

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

The Slippery Rock University Chemistry Degree is certified by the American Chemistry Society or ACS. In order to earn ACS certification, students must complete 2 credits of Independent Study and 1 credit of Research in addition to the BS requirements. Students can also choose an option concentration in order to broaden their background in chemistry or to gain additional experience if they wish to pursue other interests.

Concentrations are available in the following areas:

- Biochemistry
- Computational Chemistry
- Education
- Environmental Chemistry
- Forensic Chemistry
- Health Sciences

## Program Learning Outcomes

- Students will demonstrate knowledge of the main disciplines of chemistry, namely *Organic, Analytical, Biological, Physical, and Inorganic* chemistry.
- Students will demonstrate development of technical skills for practical applications of chemistry.
- Students will present collected experimental data in written and oral reports.
- Students and faculty will participate in faculty-led research projects. Students are expected to be actively working in the laboratory under the supervision and guidance of a faculty mentor.

## Related Links

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

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

## Curriculum Guide

### GPA Requirement

Major GPA: 2.0 or higher

Overall GPA: 2.0 or higher

### Summary\*

Code	Title	Hours
	Rock Studies 2 Requirements	45
	Other Basic Requirements	0-3
	Major Requirements	54
	Natural Science and Math College-Wide Requirements	12

Computational Chemistry Concentration	21
ACS Certification – Optional	0-3

\* 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 <sup>2,3</sup>	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 & CHEM 111	General Chemistry I and General Chemistry I Lab <sup>2,3</sup>	4
<i>Physical Sciences Inquiry</i>		
PHYS 216	University Physics 1 with Lab <sup>2,3</sup>	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>4</sup>		12
<b>Total Hours</b>		<b>45</b>

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

<sup>2</sup> Course counts for 50% of Major requirements and Major GPA

<sup>3</sup> Course can be counted as a Rock Studies 2 Requirement, but earns credit only once toward your 120-credits total.

<sup>4</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

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

Code	Title	Hours
<b>Required Introductory Chemistry Courses</b>		
CHEM 108	General Chemistry II <sup>1</sup>	3
CHEM 112	General Chemistry II Lab <sup>1</sup>	1
Subtotal		4
<b>Required Foundation Chemistry Courses</b>		
CHEM 201	Organic Chemistry I <sup>1</sup>	3
CHEM 211	Organic Chemistry Laboratory I <sup>1</sup>	1
CHEM 301	Physical Chemistry I <sup>1</sup>	3
CHEM 321	Physical Chemistry Laboratory I <sup>1</sup>	1
CHEM 335	Biochemistry I <sup>1</sup>	3
CHEM 336	Biochemistry Laboratory I <sup>1</sup>	1
CHEM 350	Analytical Chemistry <sup>1</sup>	3
CHEM 351	Analytical Chemistry Lab <sup>1</sup>	1
CHEM 442	Inorganic Chemistry <sup>1</sup>	3
CHEM 452	Physical Inorganic Chemistry Laboratory <sup>1</sup>	1
Subtotal		20
<b>Required In-Depth Chemistry Courses</b>		
CHEM 202	Organic Chemistry II <sup>1</sup>	3
CHEM 212	Organic Chemistry Laboratory II <sup>1</sup>	1
CHEM 302	Physical Chemistry II <sup>1</sup>	3
CHEM 425	Instrumental Analysis <sup>1</sup>	3
CHEM 426	Instrumental Analysis Laboratory <sup>1</sup>	1
CHEM 460	Materials Chemistry <sup>1</sup>	3
Subtotal		14
<b>Additional Required In-Depth Chemistry Courses</b>		
Select one lecture and one laboratory course:		4
CHEM 337	Biochemistry II <sup>1</sup>	
CHEM 338	Biochemistry Laboratory II <sup>1</sup>	
CHEM 340	Air Quality Assessment <sup>1</sup>	
CHEM 370	Water Quality Assessment <sup>1</sup>	
CHEM 415	Forensic Analysis <sup>1</sup>	
CHEM 416	Forensic Analysis Lab <sup>1</sup>	
CHEM 475	Advanced Organic Synthesis <sup>1</sup>	
Subtotal		4
<b>Cognate Courses</b>		
BIOL 114	Biology II: Foundations of Molecules, Genes and Cells with Lab <sup>1</sup>	4

MATH 230	Calculus II <sup>1</sup>	4
PHYS 217	University Physics 2 with Lab <sup>1</sup>	4
Subtotal		12
<b>Total Hours</b>		<b>54</b>

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

\* 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
CHEM 107	General Chemistry I <sup>1,2</sup>	3
CHEM 111	General Chemistry I Lab <sup>1,2</sup>	1
MATH 225	Calculus I <sup>1,2</sup>	4
PHYS 216	University Physics 1 with Lab <sup>1,2</sup>	4
<b>Total Hours</b>		<b>12</b>

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

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

## Computational Chemistry Concentration

Code	Title	Hours
<b>Computer Science Courses</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
CPSC 480	Topics in Computer Science: Machine Learning <sup>1</sup>	3
Subtotal		12
<b>Required Math and Science Courses</b>		
PHYS 385	Computational Physics <sup>1</sup>	3
STAT 152	Elementary Statistics I <sup>1</sup>	3
MATH 240	Linear Algebra and Differential Equations <sup>1</sup>	3
Subtotal		9
<b>Total Hours</b>		<b>21</b>

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

## ACS Certification – Optional

Code	Title	Hours
CHEM 490	Independent Study <sup>1</sup>	2
CHEM 496	Research <sup>1</sup>	1
<b>Total Hours</b>		<b>3</b>

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

## Co-curricular and Experiential Learning

Students are encouraged to explore additional curricular and co-curricular opportunities. There is a strong correlation between long-term student success and participation in the following types of programs and activities:

