

BU Physics

Programs of Study

BA in Physics
BA in Philosophy & Physics
BA in Astronomy & Physics
BA in Physics & Other CAS Field
BA|MA in Physics
BA|MA in Astrophysics & Space Physics
Minor in Physics

The undergraduate physics program at BU gives students a foundation of knowledge and problem-solving ability on which to build a variety of careers.

Reflecting the diversity of careers available to our students, the department offers two options for the concentration in physics, as well as joint concentrations with astronomy, philosophy, and other College of Arts and Sciences fields. In addition, the department offers two BA/MA programs: one in physics and one in astrophysics and space physics. Finally, we offer a minor concentration in physics, which is an excellent complement to degrees in engineering, mathematics, or other sciences.

Although many of our graduates continue their careers in physics or astronomy, a BA in physics also offers preparation for careers in such areas as industrial research and development, engineering, environmental sciences, medical physics, geophysics, oceanography, computer science, and energy-resource management. It is also ideal preparation for professional schools such as medicine, law, teaching, engineering, or business management.

The department prides itself on the quality of its teaching while also maintaining a vigorous research program. The diverse faculty assures an opportunity for close interaction with teachers and mentors. Students are encouraged to participate in ongoing research projects, and many get involved as early as their sophomore year. Qualified students enroll as seniors in independent work projects leading to a degree with distinction.

The following pages outline the degree programs we offer our undergraduates.



BU Physics

Programs of Study

BA in Physics *Option One*

This option provides students with a strong physics preparation, but also allows them the flexibility to pursue an interdisciplinary academic program combining physics with training in a related science (Astronomy, Biology, Chemistry, Computer Science, Mathematics, Geography, Energy and Environmental Studies or Earth Sciences). It is well suited for students planning to pursue graduate studies in another discipline or entering a career in a related field upon graduation. Students pursuing Option I must consult closely with their physics advisor and file a formal plan of study with the department.

Prerequisites

Calculus I and II (MA 123*, 124) **OR Enriched Calculus** (MA 127); **Principles of Physics** (PY 251, 252) and **Modern Physics** (PY 354) **OR General Physics** (PY 211, 212) and **Elementary Modern Physics** (PY 313); **Methods of Theoretical Physics** (PY 355). Please note that both mathematics and physics should normally be started in the freshman year.

Principal Courses

Electromagnetic Fields and Waves I (PY 405), **Intermediate Mechanics** (PY 408), and **Quantum Physics** (PY 451). Two additional physics courses at the 300 level or above (but not including PY 313, 354, 355, 401, 402, 482, 491, 492, or 581) are also required. In addition, three coordinated courses from a participating science or engineering department are required. If the participating department is in CAS, at least one of these courses must be at the 300 level or higher, and the other two must be at the 200 level or higher. If these are mathematics courses, they must be different from the required courses mentioned below. If the participating department is in ENG, all three courses must be at the junior level or above. PY 581 may be used to satisfy the requirement of a 300-level course from a participating department in CAS or a course from a participating department in ENG. A grade of C or higher must be attained in all principal courses.

Required Related Courses

Multivariate Calculus (MA225) and one other mathematics course at the 200 level or higher chosen in consultation with the student's physics advisor.

Recommended Courses

Electronics for Scientists (PY 371), **Electromagnetic Fields and Waves II** (PY 406), **Advanced Scientific Computing in Physics** (PY 421), **Statistical Thermodynamics** (PY 410), **Quantum Physics** (PY 452), **Undergraduate Physics Seminar** (PY 482)

*All courses are taken through the College of Arts and Sciences unless otherwise noted. For the most authoritative listing of formal requirements, consult the BU Undergraduate Programs Bulletin.

BU Physics

Programs of Study

BA in Physics *Option Two*

This option provides students with a comprehensive and rigorous education in classical and modern physics. It is well suited for students intending to pursue graduate study in physics or a closely related field, or planning to enter a technical physics-related career upon graduation.

Prerequisites

Calculus I and II (MA 123, 124) **OR** **Enriched Calculus** (MA 127) **OR** **Honors Calculus** (MA 129); **Principles of Physics** (PY 251, 252) and **Modern Physics** (PY 354) **OR** **General Physics** (PY 211, 212) and **Elementary Modern Physics** (PY 313); **Methods of Theoretical Physics** (PY 355). Please note that both mathematics and physics should normally be started in the freshman year.

Principal Courses

Electromagnetic Fields and Waves I and II (PY 405, 406), **Intermediate Mechanics** (PY 408), **Statistical Thermodynamics** (PY 410), **Quantum Physics** (PY 451, 452) and **Advanced Laboratory** (PY 581). An additional physics course is also required. This may be any physics course at the 300 level or higher with the exceptions of PY 313, 354, 401, 402, 482, 491, and 492.

Required Related Courses

Multivariate Calculus (MA225) and one other mathematics course at the 200 level or higher chosen in consultation with the student's physics advisor.

