# **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/biologybioinformatics-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 Stu	dies 2 Requirements	45
Other Bas	sic Requirements	0-3

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

1

\* 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 <sup>1</sup>	3
ENGL 102	Critical Writing	3
ENGL 104	Critical Reading	3
MATH 125	Precalculus	4
or MATH 225	Calculus I	
Select one of the fol	lowing:	3
COMM 200	Civil Discourse: Theory & Practice	
PHIL 110	Ethics and Civil Discourse	
POLS 235	Civil Discourse and Democracy	
Subtotal		16
Integrated Inquiry		
Creative and Aestheti	ic Inquiry	
Select 3 Credits (htt	ps://catalog.sru.edu/undergraduate/rock-	3
studies/rock-studies	s-program/)	
Humanities Inquiry		
	ps://catalog.sru.edu/undergraduate/rock-	3
studies/rock-studies		
Social Science Inquir		
	ps://catalog.sru.edu/undergraduate/rock-	3
studies/rock-studies		
Natural Sciences Inqu		2
CHEM 107	General Chemistry I	3
CHEM 111	General Chemistry I Lab	1
Physical Sciences Inc	. ,	4
PHYS 201	Elements of Physics I with Lab	4
or PHYS 216	University Physics 1 with Lab	17
Subtotal		17
Thematic Thread		10
Select 12 Credits (ht studies/rock-studies	tps://catalog.sru.edu/undergraduate/rock- s-program/) <sup>2</sup>	12
Total Hours		45

<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 require	ed minimum SAT or ACT math score OR	
ESAP 110	Beginning Algebra	
Total Hours		0-3

#### **Computer Competency**

Code	Title	Hours
Demonstrate "comp	uter competency" by one of the following:	0-3
Pass Computer C	Competency Exam OR	
Select one of the institution:	following at SRU or another post-secondary	
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
<b>Biology Core Require</b>	ments	
BIOL 113	Biology I: Foundations of Ecology, Evolution and Diversity with Lab $^{\rm l}$	4
BIOL 114	Biology II: Foundations of Molecules, Genes and Cells with Lab <sup>1</sup>	4
BIOL 250	Genetics with Lab <sup>1</sup>	4
BIOL 325	Biostatistics and Experimental Design with Lab <sup>1</sup>	3
Subtotal		15
Required Upper-Leve	l Biology	
BIOL 335	Cell Biology <sup>1</sup>	3
BIOL 350	Evolution <sup>1</sup>	3
BIOL 370	Molecular Biology <sup>1</sup>	3

Total Hours		60
Subtotal		15
Upper-Level Bio	blogy Electives (p. 3) <sup>1</sup>	
	blogy Electives that have not been used above.	
	s in BIOL or MARS course from Additional	
Non-Independent S		
or BIOL 450	Biology Internship	
BIOL 490	Independent Study <sup>1</sup>	
Independent Study	Option	
	following options:	3
Independent Stud	y/Internship Options	
PHYS 217	University Physics 2 with Lab <sup>1</sup>	
PHYS 202	Elements of Physics II/ Lab <sup>1</sup>	
Select one of the	following:	4
Related Sciences		
CHEM 336	Biochemistry Laboratory I <sup>2</sup>	1
CHEM 335	Biochemistry I <sup>2</sup>	3
CHEM 212	Organic Chemistry Laboratory II <sup>2</sup>	1
CHEM 202	Organic Chemistry II <sup>2</sup>	3
Related Sciences	<ul> <li>Chemistry Advanced Elective</li> </ul>	
Subtotal		8
CHEM 211	Organic Chemistry Laboratory I <sup>2</sup>	1
CHEM 201	Organic Chemistry I <sup>2</sup>	3
CHEM 112	General Chemistry II Lab <sup>2</sup>	1
CHEM 108	General Chemistry II <sup>2</sup>	3
<b>Related Sciences</b>	– Chemistry	
Subtotal		6
Upper-Level Ele	ectives (p. 3) <sup>1</sup>	
	BIOL or MARS course from Additional Upper- tives that have not been used above.	6
Upper-Level Biolo		
Subtotal		16
BIOL 492	Biology Seminar <sup>1</sup>	1
BIOL 410	Animal Physiology with Lab <sup>1</sup>	Э
BIOL 435	Cellular and Molecular Analysis Laboratory 1	3
BIOL 435	Collular and Molecular Analysis Laboratory	3

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

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

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. 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 alreadyearned 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 Bioloyg (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

