

PHYSICS: BUSINESS & TECHNOLOGY, BA

Physics and astronomy are fundamental sciences aimed at discovering the basic principles that govern our universe. Physicists study the interplay between space, time, matter, and energy. Complex behavior in nature is explained in terms of elementary relations between constituent elements and the forces that bind them, over distances ranging from subatomic to cosmic scale. Astronomy encompasses the entire physical universe beyond the earth: the solar system, stars, galaxies, galaxy clusters and superclusters, quasars, and the large-scale structure of the universe. The basic tools in physics and astronomy are mathematics and experimental investigation and observation of the world around us.

At Penn, the curriculum for undergraduate Physics majors, which includes extensive laboratory experience, is based on faculty strengths in Condensed Matter Physics, Elementary Particle Physics, and Astrophysics. Undergraduate teaching is linked to faculty research efforts in these areas, and participation by undergraduates in research is strongly encouraged.

This concentration is particularly appropriate for students whose ultimate goal is a career in modern industry involving both technical and managerial components. A student choosing this concentration will have a solid background in Physics, be comfortable with electronics and computers, and have some appreciation of modern business methods and economics.

The minimum total course units (<https://www.college.upenn.edu/credits-needed-major/>) for graduation in this major is 36. Double majors may entail more course units.

For more information: <http://www.physics.upenn.edu/>

For information about the General Education requirements, please visit the College of Arts & Sciences Curriculum (<https://www.college.upenn.edu/curriculum/>) page.

| Code | Title | Course Units |
|--|--|--------------|
| College General Education Requirements and Free Electives | | |
| Foundational Approaches + Sectors ¹ + Free Electives | | 16.5 |
| Major Requirements | | |
| <i>Core Requirements</i> | | |
| MATH 1400 | Calculus, Part I | 1 |
| MATH 1410 | Calculus, Part II | 1 |
| MATH 2400 | Calculus, Part III | 1 |
| MATH 2410 | Calculus, Part IV | 1 |
| PHYS 1230 | Principles of Physics III: Thermal Physics and Waves | 1 |
| PHYS 1250 | Principles of Physics IV: Modern Physics | 1.5 |
| PHYS 3351 | Analytical Mechanics | 1 |
| PHYS 3361 | Electromagnetism I: Electricity and Potential Theory | 1 |
| PHYS 3362 | Electromagnetism II: Magnetism, Maxwell's Equations, and Electromagnetic Waves | 1 |
| PHYS 4411 | Introduction to Quantum Mechanics I | 1 |

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|-------------------------------------|--|-----------|
| PHYS 0150 | Principles of Physics I: Mechanics and Wave Motion | 1.5 |
| or PHYS 0170 | Honors Physics I: Mechanics and Wave Motion | |
| PHYS 0151 | Principles of Physics II: Electromagnetism and Radiation | 1.5 |
| or PHYS 0171 | Honors Physics II: Electromagnetism and Radiation | |
| <i>Concentration Requirements</i> | | |
| PHYS 3364 | Laboratory Electronics | 1 |
| or PHYS 4414 | Laboratory in Modern Physics | |
| Select 1 course unit in Computation | | 1 |
| Select 4 course units in Business | | 4 |
| Total Course Units | | 36 |

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You may count no more than one course toward both a Major and a Sector requirement. For Exceptions, check the Policy Statement (<http://www.college.upenn.edu/sectors-policy/>).

Honors

Applicants must have a minimum GPA of 3.3 in major-related courses.

| Code | Title | Course Units |
|-----------------|----------------------------------|--------------|
| PHYS 4498 | Senior Honor Thesis (Semester 1) | 1 |
| PHYS 4498 | Senior Honor Thesis (Semester 2) | 1 |
| Thesis Accepted | | |

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2023 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.