

Physics Major, Biophysics Specialization

Program Requirements

- **Total Units Required:** 46-48
- **Grade Requirement:** Students must complete all coursework for the Physics Major, Biophysics Specialization with a grade of at least a C-.

Required Introductory Courses

Majors in Physics are required to complete a series of introductory courses. They may take either:

Code	Title	Units
PHYSICS 1740	Physics I	3
PHYSICS 1741	Physics I Laboratory	1
PHYSICS 1742	Physics II	3
PHYSICS 1743	Physics II Laboratory	1
Total Units		8

or (recommended for majors):

Code	Title	Units
PHYSICS 1741	Physics I Laboratory	1
PHYSICS 1743	Physics II Laboratory	1
PHYSICS 1760	Focused Physics I	4
PHYSICS 1762	Focused Physics II	4
Total Units		10

Required Courses

Majors in Physics are required to complete the following courses:

Code	Title	Units
PHYSICS 2170	Introduction to Quantum Physics	3
PHYSICS 3331	Physical Measurement Laboratory	3
PHYSICS 4011	Mechanics	3
PHYSICS 4021	Electricity and Magnetism	3
Total Units		12

They must also complete **one additional upper-level laboratory course**, chosen from the following:

Code	Title	Units
CHEM 4035	Nuclear and Radiochemistry Lab	3
PHYSICS 3321	Electronics Laboratory	3
PHYSICS 3323	Optics and Wave Physics Laboratory	3
PHYSICS 3324	Biophysics Laboratory	3
PHYSICS 4027	Introduction to Computational Physics	3

Upper-level courses: Majors are required to complete a minimum of 21 units of advanced courses (3000 level or higher) in Physics, excluding PHYSICS 3941, PHYSICS 3942, PHYSICS 4941, PHYSICS 4942, PHYSICS 4998, and PHYSICS 5000. These 21 units may include courses listed above and may also include *one* upper level engineering class chosen from the following:

Code	Title	Units
ESE 3510	Signals and Systems	3
ESE 4290	Basic Principles of Quantum Optics and Quantum Information	3
ESE 4360	Semiconductor Devices	3
ESE 4380	Applied Optics	3
ESE 4410	Control Systems	3
ESE 4820	Digital Processing	3
ESE 5310	Nano and Micro Photonics	3
ESE 5320	Introduction to Nano-Photonic Devices	3
ESE 5820	Fundamentals and Applications of Modern Optical Imaging	3
MEMS 3410	Fluid Mechanics	3

Students must receive letter grades for these advanced courses, and the course must be completed with a grade of at least a C-.

Math courses required for the physics major:

Code	Title	Units
MATH 1510	Calculus I	3
MATH 1520	Calculus II	3
MATH 2130	Calculus III	3
MATH 2500	Differential Equations	3
Total Units		12

Students who have completed MATH 2801 Honors Mathematics I and MATH 2802 Honors Mathematics II will have fulfilled the requirement for MATH 1510 Calculus I, MATH 1520 Calculus II, and MATH 2130 Calculus III.

Math courses recommended for the physics major:

- MATH 3008 Mathematics for the Physical Sciences or ESE 3180 Engineering Mathematics (We recommend that this course precede PHYS 4021 Electricity and Magnetism.)
- MATH 3300 Matrix Algebra (We recommend that this course precede PHYSICS 4074 Introduction to Particle Physics.)
- PHYSICS 5010 Theoretical Physics and PHYSICS 5020 Methods of Theoretical Physics II are also recommended.

Science-breadth requirement: Majors must select three of the following courses to satisfy the science-breadth requirement. One of the three courses must be CHEM 1030 Advanced Placement Chemistry I, CHEM 1040 Advanced Placement Chemistry II, CHEM 1601 Principles of General Chemistry I, CHEM 1602 Principles of General Chemistry II, CHEM 1701 General Chemistry I, CHEM 1702 General Chemistry II, CHEM 4010 Physical Chemistry I, or CHEM 4020 Physical Chemistry II.

