UY 1002 | Physics: The Genesis of Technology | 2 |
| EG-UY 1001 | Engineering and Technology Forum | 1 |
| EXPOS-UA 1 | Writing as Inquiry | 4 |
| EXPOS-UA 22 | Advanced Writing for Engineers | 4 |
| CS-UY 1114 | Intro To Programming & Problem Solving | 4 |
| Select one of the following: | | 4 |
| CM-UY 1003 & CM-UY 1001 | General Chemistry for Engineers and General Chemistry for Engineers Laboratory | |
| CM-UY 1013 & CM-UY 1011 | General Chemistry I and General Chemistry Laboratory I | |
| **Electives** | | |
| *Humanities or Social Sciences* | | |
| Select four humanities or social science courses [1] | | 16 |
| *Mathematics and Physics* | | |
| Select at least four credits from undergraduate math electives and at least three credits from undergraduate physics electives with adviser approval [2] | | 7 |
| *STEM and Free Electives, Independent Study and Projects* | | |
| Select 22 credits of STEM & free electives and independent study courses [3] | | 22 |
| **Total Credits** | | **128** |

1. These 4 courses can be within a single cluster or across multiple clusters. For optimal breadth of experience, students are encouraged to take electives across clusters and/or across disciplines within a cluster. These 4 humanities and social science electives must satisfy the following:
   - 1 must be a 3000/4000 level humanities or social science elective; and
   - 1 must be an Advanced Seminar, identifiable by course number 4504

   Please see the General Education Requirements (https://engineering.nyu.edu/academics/departments/technology-culture-and-society/general-education-requirements/) for further details.
2. Graduate courses may be substituted with adviser's approval.
3. 8 credits are reserved for a 6-credit physics project plus a 2-credit senior physics seminar course or a 4-credit math project/thesis and an extra 4-credit math elective. The remaining 14 credits are reserved for two 4-credit STEM electives and two 3-credit free electives.

The program adviser must approve electives selected from other disciplines.

# Sample Plan of Study

| Course | Title | Credits |
|---|---|---|
| **1st Semester/Term** | | |
| Select one of the following: | | 4 |
| CM-UY 1003 & CM-UY 1001 | General Chemistry for Engineers and General Chemistry for Engineers Laboratory | |
| CM-UY 1013 & CM-UY 1011 | General Chemistry I and General Chemistry Laboratory I | |
| PH-UY 1002 | Physics: The Genesis of Technology | 2 |
| MA-UY 1024 | Calculus I for Engineers | 4 |
| EXPOS-UA 1 | Writing as Inquiry | 4 |
| EG-UY 1001 | Engineering and Technology Forum | 1 |
| | **Credits** | **15** |
| **2nd Semester/Term** | | |
| PH-UY 1013 | Mechanics | 3 |
| MA-UY 1124 | Calculus II for Engineers | 4 |
| CS-UY 1114 | Intro To Programming & Problem Solving | 4 |
| EXPOS-UA 22 | Advanced Writing for Engineers | 4 |
| | **Credits** | **15** |
| **3rd Semester/Term** | | |
| PH-UY 2023 | Electricity, Magnetism, & Fluids | 3 |
| PH-UY 2121 | General Physics Laboratory I | 1 |
| MA-UY 2114 or MA-UY 2514 | Calculus III: Multi-Dimensional Calculus or Honors Calculus III | 4 |
| MA-UY 2224 | Probability and Statistics for Engineers | 4 |
| Humanities and Social Science Elective | | 4 |
| | **Credits** | **16** |
| **4th Semester/Term** | | |
| PH-UY 2033 | Waves, Optics, & Thermodynamics | 3 |
| PH-UY 2131 | General Physics Laboratory II | 1 |
| PH-UY 2344 | Introduction to Modern and Solid State Physics | 4 |
| MA-UY 2034 | Linear Algebra and Differential Equations | 4 |
| Humanities and Social Science Elective | | 4 |
| | **Credits** | **16** |
| **5th Semester/Term** | | |
| PH-UY 2104 | Analytical Mechanics | 4 |
| MA-UY 4414 | Applied Partial Differential Equations | 4 |
| STEM Elective | | 4 |
| Humanities and Social Science Elective | | 4 |
| | **Credits** | **16** |
| **6th Semester/Term** | | |
| PH-UY 3234 | Electricity and Magnetism | 4 |
| PH-UY 3002 | Junior Physics Laboratory | 2 |
| MA-UY 4424 or MA-UY 4524 | Intro Numerical Analysis or Honors Numerical Analysis | 4 |
| STEM Elective | | 4 |
| Free Elective | | 3 |
| | **Credits** | **17** |
| **7th Semester/Term** | | |
| PH-GY 6673 | Quantum Mechanics I | 3 |
| Select one of the following: | | 2 |
| PH-UY 4902 | Introduction to Senior Project in Physics | |
| Math Elective | | |
| Select one of the following: | | 2 |
| PH-UY 4912 | Senior Seminar in Physics | |
| Math Elective | | |
| MA-UY 3113 | Advanced Linear Algebra and Complex Variables | 3 |
| Humanities and Social Science Elective | | 4 |
| Free Elective | | 3 |
| | **Credits** | **17** |
| **8th Semester/Term** | | |
| PH-UY 4904 or MA-UY 492X | Senior Project in Physics or Independent Study | 4 |
| PH-UY 4124 | Thermodynamics and Statistical Physics | 4 |
| Math Elective | | 4 |
| Physics Elective | | 3 |
| PH-UY 3801 | Guided Studies in Physics | 1 |
| | **Credits** | **16** |
| | **Total Credits** | **128** |

# Learning Outcomes

Upon successful completion of the program, graduates will:

1. Gain a foothold in separate but substantial fields, bridging these two disciplines, learning about their applications to other branches of science and engineering.
2. Pursue a specialized course of study that explores both disciplines in greater depth.
3. Be ready for a variety of career options following graduation, including, but not limited to graduate study in chemistry, biology, medicine, and engineering, as well as professional careers in software design, economics, aerospace engineering, law, and business.

# Policies

## NYU Policies

University-wide policies can be found on the New York University Policy pages (https://bulletins.nyu.edu/nyu/policies/).

## Tandon Policies

Additional academic policies can be found on the Tandon academic policy page (https://bulletins.nyu.edu/undergraduate/engineering/academic-policies/).