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

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

Upon completing the BS degree with a major in 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.

Additionally, upon completing the BS degree with a major in Physics and a major concentration in Computational Physics, students will be able to:

1. Be knowledgeable of the use of numerical analysis to apply the laws of physics to real-world problems.
2. Demonstrate proficiency in research techniques and methodology under guidance of a faculty member.
3. Communicate scientific results both in writing and oral presentations.

Requirements for the BS Degree with a Major in Physics and a Major Concentration in Computational 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 Computational Physics must complete:

- A minimum of 72 credit hours to satisfy major requirements.
- A minimum of 120 credit hours to satisfy degree requirements.
- A minimum of 38 credit hours taken at the 300-level or above.
- Core courses common to all major concentrations.
- The requirements for the major concentration in Computational 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 (https://ga.rice.edu/programs-study/departments-programs/natural-sciences/physics-astronomy/applied-physics-bs/#requirementstext), or
  - Biological Physics (https://ga.rice.edu/programs-study/departments-programs/natural-sciences/physics-astronomy/biological-physics-bs/#requirementstext), or
  - Computational Physics (p. 1), 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 (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 Computational Physics</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>Total Credit Hours Required for the BS Degree with a Major in Physics and Major Concentration in Computational Physics</td>
<td>120</td>
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Degree Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td></td>
<td>Core Requirements</td>
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<tr>
<td></td>
<td>MATH 101</td>
<td>SINGLE VARIABLE CALCULUS I</td>
</tr>
<tr>
<td>or MATH 105</td>
<td>AP/OTH CREDIT IN CALCULUS I</td>
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<tr>
<td>or MATH 102</td>
<td>SINGLE VARIABLE CALCULUS II</td>
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<tr>
<td>or MATH 106</td>
<td>AP/OTH CREDIT IN CALCULUS II</td>
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<tr>
<td>MATH 211</td>
<td>ORDINARY DIFFERENTIAL EQUATIONS</td>
<td>3</td>
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<tr>
<td>and LINEAR ALGEBRA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or MATH 220</td>
<td>HONORS ORDINARY DIFFERENTIAL EQUATIONS</td>
<td></td>
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<tr>
<td>or MATH 221</td>
<td>HONORS CALCULUS III</td>
<td></td>
</tr>
<tr>
<td>MATH 212</td>
<td>MULTIVARIABLE CALCULUS</td>
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<tr>
<td>or MATH 222</td>
<td>HONORS CALCULUS IV</td>
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<td>Select 1 from the following:</td>
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<td>4</td>
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<tr>
<td>PHYS 101</td>
<td>MECHANICS (WITH LAB)</td>
<td></td>
</tr>
<tr>
<td>&amp; PHYS 103</td>
<td>and MECHANICS DISCUSSION</td>
<td></td>
</tr>
<tr>
<td>PHYS 111</td>
<td>HONORS MECHANICS (WITH LAB)</td>
<td></td>
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<td>Select 1 from the following:</td>
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<tr>
<td>PHYS 102</td>
<td>ELECTRICITY &amp; MAGNETISM (WITH LAB)</td>
<td></td>
</tr>
<tr>
<td>&amp; PHYS 104</td>
<td>and ELECTRICITY AND MAGNETISM DISCUSSION</td>
<td></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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</table>
PHYS 202  MODERN PHYSICS  3
PHYS 231  ELEMENTARY PHYSICS LAB  1
PHYS 301  INTERMEDIATE MECHANICS  4
PHYS 311  INTRODUCTION TO QUANTUM PHYSICS I  3
PHYS 491  UNDERGRADUATE RESEARCH  3
& PHYS 493  and UNDERGRADUATE RESEARCH SEMINAR
PHYS 492  UNDERGRADUATE RESEARCH  3
& PHYS 494  and UNDERGRADUATE RESEARCH SEMINAR

Select 2 courses from the following:

CAAM 435 / MATH 435  DYNAMICAL SYSTEMS
CAAM 454  ITERATIVE METHODS FOR SYSTEMS OF EQUATIONS AND UNCONSTRAINED OPTIMIZATION
CAAM 519  COMPUTATIONAL SCIENCE I
CAAM 520  COMPUTATIONAL SCIENCE II
CAAM 536  DIFFERENTIAL EQUATIONS
PHYS 580  INTRODUCTION TO PLASMA PHYSICS

Total Credit Hours Required for the Major in Physics and a Major Concentration in Computational Physics  72

Additional Credit Hours to Complete Degree Requirements  17
University Graduation Requirements  31

Total Credit Hours  120

Footnotes and Additional Information

* Note: University Graduation Requirements include 31 credit hours, comprised of Distribution Requirements (Groups I, II, and III), FWIS, and LPAP coursework. In some instances, courses satisfying major requirements may additionally meet distribution requirements. Additional Credit Hours to Complete Degree Requirements include general electives, coursework completed as upper-level, residency (hours taken at Rice), and/or any other additional academic program 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.

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

Program Restrictions and Exclusions

Students pursuing the BS Degree with a Major in Physics and a Major Concentration in Computational Physics should be aware of the following program restrictions:

- As noted in Majors, Minors, and Certificates (https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/) under Declaring Majors, Minors and Certificates, students may not obtain both a BA and a BS in the same major. Students pursuing the BS Degree with a Major in Physics and a Major Concentration in Computational Physics may not additionally pursue the BA Degree with a Major in Physics.
- Students pursuing the major in Physics may pursue only one major concentration within the major.
- As noted in Majors, Minors, and Certificates (https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/), students may not major and minor in the same subject.

Transfer Credit

For Rice University's policy regarding transfer credit, see Transfer Credit (https://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 department 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 Computational 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 (https://ga.rice.edu/undergraduate-students/honors-distinctions/university/) (summa cum laude, magna cum laude, and cum laude) and Distinction in Research and Creative Work (https://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 Research link, at: https://physics.rice.edu/.

**Additional Information**

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