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 and a major concentration in Computational 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 of the use of numerical analysis to apply the laws of physics to real-world problems.
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 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 132 credit hours to satisfy degree requirements.
- A minimum of 60 credit hours outside of major 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/#requirements-text), or
  - Biological Physics (https://ga.rice.edu/programs-study/departments-programs/natural-sciences/physics-astronomy/biological-physics-bs/#requirements-text), 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 (%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/degreeeworks/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 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>132</td>
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### Degree Requirements

<table>
<thead>
<tr>
<th>Code</th>
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<th>Credit Hours</th>
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<tbody>
<tr>
<td></td>
<td><strong>Core Requirements</strong></td>
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</tr>
<tr>
<td>MATH 101</td>
<td>SINGLE VARIABLE CALCULUS I</td>
<td>3</td>
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<tr>
<td>or MATH 105</td>
<td>AP/OTH CREDIT IN CALCULUS I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 102</td>
<td>SINGLE VARIABLE CALCULUS II</td>
<td>3</td>
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<tr>
<td>or MATH 106</td>
<td>AP/OTH CREDIT IN CALCULUS II</td>
<td>3</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>
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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>
<tr>
<td>or MATH 222</td>
<td>HONORS CALCULUS IV</td>
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<td><strong>Select 1 from the following:</strong></td>
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<tr>
<td>PHYS 101 &amp; PHYS 103</td>
<td>MECHANICS (WITH LAB) and MECHANICS DISCUSSION</td>
<td>4</td>
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<tr>
<td>PHYS 111</td>
<td>HONORS MECHANICS (WITH LAB)</td>
<td></td>
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<td></td>
<td><strong>Select 1 from the following:</strong></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>
<td>4</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>
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<tr>
<td>PHYS 202</td>
<td>MODERN PHYSICS</td>
<td>3</td>
</tr>
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<td>PHYS 231</td>
<td>ELEMENTARY PHYSICS LAB</td>
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<tr>
<td>PHYS 301</td>
<td>INTERMEDIATE MECHANICS</td>
<td>4</td>
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</table>
Bachelor of Science (BS) Degree with a Major in Physics and a Major Concentration in Computational Physics

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

Major Concentration in Computational Physics  3
PHYS 302  INTERMEDIATE ELECTRODYNAMICS  4
PHYS 312  INTRODUCTION TO QUANTUM PHYSICS II  3
or PHYS 425  STATISTICAL & THERMAL PHYSICS
PHYS 416  COMPUTATIONAL PHYSICS  3
CAAM 210  INTRODUCTION TO ENGINEERING  
COMPUTATION
CAAM 334  MATRIX ANALYSIS FOR DATA SCIENCE  3
or CAAM 335  MATRIX ANALYSIS
CAAM 336  DIFFERENTIAL EQUATIONS IN SCIENCE  
AND ENGINEERING
CAAM 453  NUMERICAL ANALYSIS I  3
COMP 130  ELEMENTS OF ALGORITHMS AND  4
or COMP 140  COMPUTATIONAL THINKING

Select 2 courses from the following:  6
CAAM 435 / MATH 435  DYNAMICAL SYSTEMS
CAAM 454  NUMERICAL ANALYSIS II
CAAM 520  COMPUTATIONAL SCIENCE II
CAAM 536 / CEVE 555  NUMERICAL METHODS FOR PARTIAL  
DIFFERENTIAL EQUATIONS
CAAM 519  COMPUTATIONAL SCIENCE I
PHYS 580  INTRODUCTION TO PLASMA PHYSICS

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

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

Total Credit Hours  132

Footnotes and Additional Information
* Includes coursework completed as distribution credit, FWIS, LPAP, 
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.

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

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/academic-distinctions/university/) (summa cum laude, magna 
cum laude, and cum laude) and Distinction in Research and Creative 
Work (https://ga.rice.edu/undergraduate-students/academic-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://physics.rice.edu/.

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