Recommended Courses

Electronics for Scientists (PY 371), **Senior Independent Work** (PY 401, 402), **Advanced Scientific Computing** (PY 421), **Undergraduate Physics Seminar** (PY 482), **Introduction to Solid State Physics** (PY 543), and **Introduction to Particle Physics** (PY 551). Students planning to pursue a graduate program in physics or a closely related discipline are strongly encouraged to enhance their mathematics education with some or all of the following: **Linear Algebra** (MA 242), **Advanced Calculus** (MA 411), **Complex Variables** (MA 412), and **Methods of Applied Mathematics** (MA 561)

Additional Information

Transfer students or students deciding to become physics concentrators after the first semester may substitute PY 211, 212, and 313, or their equivalents, for the introductory courses PY 251, 252, and 354 respectively. The same option is available for students whose academic experience has not prepared them for PY 251, 252. However, it is strongly recommended that interested students join the mainstream physics program as early as possible in their undergraduate careers. In that case, substitution of PY 252 for PY 212 and PY 354 for PY 313 is encouraged.

BU Physics

Programs of Study

BA in Philosophy & Physics
BA in Astronomy & Physics

BA in Philosophy & Physics

With this degree option, the Physics and Philosophy departments enable students to study the fundamental, philosophical questions underlying modern physics, the study of matter and energy, and how they interact. This joint-degree program provides a framework within which students can better understand some of the more theoretical aspects of the field of Physics.

Prerequisites

One course in philosophy at the 100 level; **Principles of Physics** (PY 251, 252) **OR** **General Physics** (PY 211, 212); PY 353 (Offered depending on student interest); **Calculus I and II** (CAS MA 123, 124)

Principal Courses

At least five courses in Philosophy and eight courses in Physics, with a grade of C or higher, are required.

Philosophy Requirements **History of Ancient Philosophy** (PH 300), **History of Modern Philosophy** (PH 310), **Philosophy of Science** (PH 270); **Symbolic Logic** (PH 360), PH 467 **OR** **Philosophical Problems of Logic and Mathematics** (PH 468); **Philosophy of Physics** (PH 470) **OR** a directed study in philosophy.

Physics Requirements **Multivariate Calculus** (MA 225); **Modern Physics** (PY 354), **Methods of Theoretical Physics** (PY 355), **Electromagnetic Fields and Waves I and II** (PY 405, 406), **Intermediate Mechanics** (PY 408), **Quantum Physics** (PY 451, 452)

BA in Astronomy & Physics

Physics when paired with Astronomy helps students understand how physical concepts are applied in our universe. Whether students are interested in solar flares or the Big Bang, this joint-degree program arms them with the knowledge and skills to observe physics in our solar system and beyond. Students who choose this concentration will be prepared to enter graduate school to study astronomy or astrophysics.

Prerequisites

Principles of Astronomy I and II (AS 202, 203); **Principles of Physics** (PY 251, 252) **OR** **General Physics** (PY 211, 212).

Principal Courses

Planetary Physics (AS 311), **Stellar and Galactic Astrophysics** (AS 312); **Observational Astronomy** (AS 441) **OR** **Advanced Laboratory** (PY 581); **Calculus I and II** (MA 123, 124) **OR** **Enriched Calculus** (MA 127); **Multivariate Calculus** (MA 225); **Modern Physics** (PY 354) **OR** **Elementary Modern Physics** (PY 313); **Methods of Theoretical Physics** (PY 355), **Electromagnetic Fields and Waves I and II** (PY 405, 406), **Intermediate Mechanics** (PY 408), **Statistical Thermodynamics** (PY 410), **Quantum Physics** (PY 451); and at least two courses from the following list: **Extragalactic Astrophysics and Cosmology** (AS 413), **Solar and Space Physics** (AS 414), and **Quantum Physics** (PY 452).

Recommended Courses

Any from the above-required list if not taken as a principal course, as well as **Electronics for Scientists** PY 371; **Remote Sensing of Environment** (GE 302), **Climate and the Environment** (GE 310); **Introduction to Computer Science** (CS 111, 112).

BU Physics

Programs of Study

BA in Physics & Other CAS Field
BA|MA in Physics

BA in Physics & Other CAS Field

Many of our students decide to pair their Physics major with another CAS field, such as Mathematics or English Literature. Students choose between Option I and II for their Physics major. All requirements of both majors must be met, and any overlapping courses may be credited toward both majors, within a specified limit. Students should plan carefully with a faculty advisor in each department before they declare two majors.

BA|MA in Physics

This five-year program is intended for students who want to continue their education in Physics at a graduate level, as well as for students who want to extend their knowledge of Physics beyond the undergraduate level before entering the job market.

Students should enroll in this program no later than the end of their sophomore year. No student will be admitted to the program later than the end of the junior year. Before entering the program, students must achieve an overall GPA of 3.0 and a minimum GPA of 2.7 (B–) in sciences and mathematics, as well as complete the 300-level course requirements for the BA with a concentration in Physics. Before award of the dual degree, students must satisfy all CAS degree requirements.

