BACHELOR OF SCIENCE (BS) DEGREE WITH A MAJOR IN BIOSCIENCES AND A MAJOR CONCENTRATION IN INTEGRATIVE BIOLOGY

Program Learning Outcomes for the BS Degree with a Major in Biosciences and a Major Concentration in Integrative Biology

Upon completing the BS degree with a major in Biosciences and a major concentration in Integrative Biology, students will be able to:

1. Demonstrate a broad knowledge of core concepts in biology.
2. Demonstrate an advanced understanding of at least two of the following: biochemistry, cell biology and genetics, ecology and evolutionary biology.
3. Demonstrate the ability to access scientific literature in the biological sciences and to use critical thinking skills to evaluate primary and secondary sources of biological research.
4. Demonstrate the ability to apply the process of science through original research, including designing experiments and/or building mathematical models, and collecting, analyzing, and interpreting data.
5. Demonstrate effective oral, written, and visual communication skills, including communicating science to diverse audiences.

Requirements for the BS Degree with a Major in Biosciences and a Major Concentration in Integrative Biology

For general university requirements, see Graduation Requirements (https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/). Students pursuing the BS degree with a major in Biosciences and a major concentration in Integrative Biology must complete:

- A minimum of 69 credit hours to satisfy major requirements.
- A minimum of 120 credit hours to satisfy degree requirements.
- A minimum of 31 credit hours taken at the 300-level or above.
- Core courses common to all major concentrations.
- The requirements for the major concentration in Biochemistry. When students declare the major (https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/#text) in Biosciences, students must additionally identify and declare one of the four major concentrations, either in:
  - Biochemistry (https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/biochemistry-bs/#requirementstext), ***or***
  - Cell Biology and Genetics (https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/cell-biology-and-genetics-bs/#requirementstext), ***or***
  - Ecology and Evolutionary Biology (https://ga.rice.edu/programs-study/departments-programs/natural-sciences/biosciences/ecology-and-evolutionary-biology-bs/#requirementstext), ***or***
  - Integrative Biology (p. 1).

Because of the common core requirements, it is possible for students to change their major concentration at any time, even after initially declaring the major. To do so, please contact the Office of the Registrar (registrar@rice.edu).

The BS degree emphasizes broad foundational knowledge of biology with in-depth exposure to two or more of the subfields of biochemistry, cell biology and genetics, or ecology and evolutionary biology.

The courses listed below satisfy the requirements for this major. In certain instances, courses not on this official list may be substituted upon approval of the major's academic advisor or, where applicable, the department's Director of Undergraduate Studies. (Course substitutions must be formally applied and entered into Degree Works by the major's Official Certifier (https://registrar.rice.edu/facstaff/degreeworks/officialcertifier/).) Students and their academic advisors should identify and clearly document the courses to be taken.

Summary

Code	Title	Credit Hours
Total Credit Hours Required for the Major in Biosciences and a Major Concentration in Integrative Biology		Minimum of 69
Total Credit Hours Required for the BS Degree with a Major in Biosciences and a Major Concentration in Integrative Biology		120

Degree Requirements

Code	Title	Credit Hours
Core Requirements		
Non-Biology Courses		
CHEM 121	GENERAL CHEMISTRY I	3
or CHEM 111	AP/OTH CREDIT IN GENERAL CHEMISTRY I	
CHEM 123	GENERAL CHEMISTRY LABORATORY I	1
or CHEM 113	AP/OTH CREDIT IN GENERAL CHEMISTRY LAB I	
MATH 101	SINGLE VARIABLE CALCULUS I	3
or MATH 105	AP/OTH CREDIT IN CALCULUS I	
MATH 102	SINGLE VARIABLE CALCULUS II	3
or MATH 106	AP/OTH CREDIT IN CALCULUS II	
PHYS 125	GENERAL PHYSICS (WITH LAB) [1]	4
STAT 305	INTRODUCTION TO STATISTICS FOR BIOSCIENCES [2]	4
or STAT 315 / DSCI 301	PROBABILITY AND STATISTICS FOR DATA SCIENCE	
Core Lecture Courses		
BIOS 201	INTRODUCTORY BIOLOGY I	3
BIOS 202	INTRODUCTORY BIOLOGY II	3
Elective Lecture Course		
Select 1 elective course from lecture courses offered by the Wiess School of Natural Sciences or the George R. Brown School of Engineering and Computing at the 200-level or above [3]		*3*

