

# BACHELOR OF SCIENCE (BS) DEGREE WITH A MAJOR IN CHEMICAL PHYSICS

## Program Learning Outcomes for the BS Degree with a Major in Chemical Physics

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

1. Demonstrate a solid foundation of knowledge in chemistry as applicable to chemical physics.
2. Demonstrate a solid foundation of knowledge in physics as applicable to chemical physics.
3. Critically analyze challenging scientific and technical problems as encountered in chemical physics.
4. Read basic scientific literature and communicate scientific results via relevant channels.

## Requirements for the BS Degree with a Major in Chemical Physics

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

- A minimum of 73 credit hours to satisfy major requirements.
- A minimum of 120 credit hours to satisfy degree requirements.
- A minimum of 33-35 credit hours, depending on course selection, taken at the 300-level or above.

The Chemical Physics major is offered jointly by the Department of Chemistry and the Department of Physics and Astronomy. Students take upper-level courses in both chemistry and physics, focusing on the applications of physics to chemical systems. Students may obtain credit for some courses by advanced placement, and the program'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 major's academic advisor, or where applicable, the department's Director of Undergraduate Studies. (Course substitutions must be formally applied and entered into Degree Works by the major's [Official Certifier \(https://registrar.rice.edu/facstaff/degreeworks/officialcertifier/\)](https://registrar.rice.edu/facstaff/degreeworks/officialcertifier/).) Students and their academic advisors should identify and clearly document the courses to be taken.

### Summary

Code	Title	Credit Hours
Total Credit Hours Required for Major in Chemical Physics		73
Total Credit Hours Required for the BS Degree with a Major in Chemical Physics		120

## Degree Requirements

Code	Title	Credit Hours
<b>Core Requirements</b>		
General Chemistry <sup>1</sup>		
CHEM 121 & CHEM 123	GENERAL CHEMISTRY I and GENERAL CHEMISTRY LABORATORY I	4
<i>Select 1 from the following:</i> 4		
CHEM 122 & CHEM 124	GENERAL CHEMISTRY II and GENERAL CHEMISTRY LABORATORY II	
CHEM 201 & CHEM 205	ADVANCED TOPICS IN GENERAL CHEMISTRY and	
CHEM 211 & CHEM 213 or CHEM 219	ORGANIC CHEMISTRY I and ORGANIC CHEMISTRY DISCUSSION I or ORGANIC CHEMISTRY I HONORS	3
CHEM 215 or CHEM 365	ORGANIC CHEMISTRY LAB or ORGANIC CHEMISTRY LAB	2
CHEM 301	PHYSICAL CHEMISTRY I	3
CHEM 302	PHYSICAL CHEMISTRY II	3
Physics		
<i>Select 1 from the following:</i> <sup>2</sup> 4		
PHYS 101 & PHYS 103	MECHANICS (WITH LAB) and MECHANICS DISCUSSION	
PHYS 111	HONORS MECHANICS (WITH LAB)	
<i>Select 1 from the following:</i> <sup>3</sup> 4		
PHYS 102 & PHYS 104	ELECTRICITY & MAGNETISM (WITH LAB) and ELECTRICITY AND MAGNETISM DISCUSSION	
PHYS 112	HONORS ELECTRICITY & MAGNETISM (WITH LAB)	
PHYS 201	WAVES, LIGHT, AND HEAT	3
PHYS 202	MODERN PHYSICS	3
PHYS 231	ELEMENTARY PHYSICS LAB	1
PHYS 301	INTERMEDIATE MECHANICS	4
PHYS 302	INTERMEDIATE ELECTRODYNAMICS	4
Mathematics		
MATH 101 or MATH 105	SINGLE VARIABLE CALCULUS I <sup>4</sup> or AP/OTH CREDIT IN CALCULUS I	3
MATH 102 or MATH 106	SINGLE VARIABLE CALCULUS II <sup>4</sup> or AP/OTH CREDIT IN CALCULUS II	3
MATH 211 or MATH 220 or MATH 221	ORDINARY DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA or HONORS ORDINARY DIFFERENTIAL EQUATIONS or HONORS CALCULUS III	3
MATH 212 or MATH 222 or MATH 232	MULTIVARIABLE CALCULUS or HONORS CALCULUS IV or HONORS MULTIVARIABLE CALCULUS	3
<b>Elective Requirements</b>		
Advanced Coursework in Physics and Chemistry		
<i>Select 3 courses from the following:</i> 9		
PHYS 311	INTRODUCTION TO QUANTUM PHYSICS I	
PHYS 312	INTRODUCTION TO QUANTUM PHYSICS II	

