

BIOLOGY, BACHELOR OF SCIENCE (BS) - CONCENTRATION IN CELLULAR AND MOLECULAR BIOLOGY - CONCENTRATION IN BIOINFORMATICS

Program Learning Outcomes

- **Competence in Laboratory and Research Skills:** To conduct, assess, and communicate research investigations using established scientific practices. (SRU UG 1, 2, 3, 4, 5, 7, 10)
- **Core Concepts for Biological Literacy:** (SRU UG 1, 2, 3, 4, 5, 7, 9)
 - Knowledge/Content
 - Evolution
 - Structure and function across all levels of biological organization
 - Diversity and interactions of life
 - Information flow, exchange and storage in biological systems
 - Critical Thinking/Problem Solving
 - Connect information from cognate science courses and liberal arts courses to biological concepts
 - Apply scientific information to current and future societal problems
- **Participation in Diverse, Enriching Scientific Activities:** Apply technical and professional skills in hands-on laboratory, clinical or field experiences. (SRU UG 1, 2, 3, 4, 5, 7, 8, 9)
- **Professional Attitude:** Graduates demonstrate professional attitude, behavior, and ability to interact with people from diverse backgrounds and cultures. (SRU UG 1, 5, 7, 8, 9)

Related Links

Biology - Cellular and Molecular Biology - Bioinformatics, BS Program Page (<https://www.sru.edu/academics/majors-and-minors/biology-bioinformatics-and-computational-biology/>)

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

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

Curriculum Guide

GPA Requirement

Major GPA: 2.0 or higher
Overall GPA: 2.0 or higher
Core GPA: 2.0 or higher

Summary*

Code	Title	Hours
	Rock Studies 2 Requirements	45
	Other Basic Requirements	0-3

Computer Competency	0-3
Major Requirements/Concentration	60
Natural Science and Math College-Wide Requirements	12
Electives	15

* 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
The Rock		
SUBJ 139	University Seminar ¹	3
ENGL 102	Critical Writing	3
ENGL 104	Critical Reading	3
MATH 125	Precalculus	4
or MATH 225	Calculus I	
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
Integrated Inquiry		
<i>Creative and Aesthetic Inquiry</i>		
Select 3 Credits (https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/)		3
<i>Humanities Inquiry</i>		
Select 3 Credits (https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/)		3
<i>Social Science Inquiry</i>		
Select 3 Credits (https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/)		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 201	Elements of Physics I with Lab	4
or PHYS 216	University Physics 1 with Lab	
Subtotal		17
Thematic Thread		
Select 12 Credits (https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/) ²		12
Total Hours		45

¹ Course offered in multiple subjects; cannot take course in first major subject

² 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	
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

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 Requirements/Concentration

- 30 major credits must be taken at SRU or PASSHE
- 30 major credits must be taken at the 300 level or above
- Students desiring a Biology Major must maintain at least a 2.000 average in Biology.
- Students must earn a "C" or better in both Biology I with Lab (BIOL 113) and Biology II with Lab (BIOL 114) before proceeding to their next biology course.
- Students must earn a "B" or better in both Genetics with Lab (BIOL 250) and Biometry with Lab (BIOL 325) prior to graduating.

Code	Title	Hours
Biology Core Requirements		
BIOL 113	Biology I: Foundations of Ecology, Evolution and Diversity with Lab ¹	4
BIOL 114	Biology II: Foundations of Molecules, Genes and Cells with Lab ¹	4
BIOL 250	Genetics with Lab ¹	4
BIOL 325	Biostatistics and Experimental Design with Lab ¹	3
Subtotal		15
Required Upper-Level Biology		
BIOL 335	Cell Biology ¹	3
BIOL 350	Evolution ¹	3
BIOL 370	Molecular Biology ¹	3

BIOL 435	Cellular and Molecular Analysis Laboratory ¹	3
BIOL 410	Animal Physiology with Lab ¹	3
BIOL 492	Biology Seminar ¹	1
Subtotal		16

Upper-Level Biology Electives

Select 6 credits in BIOL or MARS course from Additional Upper-Level Biology Electives that have not been used above.	6
Upper-Level Electives (p. 3) ¹	
Subtotal	6

Related Sciences – Chemistry

CHEM 108	General Chemistry II ²	3
CHEM 112	General Chemistry II Lab ²	1
CHEM 201	Organic Chemistry I ²	3
CHEM 211	Organic Chemistry Laboratory I ²	1
Subtotal		8

