

THE STATE UNIVERSITY OF NEW JERSEY

RUTGERS NEWARK

Rutgers-Newark

PHYSICS





Number of programs offered	4
Number of students in program	10
Average size of upper-level classes	5
Number of undergraduate courses	20

What Is Physics?

Physics is the study of those laws of nature which govern the entire range of physical phenomena. Beginning at the subatomic level and on to the universe at large, physicists explore and attempt to explain the phenomena and events surrounding us.

The department presents many options for the student who wishes to acquire some of the background that is needed to understand or participate in the scientific activity and technological development of today's world.

What Majors Are Offered by the Department?



1. BA in Physics

This option is designed to enable a major to graduate with a sound, thorough preparation in the basic areas of physics. There is opportunity for individual study and research



in specialized fields. The student will be prepared either for subsequent graduate study in physics or for employment in physics or allied fields at a level commensurate with a good undergraduate physics background. Also, the physics major may be combined with undergraduate programs or selected course work in the areas of medicine, business, and law, and provides an excellent background for entrance into professional programs in these fields.

2. BA in Applied Physics

This option is offered jointly with the New Jersey Institute of Technology (NJIT) and consists of a common core of basic physics and mathematics courses. Two tracks—one in Computational Physics and one in Microelectronics—are offered. The Computational Physics track leads to capabilities in software design, modeling and simulation. It is essentially a track that combines physics with computer science. The Microelectronics track combines physics with electrical engineering and leads to capabilities in design and construction of microchips and other computer hardware components. Students receive not only the specific training of the computer scientist or engineer but are additionally given an understanding of the fundamental physics and mathematics underlying the technology of either field. This enhances their

potential for creative work in a variety of industrial settings. In addition, the program at Newark College of Arts & Science (NCAS) produces scientists educated in the liberal arts tradition.

3. 2+2 Engineering Program

Pre-engineering can be satisfied through cross registration between Rutgers-Newark and NJIT. Students may combine science and liberal arts courses at Rutgers-Newark with appropriate engineering courses at NJIT to complete the first two years of a standard engineering curriculum. The cross-registration agreement between the two institutions ensures that the Rutgers-Newark tuition covers the cost of courses taken at NJIT. The final two years of this program are completed at the College of Engineering at Rutgers-New Brunswick. The BS degree is conferred by Rutgers College of Engineering at the end of the fourth year. Some majors (chemical, ceramic, and industrial) may require additional time because key sophomore courses in these majors are not available at either NCAS or NJIT.

4. Teacher Certification

Students seeking teacher certification in comprehensive science must complete the requirements for a major in the physics department and satisfy other requirements for certification. For details regarding admission to the teacher education program and the requirements, students should consult both their department advisor and the chairperson of the education department.

What Does the Job Market Offer Graduates with a Major in Physics?

Many graduates in physics are employed by government and educational institutions as well as by industry. People in the BA program also go into fields where a technical background may be useful (e.g., law, education, administration).

What Courses are Offered by the Department?

Astronomy and Cosmology
Physics as a Liberal Art
General Physics I, II
Physics Laboratory I, II
Intro. to Thermodynamics
Intro. to Modern Physics
Applications of Mathematics (to Physics)
Mechanics I, II
Electromagnetic Fields and Waves I, II
Intro. to Atomic and Nuclear Physics
Quantum Mechanics
Advanced Physics Lab I, II
Introductory Solid State (Physics)
Physical Electronics
Physical Optics
Physics Seminar
Digital Design
Computational Methods in Applied Physics
Mathematical Methods of Theoretical Physics

Requirements for a BA in Physics

37 credits in physics with a grade-point average of 2.5.
The following courses are required for the major:

Intro. Physics Lab I, II
General Physics I, II
Elements of Physics (may be substituted under special circumstances)
Intro. to Thermodynamics
Intro. to Modern Physics
Applications of Mathematics to Physics
Mechanics I, II
Electromagnetic Fields and Waves I, II
Intro. to Atomic and Nuclear Physics
Quantum Mechanics
Advanced Physics Laboratory I, II
Calculus I, II
Calculus IV
Elementary Differential Equations

In addition, two courses from this list are required:

Linear Algebra (or Math 337)
Fourier Series and Boundary Value Problems
Vector Analysis (or Math 335)
Numerical Analysis
Applied Mathematics I, II
Computational Methods in Applied Physics
Mathematical Methods of Theoretical Physics
Introduction to Partial Differential Equations

It is strongly recommended that students who intend to pursue a Ph.D. in physics acquire a reading knowledge of French, German, or Russian.

Requirements for a BA in Applied Physics

Introductory Physics Lab I, II
Elements of Physics
Intro. to Thermodynamics
Intro. to Modern Physics
Applications of Mathematics to Physics
Mechanics I
Electromagnetic Fields and Waves I, II
Quantum Mechanics
Introductory Solid State Physics
Advanced Physics Lab I, II
Computational Methods in Applied Physics
Digital Design
Computers and Programming I, II
Calculus I, II, IV
Elementary Differential Equations
Circuits and Systems I, II
Electrical Engineering Lab

FOR ADDITIONAL INFORMATION ABOUT THE PHYSICS DEPARTMENT CONTACT:

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FOR ADMISSION INFORMATION:

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Major Requirements listed in this brochure are subject to final department approval.