Code	Title	Credit Hours
Major Concentration in Integrative Biology		
Core Requirements		
Non-Biology Courses		
CHEM 122	GENERAL CHEMISTRY II	3
or CHEM 112	AP/OTH CREDIT IN GENERAL CHEMISTRY II	
CHEM 124	GENERAL CHEMISTRY LABORATORY II	1
or CHEM 114	AP/OTH CREDIT IN GENERAL CHEMISTRY LAB II	
CHEM 211 & CHEM 213	ORGANIC CHEMISTRY I and ORGANIC CHEMISTRY DISCUSSION I	3
Lecture Courses		
BIOS 301	BIOCHEMISTRY I	3
BIOS 332	ECOLOGY	3
BIOS 334	EVOLUTION	3
BIOS 341	CELL BIOLOGY	3
Elective Lecture Course in Ecology and Evolutionary Biology		
Select 1 course from the following:		*3*
BIOS 321	ANIMAL BEHAVIOR	
BIOS 326	INSECT BIOLOGY	
BIOS 329	ANIMAL DIVERSITY	
BIOS 336	PLANT DIVERSITY	
BIOS 338	ANALYSIS AND VISUALIZATION OF BIOLOGICAL DATA	
BIOS 373	CORAL REEF ECOSYSTEMS	
BIOS 374	GLOBAL CHANGE BIOLOGY	
BIOS 423	CONSERVATION BIOLOGY	
BIOS 431	EMERGING INFECTIOUS DISEASES	
Elective Lecture Course in Biochemistry and Cell Biology		
Select 1 course from the following:		*3*
BIOE 302	SYSTEMS PHYSIOLOGY	
BIOE 464	EXTRACELLULAR MATRIX	
BIOS 300	PARADIGMS IN BIOCHEMISTRY AND CELL BIOLOGY	
BIOS 302	BIOCHEMISTRY II	
BIOS 340	ANIMAL PHYSIOLOGY	
BIOS 344	MOLECULAR BIOLOGY AND GENETICS	
BIOS 352	PHYSICAL CHEMISTRY FOR THE BIOSCIENCES	
BIOS 353	MICROBIOLOGY: THE MOLECULAR BASIS FOR INFECTIOUS DISEASES AND THEIR TREATMENT	
BIOS 368	CONCEIVING AND MISCONCEIVING THE MONSTROUS IN FICTION AND IN ART, IN MEDICINE AND IN BIOSCIENCE	
BIOS 372	IMMUNOLOGY	
BIOS 385	CELLULAR AND MOLECULAR MECHANISMS OF THE NEURON	
BIOS 390	TRANSFER CREDIT IN BIOCHEMISTRY AND CELL BIOLOGY	
BIOS 405	PHYSICAL BIOLOGY	
BIOS 410	STEM CELL BIOLOGY	
BIOS 420	MOLECULAR BASIS OF DISEASES	
BIOS 424	MICROBIAL PHYSIOLOGY AND GENETICS	
BIOS 425	PLANT MOLECULAR GENETICS AND DEVELOPMENT	
BIOS 441	MOLECULAR MEMBRANE BIOLOGY	
BIOS 442	MOLECULES, MEMORY AND MODEL ANIMALS: METHODS IN BEHAVIORAL NEUROSCIENCE	
BIOS 443	DEVELOPMENTAL NEUROBIOLOGY	
BIOS 444	ADVANCED MOLECULAR BIOLOGY AND GENETICS	
BIOS 447	EXPERIMENTAL BIOLOGY AND THE FUTURE OF MEDICINE	
BIOS 449	ADVANCED CELL AND MOLECULAR NEUROSCIENCE	
BIOS 450	VIRUSES AND INFECTIOUS DISEASES	
BIOS 460	CANCER BIOLOGY	
BIOS 470	COMPUTATION WITH BIOLOGICAL DATA	
BIOS 481	MOLECULAR AND CELLULAR BIOPHYSICS	
BIOS 482	STRUCTURAL BIOLOGY	
EEPS 439	GEOMICROBIOLOGY	
NEUR 380 / PSYC 380	FUNDAMENTAL NEUROSCIENCE SYSTEMS	
Core Laboratory Courses		
BIOS 211	INTERMEDIATE EXPERIMENTAL CELLULAR AND MOLECULAR BIOSCIENCES	2
BIOS 213	INTRODUCTORY LAB IN ECOLOGY & EVOLUTION	2
Elective Laboratory Course		
Select 1 course from the following:		*1-2*
BIOS 311	EXPERIMENTAL BIOCHEMISTRY	
BIOS 313	EXPERIMENTAL SYNTHETIC BIOLOGY	
BIOS 314	EXPERIMENTAL MOLECULAR BIOLOGY	
BIOS 315	EXPERIMENTAL PHYSIOLOGY	
BIOS 316	LAB MODULE IN ECOLOGY	
BIOS 317	LAB MODULE IN BEHAVIOR	
BIOS 318	MICROBIOLOGY LABORATORY	
BIOS 319	TROPICAL FIELD BIOLOGY	
BIOS 320	ECOLOGY AND CONSERVATION OF BRAZILIAN WETLANDS LABORATORY	
BIOS 322	CONSERVATION BIOLOGY LAB	
BIOS 323 / ANTH 323	CLIMATE CHANGE AND HUMAN EVOLUTION: AFRICAN SAVANNA ECOLOGY AND PALEOECOLOGY	
BIOS 327	BIOLOGICAL DIVERSITY	
BIOS 330	INSECT BIOLOGY LAB	
BIOS 337	FIELD BIRD BIOLOGY LAB	
BIOS 339	PLANT DIVERSITY LAB	
BIOS 393	LABORATORY TRANSFER CREDIT IN BIOSCIENCES	
BIOS 417	EXPERIMENTAL CELL AND MOLECULAR NEUROSCIENCE	