Prerequisites

Calculus I and II (MA 123, 124) **OR** **Enriched Calculus** (MA 127); **Principles of Physics** (PY 251, 252), **Modern Physics** (PY 354), **Methods of Theoretical Physics** (PY 355)

Principal Courses

Electromagnetic Fields and Waves I and II (PY 405, 406), **Intermediate Mechanics** (PY 408), **Statistical Thermodynamics** (PY 410), **Quantum Physics** (PY 451, 452), **Mathematical Physics** (PY 501), **Quantum Mechanics I and II** (PY 511, 512), **Electromagnetic Theory I** (PY 521), **Statistical Mechanics I** (PY 541), **Advanced Laboratory** (PY 581), and either **Introduction to Solid State Physics** (PY 543) **OR** **Introduction to Particle Physics** (PY 551). In addition, students are required to enroll for two semesters of **Directed Research** (GRS PY 901, 902) in their final year, in connection with their work on a master's thesis, or to achieve a "low pass" on the graduate comprehensive examination. In the latter case, the student must also take one additional Physics course at the 500 level or above.

Required Related Courses

Multivariate Calculus (MA 225) and one other mathematics course at the 200 level or higher chosen in consultation with the student's Physics advisor.

Recommended Courses

Computational Physics (PY 502), **Introduction to Solid State Physics** (PY 543), **Introduction to Particle Physics** (PY 551), PY 561 (Offered depending on student interest); **Linear Algebra** (MA 242), **Advanced Calculus** (MA 411), **Complex Variables** (MA 412), **Mathematical Logic** (MA 531), **Methods of Applied Mathematics II** (MA 561)

In the principal courses numbered 300–499, a minimum average grade of C must be attained. In the principal courses numbered 500 or above, the minimum passing grade is B–.

BU Physics

Programs of Study

BA|MA in Astrophysics & Space Physics
Minor in Physics
CAS Requirements

BA|MA in Astrophysics & Space Physics

The BA/MA program in Astrophysics and Space Physics is designed for those well-prepared students who wish to obtain a master's degree by adding a fifth year of intensive study in Astrophysics and Space Physics. The requirements of the BA/MA program consist of those for the BA in Astronomy and Physics plus those of the MA in Astronomy.

Application to the Department of Astronomy Director of Graduate Studies must be completed by March of the junior year. Only those students with a cumulative grade point average of 3.0 overall and 3.3 in mathematics, Physics, and astronomy courses will normally be admitted. There are two tracks in the program, one comprising 38 courses plus a master's thesis, and one comprising 40 courses without a thesis. Further details may be obtained at the Department of Astronomy office or from the Director of Graduate Studies.

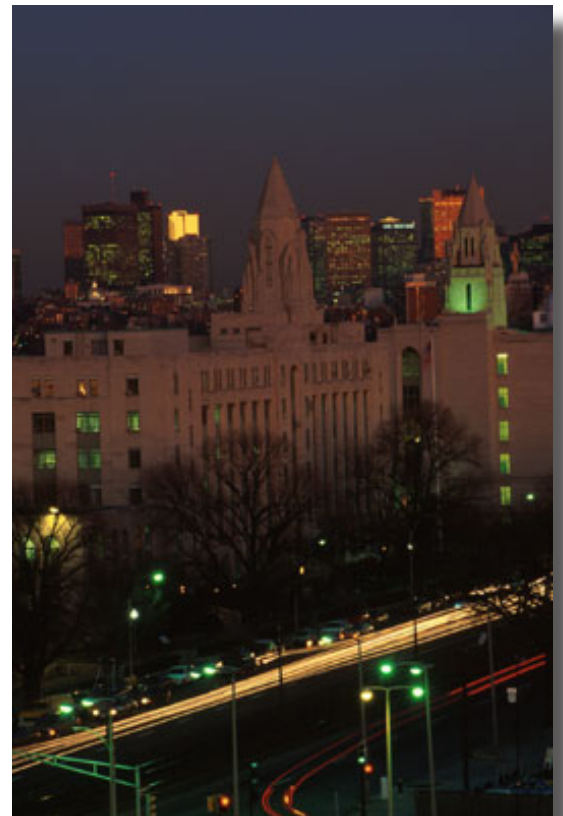
Minor in Physics

A minor in Physics is a great way to supplement any science major or simply support a student who would like a well-rounded background. Many math and engineering students decide to enhance their majors with a minor in Physics.

CAS Requirements

Candidates for the Bachelor of Arts degree in the College of Arts and Sciences must also satisfy requirements in writing, foreign language, mathematics, general education, the selected concentration, and electives. Each requirement is outlined in the CAS undergraduate bulletin, available at bu.edu/bulletins/und. Print copies are also available in the Dean Ralph W. Taylor Academic Advising Center, located in CAS Room 105.

All College of Arts and Sciences students must complete a minimum of thirty-two 4-credit courses (128 credits). The student is also advised to review the Promotion and Graduation section listed under CAS Policies and Procedures.



For more information on these programs, please visit physics.bu.edu/undergrad.