Related Sciences – Chemistry Advanced Elective

CHEM 202	Organic Chemistry II ²	3
CHEM 212	Organic Chemistry Laboratory II ²	1
CHEM 335	Biochemistry I ²	3
CHEM 336	Biochemistry Laboratory I ²	1

Related Sciences – Physics

Select one of the following:	4	
PHYS 202	Elements of Physics II/ Lab ¹	
PHYS 217	University Physics 2 with Lab ¹	

Independent Study/Internship Options

Select one of the following options:	3	
<i>Independent Study Option</i>		
BIOL 490	Independent Study ¹	
or BIOL 450	Biology Internship	

Non-Independent Study Option

Select 3 credits in BIOL or MARS course from Additional Upper-Level Biology Electives that have not been used above.	
Upper-Level Biology Electives (p. 3) ¹	
Subtotal	15

Total Hours **60**

¹ Course counts for 50% of Major requirements and Major GPA

² Course counts for 50% of Major requirements but not for 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	3
CHEM 111	General Chemistry I Lab	1
MATH 125	Precalculus	4
or MATH 225	Calculus I	
PHYS 201	Elements of Physics I with Lab	4
or PHYS 216	University Physics 1 with Lab	

Concentration in Bioinformatics Requirements

Code	Title	Hours
CPSC 146	Programming Principles	3
CPSC 246	Advanced Programming Principles	3
CPSC 374	Algorithms and Data Structures	3
CPSC 480	Topics in Computer Science: Machine Learning	3
MATH 230	Calculus II	4

Additional Upper-Level Biology Electives

Code	Title	Hours
BIOL 209	Human Anatomy and Physiology I ¹	4
BIOL 301	Forest Ecology ¹	3
BIOL 302	Ecology of Amphibians & Reptiles/Lab ¹	3
BIOL 303	Behavioral Ecology/Lab ¹	3
BIOL 305	Wetlands and Aquatic Plants/Lab ¹	3
BIOL 306	Freshwater Biomonitoring/Lab ¹	3
BIOL 307	Vertebrate Ecology/Lab ¹	3
BIOL 308	Aquatic Ecosystem Management / Lab ¹	3
BIOL 309	Human Anatomy and Physiology II	4
BIOL 310	Plant Diversity with Lab ¹	3
BIOL 311	Entomology/Lab ¹	3
BIOL 312	Zoology with Lab	3
BIOL 313	Herpetology/Lab ¹	3
BIOL 314	Parasitology with Lab ¹	3
BIOL 316	Immunology with Lab ¹	3
BIOL 317	Ecology and Fungi ¹	3
BIOL 320	Ornithology/Lab ¹	3
BIOL 321	Wildlife Management/Lab ¹	3
BIOL 322	Conservation Biology/Lab ¹	3
BIOL 323	Stream Ecology/Lab ¹	3
BIOL 326	Field Methods in Biogeography/Lab ¹	3
BIOL 327	Limnology/Lab ¹	3
BIOL 331	Mammology/Lab ¹	3
BIOL 343	Embryology with Lab ¹	3
BIOL 356	Field Ecology / Lab ¹	3
BIOL 357	Environmental Microbiology with Lab ¹	4
BIOL 360	Field Botany ¹	3
BIOL 361	Flora of Western Pennsylvania ¹	3
BIOL 371	Vertebrate Field Zoology ¹	3
BIOL 373	Ichthyology/Lab ¹	3
BIOL 375	Ecology of Fish / Lab ¹	3
BIOL 380	Endocrinology ¹	3
BIOL 400	Disease Ecology ¹	3
BIOL 402	Biogeography/Lab ¹	3
BIOL 405	Animal Physiological Ecology with Lab ¹	4
BIOL 409	Pathophysiology ¹	3
BIOL 412	Population Biology ¹	3
BIOL 430	Pathogenic Microbiology ¹	3
BIOL 450	Biology Internship ¹	3
BIOL 470	Histology with Lab ¹	3
BIOL 498	Selected Topics ¹	3