Code	Title	Units
BIOL 2960	Principles of Biology I	4
BIOL 2970	Principles of Biology II	4
CHEM 1030	Advanced Placement Chemistry I	3
CHEM 1040	Advanced Placement Chemistry II	3
CHEM 1601	Principles of Chemistry I	3
CHEM 1602	Principles of General Chemistry II	3
CHEM 1701	General Chemistry I	3
CHEM 1702	General Chemistry II	3
CHEM 1751	General Chemistry Laboratory I	2
CHEM 1752	General Chemistry Laboratory II	2
CHEM 4010	Physical Chemistry I	3
CHEM 4020	Physical Chemistry II	3
CHEM 4079	Instrumental Methods:Physical Chemistry	3
CSE 1301	Introduction to Computer Science	3
CSE 1302	Introductory to Computer Engineering	3
CSE 2407	Data Structures and Algorithms	3
EEPS 2021	Introduction to Earth, Environmental, and Planetary Science	3

Students who have received credit for CHEM 1030 Advanced Placement Chemistry I and CHEM 1040 Advanced Placement Chemistry II can use them toward the science-breadth requirement.

Requirements for the Biophysics Specialization

Physics majors may concentrate in the subfield of biophysics by taking the following courses (as part of their distribution requirements):

Physics requirement:

Code	Title	Units
PHYSICS 4063	Statistical Mechanics and Thermodynamics	3

One of the following:

Code	Title	Units
PHYSICS 3350	Physics of the Brain	3
PHYSICS 3355	Physics of Vision	3

One of the following:

Code	Title	Units
PHYSICS 3354	Physics of Living Systems	3
PHYSICS 4081	Critical Analysis of Scientific Data	3
PHYSICS 4553	Topics in Theoretical Biophysics	3
PHYSICS 5090	Nonlinear Dynamic	3
PHYSICS 5630	Topics in Theoretical Biophysics	

Biology requirements:

Code	Title	Units
BIOL 2960	Principles of Biology I	4
BIOL 2970	Principles of Biology II	4
Total Units		8

Note: Students who want to have the biophysics track displayed on their transcript must inform the Department of Physics at least one semester before their graduation date. Contact the Director of Undergraduate Studies (dus@physics.wustl.edu) with any questions.

Additional Information

Senior Honors

Students are encouraged to work toward Latin honors (i.e., cum laude, magna cum laude, and summa cum laude). To qualify, students must meet the academic requirements of the College and successfully complete a suitable project under the supervision of a faculty member in the department. The project, whether experimental or theoretical, should demonstrate the student's capacity for independent work. Honors candidates must apply to the Undergraduate Studies Committee no later than the first day of classes of their senior year. The application should include a description of the proposed project, co-signed by the supervising professor. A written report of the completed work must be submitted to the committee by a March deadline. By enrolling in PHYSICS 4998 Honors Program, students may earn up to 6 units of credit for the honors project.

The Physics department also offers Physics majors the possibility to earn departmental distinctions. These distinctions require the same grade point average cutoffs as Latin honors but are calculated exclusively from the grades in Physics courses (i.e., all courses with the prefix PHYSICS). Three levels of distinction are offered: 1) highest distinction; 2) high distinction; and 3) distinction. The highest and high distinctions require at least one semester of undergraduate research and a senior thesis describing the results; these distinctions are limited to the top 15% (highest distinction) and the top 15% to 50% (high distinction) of the physics majors in their senior year as ranked by their GPA in Physics courses. Students who meet the GPA cutoff but who do not undertake undergraduate research and a senior thesis may only receive the third level of distinction.

Transfer Credit and Study Abroad

Students may transfer up to 9 credits of advanced coursework (3000+ level) to satisfy major requirements by taking comparable physics courses at another institution. Prior approval by the department is needed. Online or other distance learning courses are not eligible for transfer credit.

Website: <http://physics.wustl.edu>