

# PHYSICS, BACHELOR OF SCIENCE (BS) - CONCENTRATION IN COMPUTATIONAL PHYSICS

## Program Learning Outcomes

Upon graduation, students in the Physics Program at SRU will be:

- Proficient in the basic and advanced concepts of classical and modern physics.
- Accomplished problem solvers capable of applying inductive and deductive logic, mathematical modeling, computational tools, and principles of physics to novel situations.
- Skilled at constructing and assembling experimental apparatuses, conducting and analyzing measurements of physical phenomena, and drawing valid conclusions from experimental data.
- Effective communicators, capable of presenting scientific results effectively to diverse audiences.
- Prepared for a career in science, industry, and education or to pursue a graduate program in physics or related areas.

## Related Links

Physics - Computational Physics, BS Program Page (<https://www.sru.edu/academics/majors-and-minors/physics-computational-physics/>)

Physics Fact Sheet URL (<https://www.sru.edu/documents/programs/factsheets/undergraduate/physics-fs.pdf>)

Professional Licensure/Certification Page (<https://www.sru.edu/students/student-consumer-information/professional-licensure/>)

## Curriculum Guide

### GPA Requirement

Major GPA: 2.00 or higher  
Overall GPA: 2.00 or higher

### Summary\*

Code	Title	Hours
	Rock Studies 2 Requirements	45
	Other Basic Requirements	0-3
	Major/Concentration Requirements	59
	Natural Science and Math College-Wide Requirements	12
	Electives	16

\* All undergraduate degree programs require a minimum of 120 credits. Some courses meet multiple requirements, but are only counted once toward the 120 credit total required to graduate.

### Rock Studies 2 Requirements

Code	Title	Hours
	<b>The Rock</b>	
SUBJ 139	Foundations of Academic Discovery <sup>1</sup>	3
ENGL 102	Critical Writing	3

ENGL 104	Critical Reading	3
MATH 225	Calculus I	4
Select one of the following:		3
COMM 200	Civil Discourse: Theory & Practice	
PHIL 110	Ethics and Civil Discourse	
POLS 235	Civil Discourse and Democracy	
Subtotal		16
<b>Integrated Inquiry</b>		
<i>Creative and Aesthetic Inquiry</i>		
Select 3 Credits ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )		3
<i>Humanities Inquiry</i>		
Select 3 Credits ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )		3
<i>Social Science Inquiry</i>		
Select 3 Credits ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )		3
<i>Natural Sciences Inquiry</i>		
CHEM 107	General Chemistry I	3
CHEM 111	General Chemistry I Lab	1
<i>Physical Sciences Inquiry</i>		
PHYS 211	General Physics I with Lab	4
Subtotal		17
<b>Thematic Thread</b>		
Select 12 Credits ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> ) <sup>2</sup>		12
<b>Total Hours</b>		<b>45</b>

<sup>1</sup> Course offered in multiple subjects; cannot take course in first major subject.

<sup>2</sup> One course from each category; six credits must be 300-level or above; no more than 4 credits from one subject area; specific courses required in first major, regardless of prefix of course, cannot be used to satisfy thread requirements; any course with same prefix as first major cannot be used to satisfy thread requirements, even if it is not a course in the first major.

### Basic Math Requirement

Check with your adviser or a current degree audit report to see if you have been exempted from this course. The credit earned in this course will not be counted toward the 120 credit hour minimum needed to earn a degree.

Code	Title	Hours
Complete one of the following:		0-3
Meet required minimum SAT or ACT math score OR		
ESAP 110	Beginning Algebra	
<b>Total Hours</b>		<b>0-3</b>

### DIVERSITY, EQUITY, AND INCLUSION REQUIREMENT

Students must take and pass a course with the Diversity, Equity, and Inclusion (DEI) designation prior to graduation. Students can meet this requirement by taking any DEI - designated course in any program at any time during their undergraduate career.

## Major/Concentration Requirements

- 30 major credits must be taken at SRU or PASSHE
- 29 major credits must be taken at the 300 level or above

Code	Title	Hours
<b>Required Physics Courses</b>		
PHYS 212	General Physics II with Lab <sup>1</sup>	3
PHYS 213	General Physics III/ Lab <sup>1</sup>	4
PHYS 312	Modern Physics I <sup>1</sup>	3
PHYS 315	Dynamics <sup>1</sup>	3
PHYS 331 or MATH 331	Mathematical Methods of Physics <sup>1</sup> Mathematical Methods of Physics	3
PHYS 381	Advanced Physics Laboratory <sup>1</sup>	2
PHYS 385	Computational Physics <sup>1</sup>	3
PHYS 412	Modern Physics II <sup>1</sup>	1
PHYS 480	Quantum <sup>1</sup>	3
PHYS 490	Independent Study <sup>1</sup>	2
Subtotal		27
<b>Required Physics Electives</b>		
Select two of the following: <sup>2</sup>		6
PHYS 314	Statics <sup>1</sup>	
PHYS 325	Analog & Digital Electronics <sup>1</sup>	
PHYS 371	Physical Optics <sup>1</sup>	
PHYS 375	Thermal Physics <sup>1</sup>	
PHYS 410	Electricity and Magnetism <sup>1</sup>	
Subtotal		6
<b>Related Field Work</b>		
CPSC 146	Programming Principles <sup>1</sup>	3
CPSC 246	Advanced Programming Principles <sup>1</sup>	3
CPSC 374	Algorithms and Data Structures <sup>1</sup>	3
MATH 230	Calculus II <sup>1</sup>	4
MATH 231	Calculus III <sup>1</sup>	4
MATH 240	Linear Algebra and Differential Equations <sup>1</sup>	3
MATH 301	Differential Equations I <sup>1</sup>	3
MATH 315	Numerical Mathematics <sup>1</sup>	3
Subtotal		26
<b>Total Hours</b>		<b>59</b>

<sup>1</sup> Course counts for 50% of Major requirements and Major GPA

<sup>2</sup> Students are encouraged to take PHYS 410.