Independent Research [4]		
Select a minimum of 9 credit hours from the following:		*9 or 13*
BIOS 310	INDEPENDENT RESEARCH FOR BIOSCIENCES UNDERGRADUATES (taken for at least 3 credit hours per semester) [4]	
BIOS 310 & BIOS 401 & BIOS 411 & BIOS 402 & BIOS 412	INDEPENDENT RESEARCH FOR BIOSCIENCES UNDERGRADUATES and UNDERGRADUATE HONORS RESEARCH and UNDERGRADUATE RESEARCH SEMINAR and UNDERGRADUATE HONORS RESEARCH and UNDERGRADUATE RESEARCH SEMINAR [4]	
Capstone Requirement [5]		
Select 1 course from the following:		*3*
BIOS 405	PHYSICAL BIOLOGY	
BIOS 410	STEM CELL BIOLOGY	
BIOS 420	MOLECULAR BASIS OF DISEASES	
BIOS 423	CONSERVATION BIOLOGY	
BIOS 424	MICROBIAL PHYSIOLOGY AND GENETICS	
BIOS 425	PLANT MOLECULAR GENETICS AND DEVELOPMENT	
BIOS 431	EMERGING INFECTIOUS DISEASES	
BIOS 441	MOLECULAR MEMBRANE BIOLOGY	
BIOS 442	MOLECULES, MEMORY AND MODEL ANIMALS: METHODS IN BEHAVIORAL NEUROSCIENCE	
BIOS 443	DEVELOPMENTAL NEUROBIOLOGY	
BIOS 444	ADVANCED MOLECULAR BIOLOGY AND GENETICS	
BIOS 447	EXPERIMENTAL BIOLOGY AND THE FUTURE OF MEDICINE	
BIOS 449	ADVANCED CELL AND MOLECULAR NEUROSCIENCE	
BIOS 450	VIRUSES AND INFECTIOUS DISEASES	
BIOS 460	CANCER BIOLOGY	
BIOS 470	COMPUTATION WITH BIOLOGICAL DATA	
BIOS 481	MOLECULAR AND CELLULAR BIOPHYSICS	
BIOS 482	STRUCTURAL BIOLOGY	
Total Credit Hours Required for the Major in Biosciences and Major Concentration in Integrative Biology		**Minimum of 69**
Additional Credit Hours to Complete Degree Requirements *		20
University Graduation Requirements (https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/) *		31
Total Credit Hours		**120**