or CHEM 43 QUANTUM CHEMISTRY	
CHEM 360	INORGANIC CHEMISTRY
CHEM 415	CHEMICAL KINETICS AND DYNAMICS
CHEM 420	CLASSICAL AND STATISTICAL THERMODYNAMICS
or PHYS 425 STATISTICAL & THERMAL PHYSICS	
Advanced Laboratories	
<i>Select 2 courses from the following:</i> 4	
CHEM 366	INORGANIC CHEMISTRY LAB
CHEM 367	MATERIALS CHEMISTRY LAB
CHEM 368	CHEMICAL MEASUREMENT LAB
CHEM 491	RESEARCH FOR UNDERGRADUATES <sup>5</sup>
or PHYS 461 INDEPENDENT RESEARCH	
CHEM 491	RESEARCH FOR UNDERGRADUATES <sup>5</sup>
PHYS 332	JUNIOR PHYSICS LAB II
Advanced Coursework in Mathematics (MATH) or Computational Applied Mathematics and Operations Research (CMOR)	
<i>Select 2 courses from MATH or CMOR course offerings at the 300-level or above</i> 6	
<b>Total Credit Hours Required for the Major in Chemical Physics</b>	<b>73</b>
Additional Credit Hours to Complete Degree Requirements *	16
<u>University Graduation Requirements</u> ( <a href="https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/">https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/</a> ) *	31
<b>Total Credit Hours</b>	<b>120</b>

### 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 FWIS or distribution requirements may additionally meet other requirements, such as the Analyzing Diversity (AD) requirement, or some of the student's declared major, minor, or certificate 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.

<sup>1</sup> CHEM 111 may be substituted for CHEM 121; CHEM 113 may be substituted for CHEM 123; CHEM 112 may be substituted for CHEM 122; CHEM 114 may be substituted for CHEM 124.

<sup>2</sup> The Chemistry and Physics departments have determined that credit awarded for PHYS 141 *CONCEPTS IN PHYSICS I* is not eligible for meeting the requirements of the Chemical Physics major.

<sup>3</sup> The Chemistry and Physics departments have determined that credit awarded for PHYS 142 *CONCEPTS IN PHYSICS II* is not eligible for meeting the requirements of the Chemical Physics major.

<sup>4</sup> Students without credit for basic calculus (e.g., MATH 101, MATH 105, and/or MATH 102, MATH 106) must either enroll in the relevant course(s) or substitute more advanced MATH or CMOR coursework with prior approval by the program advisor.

<sup>5</sup> A limit of 2 credit hours from CHEM 491 or PHYS 461 may count toward the Advanced Laboratories requirement.

## Policies for the BS Degree with a Major in Chemical Physics

### Program Restrictions and Exclusions

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

- Students pursuing the major in Chemical Physics may not declare the BA degree with a major in Physics.
- Students pursuing the major in Chemical Physics may not declare the minor in 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 (<https://oaa.rice.edu/advising-network/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.

### Program Transfer Credit Guidelines

Students pursuing the major in Chemical Physics should be aware of the following program-specific 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. For more information, please see <https://chemistry.rice.edu/transfer-credit> (<https://chemistry.rice.edu/transfer-credit/>).

### Additional Information

For additional information, please see the following department websites:

- Chemistry: <https://chemistry.rice.edu/> (<https://chemistry.rice.edu>)
- Physics and Astronomy: <https://physics.rice.edu/>

## Opportunities for the BS Degree with a Major in Chemical 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.

### Additional Information

For additional information, please see the following department websites:

- Chemistry: <https://chemistry.rice.edu/>
- Physics and Astronomy: <https://physics.rice.edu/>