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

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

Upon completing the BS Degree with a major in Physics and a major concentration in Applied 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. Be knowledgeable in the applications of physics concepts to real world devices and applications.
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 Applied Physics

For general university requirements, see Graduation Requirements (https://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 Applied Physics must complete:

- A minimum of 68 credit hours to satisfy major requirements.
- A minimum of 128 credit hours to satisfy degree requirements.
- A minimum of 60 credit hours outside of major requirements.
- A minimum of 37 credit hours taken at the 300-level or above.
- Core courses common to all major concentrations.
- The requirements for the major concentration in Applied Physics. When students declare the major (https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/#text) in Physics, students must additionally identify and declare one of four major concentrations, either in:
  - Applied Physics (p. 1), or
  - Biological Physics (https://ga.rice.edu/programs-study/departments-programs/natural-sciences/physics-astronomy/biological-physics-bs/#requirementstext), or
  - Computational Physics (https://ga.rice.edu/programs-study/departments-programs/natural-sciences/physics-astronomy/computational-physics-bs/#requirementstext), or

Because of the common core requirements, it is possible for students to change their major concentration at any time, even after initially declaring the major. To do so, please contact the Office of the Registrar (%20registrar@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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Credit Hours Required for the Major in Physics</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>and a Major Concentration in Applied Physics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Credit Hours Required for the BS Degree with</td>
<td>128</td>
</tr>
<tr>
<td></td>
<td>a Major in Physics and a Major Concentration in</td>
<td></td>
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<tr>
<td></td>
<td>Applied Physics</td>
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</table>

Degree Requirements

Core Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 101</td>
<td>SINGLE VARIABLE CALCULUS I</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 105</td>
<td>AP/OTH CREDIT IN CALCULUS I</td>
<td></td>
</tr>
<tr>
<td>MATH 102</td>
<td>SINGLE VARIABLE CALCULUS II</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 106</td>
<td>AP/OTH CREDIT IN CALCULUS II</td>
<td></td>
</tr>
<tr>
<td>MATH 211</td>
<td>ORDINARY DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 220</td>
<td>HONORS ORDINARY DIFFERENTIAL EQUATIONS</td>
<td></td>
</tr>
<tr>
<td>or MATH 221</td>
<td>HONORS CALCULUS III</td>
<td></td>
</tr>
<tr>
<td>MATH 212</td>
<td>MULTIVARIABLE CALCULUS</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 222</td>
<td>HONORS CALCULUS IV</td>
<td></td>
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</table>

Select 1 from the following:

- PHYS 101 MECHANICS (WITH LAB) and MECHANICS DISCUSSION
- PHYS 111 HONORS MECHANICS (WITH LAB)

Select 1 from the following:

- PHYS 102 ELECTRICITY & MAGNETISM (WITH LAB) and ELECTRICITY AND MAGNETISM DISCUSSION
- PHYS 112 HONORS ELECTRICITY & MAGNETISM (WITH LAB)
- PHYS 201 WAVES, LIGHT, AND HEAT
- PHYS 202 MODERN PHYSICS
- PHYS 231 ELEMENTARY PHYSICS LAB
- PHYS 301 INTERMEDIATE MECHANICS
- PHYS 311 INTRODUCTION TO QUANTUM PHYSICS I
Bachelor of Science (BS) Degree with a Major in Physics and a Major Concentration in Applied Physics

### Major Concentration in Applied Physics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 302</td>
<td>INTERMEDIATE ELECTRODYNAMICS</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 312 or ELEC 361</td>
<td>INTRODUCTION TO QUANTUM PHYSICS II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 332</td>
<td>JUNIOR PHYSICS LAB II</td>
<td>2</td>
</tr>
<tr>
<td>ELEC 364</td>
<td>PHOTONICS MEASUREMENTS: PRINCIPLES AND PRACTICE</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 412</td>
<td>SOLID STATE PHYSICS</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 425</td>
<td>STATISTICAL &amp; THERMAL PHYSICS</td>
<td>3</td>
</tr>
<tr>
<td>ELEC 242 or ELEC 244</td>
<td>SIGNALS, SYSTEMS, AND TRANSFORMS and ANALOG CIRCUITS LABORATORY</td>
<td>4</td>
</tr>
<tr>
<td>ELEC 305</td>
<td>INTRODUCTION TO PHYSICAL ELECTRONICS</td>
<td>3</td>
</tr>
<tr>
<td>MATH 381 or CAAM 336</td>
<td>INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS and DIFFERENTIAL EQUATIONS IN SCIENCE AND ENGINEERING</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credit Hours for the Major in Physics and a Major Concentration in Applied Physics: 68**

### University Graduation Requirements

- **Total Credit Hours: 128**
- 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.

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

**Transfer Credit**

For Rice University’s policy regarding transfer credit, see Transfer Credit [website]. 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: [website]. Students are encouraged to meet with their academic program’s transfer credit advisor when considering transfer credit possibilities.

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**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.

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**Additional Information**

For additional information, please see the Physics and Astronomy website: [website].

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**Opportunities for the BS Degree with a Major in Physics and a Major Concentration in Applied 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 [website]. Some departments have department-specific Honors awards or designations.

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**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: [website].

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**Additional Information**

For additional information, please see the Physics and Astronomy website: [website].

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Footnotes and Additional Information

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. Or approved substitute in applied physics.