BACHELOR OF SCIENCE (BS) DEGREE WITH A MAJOR IN PHYSICS AND A MAJOR CONCENTRATION IN BIOLOGICAL PHYSICS

Program Learning Outcomes for the BS Degree with a Major in Physics and a Major Concentration in Biological Physics

Upon completing the BS degree with a major in Physics and a major concentration in Biological Physics, students will be able to:

1. Demonstrate an understanding of fundamental concepts in Mechanics.
2. Demonstrate an understanding of fundamental concepts in Electromagnetism.
3. Demonstrate an understanding of fundamental concepts in Quantum Mechanics.
4. Understand how the tools and concepts of physics are used to understand fundamental processes in the biosciences.
5. Demonstrate proficiency in research techniques and methodology under guidance of a faculty member.
6. Communicate scientific results both in writing and oral presentations.

Requirements for the BS Degree with a Major in Physics and a Major Concentration in Biological Physics

For general university requirements, see Graduation Requirements (ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements). Students pursuing the BS degree with a major in Physics and a major concentration in Biological Physics must complete:

- A minimum of 75 credit hours to satisfy major requirements.
- A minimum of 135 credit hours to satisfy degree requirements.
- A minimum of 60 credit hours outside of major requirements.
- A minimum of 32 credit hours taken at the 300-level or above.
- Core courses common to all major concentrations.

The requirements for the major concentration in Biological Physics. When students declare the major (ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/#text) in Physics, students must additionally identify and declare one of the major concentrations, either in:

- Applied Physics (ga.rice.edu/programs-study/departments-programs/natural-sciences/physics-astronomy/applied-physics-bs/#requirementstext), or
- Biological Physics (p. 1), or
- Computational Physics (ga.rice.edu/programs-study/departments-programs/natural-sciences/physics-astronomy/computational-physics-bs/#requirementstext), or
- General Physics (ga.rice.edu/programs-study/departments-programs/natural-sciences/physics-astronomy/general-physics-bs/#requirementstext)

Because of the common core requirements, it is possible for students to change their major concentration, even after initially declaring the major. To do so, please contact the Office of the Registrar (registrar@rice.edu).

Students may obtain credit for some courses by advanced placement, and the department’s undergraduate committee can modify requirements to meet the needs of students with special backgrounds.

The courses listed below satisfy the requirements for this major. In certain instances, courses not on this official list may be substituted upon approval of the department’s undergraduate committee. (Course substitutions must be formally applied and entered into Degree Works by the major’s official certifier (https://registrar.rice.edu/facstaff/degreeworks/officialcertifier).) Students and their academic advisors should identify and clearly document the courses to be taken.

Summary

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td></td>
<td>Total Credit Hours Required for the Major in Physics and a Major Concentration in Biological Physics</td>
<td>75</td>
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<tr>
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<td>Total Credit Hours Required for the BS Degree with a Major in Physics and a Major Concentration in Biological Physics</td>
<td>135</td>
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Degree Requirements

<table>
<thead>
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<th>Code</th>
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<th>Credit Hours</th>
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<td>Core Requirements</td>
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<td>Select 1 from the following:</td>
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<tr>
<td>PHYS 101 &amp; PHYS 103</td>
<td>MECHANICS (WITH LAB) and MECHANICS DISCUSSION</td>
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</tr>
<tr>
<td>PHYS 111</td>
<td>HONORS MECHANICS (WITH LAB)</td>
<td></td>
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<tr>
<td>PHYS 102 &amp; PHYS 104</td>
<td>ELECTRICITY &amp; MAGNETISM (WITH LAB) and ELECTRICITY AND MAGNETISM DISCUSSION</td>
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<tr>
<td>PHYS 112</td>
<td>HONORS ELECTRICITY &amp; MAGNETISM (WITH LAB)</td>
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<tr>
<td>PHYS 201</td>
<td>WAVES, LIGHT, AND HEAT</td>
<td>3</td>
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<tr>
<td>PHYS 202</td>
<td>MODERN PHYSICS</td>
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<tr>
<td>PHYS 231</td>
<td>ELEMENTARY PHYSICS LAB</td>
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<td>PHYS 301</td>
<td>INTERMEDIATE MECHANICS</td>
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<tr>
<td>PHYS 311</td>
<td>INTRODUCTION TO QUANTUM PHYSICS I</td>
<td>3</td>
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<tr>
<td>PHYS 491 &amp; PHYS 493</td>
<td>UNDERGRADUATE RESEARCH and UNDERGRADUATE RESEARCH SEMINAR 1</td>
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<td>PHYS 492 &amp; PHYS 494</td>
<td>UNDERGRADUATE RESEARCH and UNDERGRADUATE RESEARCH SEMINAR 2</td>
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<td>MATH 101 or MATH 105</td>
<td>SINGLE VARIABLE CALCULUS I or AP/OTH CREDIT IN CALCULUS I</td>
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<tr>
<td>MATH 102 or MATH 106</td>
<td>SINGLE VARIABLE CALCULUS II or AP/OTH CREDIT IN CALCULUS II</td>
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Bachelor of Science (BS) Degree with a Major in Physics and a Major Concentration in Biological Physics

