

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

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/>)

Chemistry Department Page (<https://www.sru.edu/academics/colleges-and-departments/ches/departments/chemistry/>)

Professional Licensure/Certification Page (<http://www.sru.edu/Documents/offices/PRMA/PLC.pdf>)

If you are a Liberal Studies student, please click here (<http://catalog.sru.edu/undergraduate/health-engineering-sciences/chemistry/chemistry-bs-concentration-computational-chemistry-liberal/#curriculumguidetext>) for your Curriculum Guide.

## Curriculum Guide

### GPA Requirement

Major GPA: 2.0 or higher

Overall GPA: 2.0 or higher

### Summary\*

Code	Title	Hours
	Rock Studies Requirements	45
	Other Basic Requirements	0-3
	Computer Competency	0-3
	Major Requirements	56
	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 Requirements

Code	Title	Hours
<b>The Rock</b>		
SUBJ 139	University Seminar <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:		
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="http://catalog.sru.edu/undergraduate/rock-studies/rock-studies-quick-guide/">http://catalog.sru.edu/undergraduate/rock-studies/rock-studies-quick-guide/</a> )		3
<i>Humanities Inquiry</i>		
Select 3 Credits ( <a href="http://catalog.sru.edu/undergraduate/rock-studies/rock-studies-quick-guide/">http://catalog.sru.edu/undergraduate/rock-studies/rock-studies-quick-guide/</a> )		3
<i>Social Science Inquiry</i>		
Select 3 Credits ( <a href="http://catalog.sru.edu/undergraduate/rock-studies/rock-studies-quick-guide/">http://catalog.sru.edu/undergraduate/rock-studies/rock-studies-quick-guide/</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 211	General Physics I with Lab <sup>2,3</sup>	4
Subtotal		17
<b>Thematic Thread</b>		
Select 12 Credits ( <a href="http://catalog.sru.edu/undergraduate/rock-studies/rock-studies-quick-guide/">http://catalog.sru.edu/undergraduate/rock-studies/rock-studies-quick-guide/</a> ) <sup>4</sup>		12
Total Hours		45

<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 Requirement, but earns credit only once toward your 120-credits total.

<sup>4</sup> From at least 3 categories; no more than 6 credits from one department; 6 credits must be 300-level or above.

## 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		
ACSD 110	Beginning Algebra	
Total Hours		0-3

## Computer Competency

Code	Title	Hours
Demonstrate "computer competency" by one of the following: 0-3		
Pass Computer Competency Exam OR		
Select one of the following at SRU or another post-secondary institution:		
CPSC 100	Introduction to Computing for Liberal Arts	
CPSC 110	Computer Concepts	
CPSC 130	Introduction to Computing and Programming	
PE 202	Technology for Wellness	
Total Hours		0-3

## Major/Concentration Requirements

- 28 major credits must be taken at SRU or PASSHE
- 28 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 243	Introduction to Research in Chemistry <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
CHEM 491	Chemistry Seminar <sup>1</sup>	1
Subtotal		22
<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

### Additional Required In-Depth Chemistry Courses

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

### Cognate Courses

BIOL 104	Principles of Biology with Lab <sup>1</sup>	4
PHYS 213	General Physics III/ Lab <sup>1</sup>	4
MATH 230	Calculus II <sup>1</sup>	4
Subtotal		12
Total Hours		56

<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
PHYS 211	General Physics I with Lab <sup>1,2</sup>	4
MATH 225	Calculus I <sup>1,2</sup>	4
Total Hours		12

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

<sup>2</sup> Course can be counted as a Rock Studies 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
Total Hours		21

<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
Total Hours		3

<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

CHEMISTRY - BS (6118)

Concentration in Computational Chemistry (CCHM)

This program is effective as of Fall 2019.

Revised 9-2019

UCC 3.5.2019

## 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 Rock Studies 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
Select one of the following:		3-4
MATH 120	Intermediate Algebra (if necessary)	
MATH 125	Precalculus (if necessary)	
MATH 225	Calculus I (if necessary)	
MATH 230	Calculus II	
BIOL 104	Principles of Biology with Lab	4

SUBJ 139	University Seminar <sup>1</sup>	3
INDS 101	FIRST Seminar	1
Hours		15-16

<b>Spring</b>		
CHEM 108 & CHEM 112	General Chemistry II and General Chemistry II Lab	4
Select one of the following:		4
MATH 125	Precalculus (if necessary)	
MATH 225	Calculus I (if necessary)	
MATH 230	Calculus II	
ENGL 102	Critical Writing	3
STAT 152	Elementary Statistics I	3
Hours		14

<b>Second Year</b>		
<b>Fall</b>		
CHEM 201 & CHEM 211	Organic Chemistry I and Organic Chemistry Laboratory I	4
CHEM 243	Introduction to Research in Chemistry	1
Select one of the following:		4
MATH 225	Calculus I (if necessary)	
MATH 230	Calculus II	
PHYS 211	General Physics I with Lab	4
CPSC 146	Programming Principles	3
Hours		16

<b>Spring</b>		
CHEM 202 & CHEM 212	Organic Chemistry II and Organic Chemistry Laboratory II	4
MATH 230	Calculus II	4
PHYS 213	General Physics III/ Lab	4
ENGL 104	Critical Reading	3
CPSC 246	Advanced Programming Principles	3
Hours		18

<b>Third Year</b>		
<b>Fall</b>		
CHEM 335 & CHEM 336	Biochemistry I and Biochemistry Laboratory I	4
CHEM 350 & CHEM 351	Analytical Chemistry and Analytical Chemistry Lab	4
BIOL 370	Molecular Biology with Lab	3
CPSC 374	Algorithms and Data Structures	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	
Hours		17

<b>Spring</b>		
Select one of the following:		3
CHEM 302	Physical Chemistry II (even years)	
CHEM 460	Materials Chemistry (odd years)	
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 415 & CHEM 416	Forensic Analysis and Forensic Analysis Lab	
CHEM 475	Advanced Organic Synthesis	
CHEM 425 & CHEM 426	Instrumental Analysis and Instrumental Analysis Laboratory	4
CHEM 491	Chemistry Seminar	1
CPSC 480	Topics in Computer Science: Machine Learning	3
	Hours	15

**Fourth Year****Fall**

CHEM 301 & CHEM 321	Physical Chemistry 1 and Physical Chemistry Laboratory I	4
CHEM 442	Inorganic Chemistry	3
PHYS 385	Computational Physics	3
Inquiry/Thread/Elective Course		3
	Hours	13

**Spring**

Select one of the following:		3
CHEM 302	Physical Chemistry II (even years)	
CHEM 460	Materials Chemistry (odd years)	
CHEM 452	Physical Inorganic Chemistry Laboratory	1
Inquiry/Thread Course(s)/Elective(s)		3
Inquiry/Thread/Elective Course		3
Inquiry/Thread/Elective Course		3
	Hours	13
	Total Hours**	121-122

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

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

Optional ACS Certification requires 2 credits of CHEM 490: Independent Study and 1 credit of CHEM 496: Research.

Major Code: 6118

Concentration Code: CCHM

Revised date: 9-2019

**\*\* 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.**