

# Physics Major, Biophysics Specialization

## Program Requirements

- **Total units required:** 46-48

### Required Introductory Courses

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

Code	Title	Units
Physics 191	Physics I	3
Physics 191L	Physics I Laboratory	1
Physics 192	Physics II	3
Physics 192L	Physics II Laboratory	1

or (recommended for majors):

Code	Title	Units
Physics 193	Focused Physics I	4
Physics 193L	Focused Physics I Laboratory	1
Physics 194	Focused Physics II	4
Physics 194L	Physics II Laboratory	1

### Required Courses

Majors in physics are required to complete the following courses:

Code	Title	Units
Physics 217	Introduction to Quantum Physics	3
Physics 322	Physical Measurement Laboratory	3
Physics 411	Mechanics	3
Physics 421	Electricity and Magnetism	3
<b>Total Units</b>		<b>12</b>

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

Code	Title	Units
Physics 316	Optics and Wave Physics Laboratory	3
Physics 321	Electronics Laboratory	3
Physics 360	Biophysics Laboratory	3
Physics 427	Introduction to Computational Physics	3
Physics 435	Nuclear and Radiochemistry Lab	3

**Upper-level courses:** Majors are required to complete a minimum of 21 units of advanced courses (300 level or higher) in Physics, excluding Physics 341, Physics 342, Physics 441, Physics 442, Physics 499 and Physics 500. 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 351	Signals and Systems	3
ESE 429	Basic Principles of Quantum Optics and Quantum Information	3
ESE 436	Semiconductor Devices	3
ESE 438	Applied Optics	3
ESE 441	Control Systems	3
ESE 482	Digital Signal Processing	3
ESE 531	Nano and Micro Photonics	3
ESE 532	Introduction to Nano-Photonic Devices	3
ESE 582	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 131	Calculus I	3
Math 132	Calculus II	3
Math 217	Differential Equations	3
Math 233	Calculus III	3
<b>Total Units</b>		<b>12</b>

Students who have completed Math 203 Honors Mathematics I and Math 204 Honors Mathematics II will have fulfilled the requirement for Math 131 Calculus I, Math 132 Calculus II, and Math 233 Calculus III.

**Math courses recommended for the physics major:**

- Math 308 Mathematics for the Physical Sciences **or** ESE 318 Engineering Mathematics A (We recommend that this course precede Physics 421 Electricity and Magnetism.)
- Math 309 Matrix Algebra (We recommend that this course precede Physics 474 Introduction to Particle Physics.)
- Physics 501 Theoretical Physics/Math 501C Theoretical Physics and Physics 502 Methods of Theoretical Physics II/Math 502C Methods of Theoretical Physics II also are 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 103 Advanced Placement Chemistry I, Chem 104 Advanced Placement Chemistry II, Chem 105 Principles of General Chemistry I, Chem 106 Principles of General Chemistry II, Chem 111A General Chemistry I, Chem 112A General Chemistry II, Chem 401 Physical Chemistry I or Chem 402 Physical Chemistry II.

Code	Title	Units
Biol 2960	Principles of Biology I	4
Biol 2970	Principles of Biology II	4
Chem 103	Advanced Placement Chemistry I	3
Chem 104	Advanced Placement Chemistry II	3
Chem 105	Principles of General Chemistry I	3
Chem 106	Principles of General Chemistry II	3
Chem 111A	General Chemistry I	3
Chem 112A	General Chemistry II	3
Chem 151	General Chemistry Laboratory I	2
Chem 152	General Chemistry Laboratory II	2
Chem 401	Physical Chemistry I	3
Chem 402	Physical Chemistry II	3
Chem 445	Instrumental Methods: Physical Chemistry	3
CSE 131	Introduction to Computer Science	3
CSE 132	Introduction to Computer Engineering	3
CSE 247	Data Structures and Algorithms	3
EEPS 202	Introduction to Earth, Environmental, and Planetary Science	3

Students who have received credit for Chem 103 Advanced Placement Chemistry I and Chem 104 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 463	Statistical Mechanics and Thermodynamics	3

### One of the following:

Code	Title	Units
Physics 350	Physics of the Brain	3
or Physics 450	Physics of the Brain	
Physics 355	Physics of Vision	3
or Physics 455	Physics of Vision	

### One of the following:

Code	Title	Units
Physics 354	Physics of Living Systems	3
or Physics 454	Physics of Living Systems	
Physics 453	Topics in Theoretical Biophysics	3
Physics 481	Critical Analysis of Scientific Data	3
Physics 509	Nonlinear Dynamics	3
Physics 563	Topics in Theoretical Biophysics	3

### Biology requirements:

Code	Title	Units
Biol 2960	Principles of Biology I	4
Biol 2970	Principles of Biology II	4
<b>Total Units</b>		<b>8</b>

**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](mailto: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 499, 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 L31). 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 the 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 course work (300+ 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>