MATH 211 ORDINARY DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA 3
or MATH 220 HONORS ORDINARY DIFFERENTIAL EQUATIONS
or MATH 221 HONORS CALCULUS III

MATH 212 MULTIVARIABLE CALCULUS 3
or MATH 222 HONORS CALCULUS IV

Major Concentration in Biological Physics 3
PHYS 302 INTERMEDIATE ELECTRODYNAMICS 4
PHYS 312 INTRODUCTION TO QUANTUM PHYSICS II 3
PHYS 355 INTRODUCTION TO BIOLOGICAL PHYSICS 3
PHYS 425 STATISTICAL & THERMAL PHYSICS 3
BIOC 201 INTRODUCTORY BIOLOGY 3
BIOC 211 INTERMEDIATE EXPERIMENTAL BIOSCIENCES 2

BIOC 301 BIOCHEMISTRY I & BIOC 341 CELL BIOLOGY 3
CHEM 121 & CHEM 123 GENERAL CHEMISTRY I and GENERAL CHEMISTRY LABORATORY I 4
CHEM 122 & CHEM 124 GENERAL CHEMISTRY II and GENERAL CHEMISTRY LABORATORY II 4
CHEM 211 & CHEM 213 ORGANIC CHEMISTRY I and ORGANIC CHEMISTRY DISCUSSION 3
MATH 381 INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS and ORGANIC CHEMISTRY DISCUSSION 3
or CAAM 336 DIFFERENTIAL EQUATIONS IN SCIENCE AND ENGINEERING 3

Total Credit Hours Required for the Major in Physics and a Major Concentration in Biological Physics 75

University Graduation Requirements (ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements) 60

Total Credit Hours 135

Footnotes and Additional Information
* Includes coursework completed as distribution credit, FWIS, LPAR upper-level, residency (hours taken at Rice), 60 hours outside of the major (if applicable), and any additional academic program requirements. The “hours outside of the major” requirement may include all of the above university requirements.
1 PHYS 491 and PHYS 493 must be taken concurrently.
2 PHYS 492 and PHYS 494 must be taken concurrently.
3 Because of common core requirements, it is possible to change major concentrations even after declaring the major. See the Undergraduate tab of the Physics and Astronomy department listing for the requirements for each major concentration for the BS degree in Physics.
4 CHEM 121 and CHEM 123 can be satisfied by completing CHEM 151 and CHEM 153. CHEM 122 and CHEM 124 can be satisfied by completing CHEM 152 and CHEM 154.

Policies for the BS Degree with a Major in Physics and a Major Concentration in Biological Physics

Transfer Credit
For Rice University’s policy regarding transfer credit, see Transfer Credit (ga.rice.edu/undergraduate-students/academic-policies-procedures/transfer-credit). Some departments and programs have additional restrictions on transfer credit. The Office of Academic Advising maintains the university’s official list of transfer credit advisors on their website: https://oaa.rice.edu. Students are encouraged to meet with their academic program’s transfer credit advisor when considering transfer credit possibilities.

Departmental Transfer Credit Guidelines
Students pursuing the major in Physics should be aware of the following departmental transfer credit guidelines:

- Requests for transfer credit will be considered by the program director (and/or the program’s official transfer credit advisor) on an individual case-by-case basis.

Additional Information
For additional information, please see the Physics and Astronomy website: https://physics.rice.edu/

Opportunities for the BS Degree with a Major in Physics and a Major Concentration in Biological Physics

Academic Honors
The university recognizes academic excellence achieved over an undergraduate’s academic history at Rice. For information on university honors, please see Latin Honors (ga.rice.edu/undergraduate-students/honors-distinctions/university) (summa cum laude, magna cum laude, and cum laude) and Distinction in Research and Creative Work (ga.rice.edu/undergraduate-students/honors-distinctions/university). Some departments have department-specific Honors awards or designations.

Research in the Department of Physics and Astronomy
The Physics and Astronomy Department encourages undergraduate participation in research, both within the department and through extramural programs. For current opportunities, please visit the Department’s website and click on the Undergraduate Study link, at: https://www.physics.rice.edu/.

Additional Information
For additional information, please see the Physics and Astronomy website: https://physics.rice.edu/