\* Some courses may require pre-requisites. Please see course descriptions to determine if there are any pre-requisites for that specific course.

## Natural Science and Math College-Wide Requirements

Code	Title	Hours
Students must take the following four courses:		
CHEM 107	General Chemistry I <sup>1</sup>	3
CHEM 111	General Chemistry I Lab <sup>1</sup>	1
MATH 225	Calculus I <sup>1</sup>	4
PHYS 211	General Physics I with Lab <sup>1</sup>	4
<b>Total Hours</b>		<b>12</b>

<sup>1</sup> Course can be counted as a Rock Studies 2 Requirement, but earns credit only once toward your 120-credits total.

PHYSICS - BS (6164)

Concentration in Computational Physics (COPH)

This program is effective as of Fall 2019.

Revised 02.2020

UCC 2.5.2019

## Important Curriculum Guide Notes

This Curriculum Guide is provided to help SRU students and prospective students better understand their intended major curriculum. Enrolled SRU students should note that the My Rock Audit may place already-earned and/or in progress courses in different, yet valid, curriculum categories. Enrolled SRU students should use the My Rock Audit Report and materials and information provided by their faculty advisers to ensure accurate progress towards degree completion. *The information on this guide is current as of the date listed. Students are responsible for curriculum requirements at the time of enrollment at the University.*

PASSHE - Pennsylvania State System of Higher Education Institutions

## Recommended Four-Year Plan

Course	Title	Hours
<b>First Year</b>		
<b>Fall</b>		
ENGL 102	Critical Writing	3
ESAP 101	FIRST Seminar *	1
MATH 225	Calculus I	4
PHYS 211	General Physics I with Lab	4
SUBJ 139	Foundations of Academic Discovery <sup>1</sup>	3
<b>Hours</b>		<b>15</b>
<b>Spring</b>		
ENGL 104	Critical Reading	3
PHYS 213	General Physics III/ Lab	4
MATH 230	Calculus II	4
Rock Studies 2 Requirement ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )		3
<b>Hours</b>		<b>14</b>
<b>Second Year</b>		
<b>Fall</b>		
CHEM 107 & CHEM 111	General Chemistry I and General Chemistry I Lab	4
CPSC 146	Programming Principles	3
MATH 231	Calculus III	4
PHYS 212	General Physics II with Lab	3
Declare a Thematic Thread <sup>2</sup>		
<b>Hours</b>		<b>14</b>
<b>Spring</b>		
CPSC 246	Advanced Programming Principles	3
MATH 240	Linear Algebra and Differential Equations	3
MATH 301	Differential Equations I	3
Rock Studies 2 Requirement ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )		3

Rock Studies 2 Requirement ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )	3
<b>Hours</b>	<b>15</b>
<b>Third Year</b>	
<b>Fall</b>	
Free Elective	3
PHYS 312            Modern Physics 1	3
PHYS 385            Computational Physics	3
Select one of the following:	3
COMM 200        Civil Discourse: Theory & Practice	
PHIL 110          Ethics and Civil Discourse	
POLS 235          Civil Discourse and Democracy	
Rock Studies 2 Requirement ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )	3
<b>Hours</b>	<b>15</b>
<b>Spring</b>	
PHYS 315            Dynamics	3
PHYS 375            Thermal Physics	3
PHYS 381            Advanced Physics Laboratory	2
MATH 315            Numerical Mathematics	3
CPSC 374            Algorithms and Data Structures	3
PHYS 412            Modern Physics 2	1
<b>Hours</b>	<b>15</b>
<b>Fourth Year</b>	
<b>Fall</b>	
PHYS 490            Independent Study (Computational Physics Research)	1
PHYS 331            Mathematical Methods of Physics	3
Rock Studies 2 Requirement ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )	3
Rock Studies 2 Requirement ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )	3
Physics Elective	3
Free Elective	3
<b>Hours</b>	<b>16</b>
<b>Spring</b>	
PHYS 410            Electricity and Magnetism	3
PHYS 480            Quantum	3
PHYS 490            Independent Study (Computational Physics Research)	1
Rock Studies 2 Requirement ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )	3
Technical Elective	3
Free Elective	3
<b>Hours</b>	<b>16</b>
<b>Total Hours**</b>	<b>120</b>

*\*\* This document is meant to serve as a guide. Some planners may show more than 120 credits because faculty have created flexibility in choosing courses. However, only 120 credits are required to obtain a degree. Please consult with your academic adviser and refer to your curriculum guide prior to registering for courses. This plan should be reviewed, and verified, by you and your academic adviser at least once each academic year.*

Major Code: 6164  
Concentration: COPH  
Revised: 12-2019

<sup>1</sup> Course offered in multiple subjects; cannot take course in first major subject.

<sup>2</sup> Work with your Academic Adviser to declare a Thematic Thread by the end of your fall semester in your second year.

\* Students are encouraged to take ESAP 101 as a Free Elective.