First YearFallBIO 113and Diversity with LabCHEM 107General Chemistry ICHEM 101General Chemistry IENGL 102Critical WritingSID 101FYRST Seminar*SUB J139Foundations of Academic Discovery 1SUB J139Foundations of Academic Discovery 1Soring8BIOL 114Biology II: Foundations of Molecules, General Chemistry II LabCHEM 108General Chemistry IICHEM 109General Chemistry IICHEM 109General Chemistry IICHEM 100General Chemistry IICHEM 201Organic Chemistry IIChem 201Organic Chemistry ICHEM 201Crivi DiscoursePOLS 235CiviI Discourse and DemocracyPHIL 110Ethics and CiviI DiscoursePOLS 235Biostatistics and Experimental Design with LabSelect one of the following: Lab3Select one of the Gollowing: Lab3Select one of the Gollowing: Lab3Social Science Inquiry (https://catalog.sru.edu/undergraduate/rock-studies-program/)Declare a Thematic Thread 23CHEM 202Organic Chemistry IIBIOL 320+ <th>Course</th> <th>Title</th> <th>Hours</th>	Course	Title	Hours
BIOL 113 Biology I: Foundations of Ecology, Evolution and Diversity with Lab CHEM 107 General Chemistry I CHEM 107 General Chemistry I CHEM 111 General Chemistry I Lab CHEM 110 Critical Writing 3 ESAP 101 FYRST Seminar 1 SUBJ 139 Foundations of Academic Discovery 1 Spring BIOL 114 Biology II: Foundations of Molecules, General Chemistry II Lab CHEM 108 General Chemistry II Lab CHEM 104 Critical Reading 3 Creative & Aesthetic Inquiry (https://catalog.sru.edu/ undergraduate/rock-studies-program/) Hours 14 Second Year Fall BIOL 250 Genetics with Lab CHEM 201 Organic Chemistry I CPSC 146 Programming Principles 3 Select one of the following: 3 COMM 200 Civil Discourse: Theory & Practice PHL 110 Ethics and Civil Discourse OCMM 200 Civil Discourse Theory & Practice PHL 110 Ethics and Civil Discourse POLS 235 Civil Discourse and Democracy Humanities Inquiry (https://catalog.sru.edu/undergraduate/rock-studies-program/) Declare a Thematic Thread 2 Forg BIOL 300+ Upper Level BIOL Elective CPSC 246 Advanced Programming Principles 3 Social Science Inquiry (https://catalog.sru.edu/undergraduate/rock-studies-program/) Thematic Thread Requirement (https://catalog.sru.edu/undergraduate/rock-studies-program/) Th	First Year		
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ENGL 102Critical Writing3ESAP 101FYRST Seminar*1SUBJ 139Foundations of Academic Discovery 13Hours15SpringBiology II: Foundations of Molecules, Genes and Cells with Lab4BIOL 114Biology II: Foundations of Molecules, Genes and Cells with Lab4CHEM 108General Chemistry II3CHEM 112General Chemistry II Lab1ENCL 104Critical Reading3Creative & Aesthetic Inquiry (https://catalog.sru.edu/ undergraduate/rock-studies/rock-studies-program/)3Hours14Second YearHours14FallBiol 250Genetics with Lab4CHEM 201Organic Chemistry Laboratory I1CPSC 146Programming Principles3Select one of the following:33COMM 200Civil Discourse: Theory & PracticePHL 110Ethics and Civil Discourse3Sudies/rock-studies-program/)Declare a Thematic Thread 2Declare a Thematic Thread 23Select one of the following:3Select one of the following:3CHEM 202Organic Chemistry IIBIOL 325Biostatistics and Experimental Design with LabSelect one of the following:3CHEM 202Organic Chemistry Laboratory IIBIOL 300+Upper Level BIOL ElectiveCPSC 246Advanced Programming PrinciplesSocial Science Inquiry (https://ccatalog.sru.edu/undergraduate/ rock-studies/rock-studies/rock-s	CHEM 107	General Chemistry I	3
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	CHEM 335	Biochemistry I	
			4

Spring BIOL 450 BIOL 490		
Spring		
Elective with DEI attr	Hours	3 16
PHYS 201 or PHYS 216	Elements of Physics I with Lab or University Physics 1 with Lab	4
BIOL 401	Ecology with Lab	3
	quirement (https://catalog.sru.edu/ studies/rock-studies-program/)	3
Fall BIOL 300+	Upper Level BIOL Elective	3
Fourth Year	Hours	16
CPSC 374	Algorithms and Data Structures	3
BIOL 435	Cellular and Molecular Analysis Laboratory	3
BIOL 335	Cell Biology	3
BIOL 330	Microbiology/Lab	3
Spring MATH 230	Calculus II	4
undergraduate/rock-	quirement (https://catalog.sru.edu/ studies/rock-studies-program/) Hours	
	uirement (https://catalog.sru.edu/	3
-	studies/rock-studies-program/)	

<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.

Major/Concentration: 6108/CEMB/BIFF Revised: 05.22.2023