MARS 300	Behavior of Marine Organisms ¹	3
MARS 310	The Mammals of Coastal Ecosystems ¹	3
MARS 320	Marine Microbiology ¹	3
MARS 330	Tropical Invertebrates	3
MARS 342	Marine Botany ¹	3
MARS 343	Marine Ichthyology ¹	3
MARS 344	Anatomy of Marine Chordates ¹	3
MARS 345	Ornithology ¹	3
MARS 350	Physiology of Marine Invertebrates ¹	3
MARS 398	Selected Topics ¹	3
MARS 420	Marine Micropaleontology ¹	3
MARS 431	Ecology of Marine Plankton ¹	3
MARS 441	Biology of Molluscs ¹	3
MARS 490	Independent Study ¹	3
MARS 491	Coral Reef Ecology ¹	3
MARS 492	Marine Mammals ¹	3
MARS 498	Selected Topics ¹	3
MARS 500	Problems in Marine Science ¹	3

¹ 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. Student-faculty research
2. Internships
3. Volunteering
4. Job Shadowing

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

BIOLOGY - BS (6108)
 Concentration in Cellular and Molecular Biology (CEMB)
 w/optional Concentration in Bioinformatics (BIIF)
 This program is effective as of Summer 2023
 Revised 05.19.2023
 UCC 11.29.2022

RECOMMENDED FOUR-YEAR PLAN

Course	Title	Hours		Hours
First Year			Thematic Thread Requirement (https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/)	3
Fall			Thematic Thread Requirement (https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/)	3
BIOL 113	Biology I: Foundations of Ecology, Evolution and Diversity with Lab	4		
	Hours	15		16
CHEM 107	General Chemistry I	3	Spring	
CHEM 111	General Chemistry I Lab	1	MATH 230	Calculus II
ENGL 102	Critical Writing	3	BIOL 330	Microbiology/Lab
ESAP 101	FYRST Seminar *	1	BIOL 335	Cell Biology
SUBJ 139	Foundations of Academic Discovery ¹	3	BIOL 435	Cellular and Molecular Analysis Laboratory
	Hours	15	CPSC 374	Algorithms and Data Structures
				Hours
				16
Spring			Fourth Year	
BIOL 114	Biology II: Foundations of Molecules, Genes and Cells with Lab	4	Fall	
CHEM 108	General Chemistry II	3	BIOL 300+	Upper Level BIOL Elective
CHEM 112	General Chemistry II Lab	1	Thematic Thread Requirement (https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/)	3
ENGL 104	Critical Reading	3	BIOL 401	Ecology with Lab
Creative & Aesthetic Inquiry (https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/)		3	PHYS 201	Elements of Physics I with Lab
	Hours	14	or PHYS 216	or University Physics 1 with Lab
			Elective with DEI attribute	3
Second Year				Hours
				16
Fall			Spring	
BIOL 250	Genetics with Lab	4	BIOL 450	Biology Internship
CHEM 201	Organic Chemistry I	3	BIOL 490	Independent Study
CHEM 211	Organic Chemistry Laboratory I	1	BIOL 492	Biology Seminar
CPSC 146	Programming Principles	3	BIOL 300+	Upper Level BIOL Elective
Select one of the following:		3	PHYS 202	Elements of Physics II/ Lab
COMM 200	Civil Discourse: Theory & Practice		or PHYS 217	or University Physics 2 with Lab
PHIL 110	Ethics and Civil Discourse		CPSC 480	Topics in Computer Science: Machine Learning
POLS 235	Civil Discourse and Democracy			Hours
Humanities Inquiry (https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/)		3		17
Declare a Thematic Thread ²				Total Hours**
	Hours	17		126
Spring				
BIOL 325	Biostatistics and Experimental Design with Lab	3		
Select one of the following:		3		
CHEM 202 & CHEM 212	Organic Chemistry II and Organic Chemistry Laboratory II			
BIOL 300+	Upper Level BIOL Elective			
CPSC 246	Advanced Programming Principles	3		
Social Science Inquiry (https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/)		3		
Thematic Thread Requirement (https://catalog.sru.edu/undergraduate/rock-studies/rock-studies-program/)		3		
	Hours	15		
Third Year				
Fall				
BIOL 340	Vertebrate Anatomy with Lab	3		
CHEM 335	Biochemistry I	3		
or CHEM 301	or Physical Chemistry 1			
MATH 225	Calculus I	4		

¹ Course offered in multiple subjects; cannot take course in first major subject.

² 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.

Major/Concentration: 6108/CEMB/BIFF

Revised: 05.22.2023