1. High-Impact Practice (HIP) designated classes (e.g., Organic Chemistry II Lab)
2. Student-faculty research
3. Student leadership development (Chemistry Club)
4. Career education and development
5. Internships
6. Student teaching (serve as Lab Assistants and tutors)
7. Volunteering

## 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

CHEMISTRY - BS (6118)  
 Concentration in Computational Chemistry (CCHM)  
 This program is effective as of Summer 2022  
 Revised 07.06.2022  
 UCC 03.22.2022

## Recommended Four-Year Plan

Course	Title	Hours
<b>First Year</b>		
<b>Fall</b>		
CHEM 107 & CHEM 111	General Chemistry I and General Chemistry I Lab	4
BIOL 114	Biology II: Foundations of Molecules, Genes and Cells with Lab	4
ENGL 102	Critical Writing	3
ESAP 101	FYRST Seminar *	1
Select one of the following:		4
MATH 125	Precalculus	
MATH 225	Calculus I	
MATH 230	Calculus II	
<b>Hours</b>		<b>16</b>
<b>Spring</b>		
CHEM 108 & CHEM 112	General Chemistry II and General Chemistry II Lab	4
STAT 152	Elementary Statistics I	3
SUBJ 139	Foundations of Academic Discovery	3
Select one of the following:		4
MATH 225	Calculus I (if necessary)	
MATH 230	Calculus II	
MATH 240	Linear Algebra and Differential Equations	
<b>Hours</b>		<b>14</b>

### Second Year

#### Fall

CHEM 201 & CHEM 211	Organic Chemistry I and Organic Chemistry Laboratory I	4
CPSC 146	Programming Principles	3
ENGL 104	Critical Reading	3
PHYS 216	University Physics 1 with Lab	4
Select one of the following:		3-4
MATH 230	Calculus II	
MATH 240	Linear Algebra and Differential Equations	
<b>Hours</b>		<b>17-18</b>

#### Spring

CHEM 202 & CHEM 212	Organic Chemistry II and Organic Chemistry Laboratory II	4
CPSC 246	Advanced Programming Principles	3
MATH 240	Linear Algebra and Differential Equations	3
PHYS 217	University Physics 2 with Lab	4
Select one of the following (Civil Discourse):		3
COMM 200	Civil Discourse: Theory & Practice	
PHIL 110	Ethics and Civil Discourse	
POLS 235	Civil Discourse and Democracy	
<b>Hours</b>		<b>17</b>

### Third Year

#### Fall

Select one of the following:		7-8
In even years, select:		
CHEM 335 & CHEM 336	Biochemistry I and Biochemistry Laboratory I	
CHEM 442	Inorganic Chemistry	
In odd years, select:		
CHEM 301 & CHEM 321	Physical Chemistry 1 and Physical Chemistry Laboratory I	
CHEM 350 & CHEM 351	Analytical Chemistry and Analytical Chemistry Lab	
PHYS 385	Computational Physics	3
Inquiry/Thread/Elective ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )		3
Inquiry/Thread/Elective ( <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>16-17</b>

#### Spring

Select one of the following:		7
In odd years, select:		
CHEM 452	Physical Inorganic Chemistry Laboratory	
CHEM 460	Materials Chemistry (odd years)	
Inquiry/Thread/Elective Course ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )		
In even years, select:		
CHEM 302	Physical Chemistry II	
CHEM 425 & CHEM 426	Instrumental Analysis and Instrumental Analysis Laboratory	
Select one of the following:		4
In Depth Chemistry Elective (1 lecture and 1 lab)		

CHEM 337 & CHEM 338	Biochemistry II and Biochemistry Laboratory II	
CHEM 340	Air Quality Assessment	
CHEM 370	Water Quality Assessment	
CHEM 415 & CHEM 416	Forensic Analysis and Forensic Analysis Lab	
CHEM 475	Advanced Organic Synthesis	
CPSC 374	Algorithms and Data Structures	3
Inquiry/Thread/Elective Course ( <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>17</b>

**Fourth Year****Fall**

Select one of the following:		7-8
In even years, select:		
CHEM 335 & CHEM 336	Biochemistry I and Biochemistry Laboratory I	
CHEM 442	Inorganic Chemistry	
In odd years, select:		
CHEM 301 & CHEM 321	Physical Chemistry 1 and Physical Chemistry Laboratory I	
CHEM 350 & CHEM 351	Analytical Chemistry and Analytical Chemistry Lab	
CPSC 480	Topics in Computer Science: Machine Learning	3
Inquiry/Thread/Elective Course ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )		3
Inquiry/Thread/Elective Course ( <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>16-17</b>

**Spring**

Select one of the following:		7
In odd years, select:		
CHEM 452	Physical Inorganic Chemistry Laboratory	
CHEM 460	Materials Chemistry	
Inquiry/Thread/Elective Course ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )		
In even years, select:		
CHEM 302	Physical Chemistry II	
CHEM 425 & CHEM 426	Instrumental Analysis and Instrumental Analysis Laboratory	
Select one of the following In Depth Chemistry Electives (1 lecture and 1 lab):		4
CHEM 337 & CHEM 338	Biochemistry II and Biochemistry Laboratory II	
CHEM 340	Air Quality Assessment	
CHEM 370	Water Quality Assessment	
CHEM 415 & CHEM 416	Forensic Analysis and Forensic Analysis Lab	
CHEM 475	Advanced Organic Synthesis	
Inquiry/Thread/Elective Course ( <a href="https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/">https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/</a> )		3

Inquiry/Thread/Elective Course ( <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>17</b>
<b>Total Hours**</b>	<b>130-133</b>

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

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

**\*\* 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: 6118

Concentration Code: CCHM

Revised date: 08.03.2023