Footnotes and Additional Information

* **Note:** University Graduation Requirements include 31 credit hours, comprised of Distribution Requirements (Groups I, II, and III), FWIS, and LPAP coursework. In some instances, courses satisfying FWIS or distribution requirements may additionally meet other requirements, such as the Analyzing Diversity (AD) requirement, or some of the student's declared major, minor, or certificate requirements. Additional Credit Hours to Complete Degree Requirements include general electives, coursework completed as upper-level, residency (hours taken at Rice), and/or any other additional academic program requirements.

1 PHYS 101 **and** PHYS 103 ***or*** PHYS 111 may be substituted for PHYS 125. The BioSciences department has determined that credit awarded for PHYS 141 *CONCEPTS IN PHYSICS I* is not eligible for meeting the requirements of the Biosciences major.

2 In certain instances, and with appropriate approvals, the lower-level courses STAT 280 or STAT 180 may be substituted for STAT 305 (or STAT 315/DSCI 301).

3 Students must select 1 elective course (3 credit hours) from courses offered by the *Wiess School of Natural Sciences* or the *George R. Brown School of Engineering and Computing* at the 200-level or above, designated as a lecture course. Courses offered by the *Wiess School of Natural Sciences* or the *George R. Brown School of Engineering and Computing* include the following subject codes: ASTR, BIOE, BIOS, CEVE, CHBE, CHEM, CMOR, COMP, DSCI, EDES, EEPS, ELEC, ENGI, GLHT, HEAL, KINE, MATH, MECH, MSNE, NEUR, NSCI, PHYS, RCEL, and STAT.

4 In order to fulfill the Independent Research requirement, a minimum of 9 credit hours is required either through the course BIOS 310 (taken for at least 3 credit hours per semester), ***or*** a minimum of 13 credit hours is required through the courses BIOS 310 (taken for at least 3 credit hours) **and** BIOS 401, BIOS 411, BIOS 402, and BIOS 412.

Please note:

- In order to fulfill the Independent Research requirement, BIOS 310 must be taken for at least 3 credit hours per semester.
- BIOS 411 is a co-requisite with BIOS 401.
- BIOS 412 is a co-requisite with BIOS 402.
- Students registering for BIOS 401 and BIOS 411 are expected to take BIOS 402 and BIOS 412 the following semester.

5 The Capstone Requirement is **in addition** to the other lecture course requirements. The same course may not be used to satisfy more than one requirement for this major and/or major concentration.

Policies for the BS Degree with a Major in Biosciences and a Major Concentration in Integrative Biology

Advising

Rice University policies are governed primarily by the General Announcements; students are encouraged to look there first for academic policies. Advising information specific to the Department of BioSciences can be found by clicking on the *Undergraduate Program* tab on the department website (https://biosciences.rice.edu/).

Program Restrictions and Exclusions

Students pursuing the BS Degree with a Major in Biosciences and a Major Concentration in Integrative Biology should be aware of the following program restrictions:

- As noted in Majors, Minors, and Certificates (https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/), under *Declaring Majors, Minors and Certificates*, students may not obtain both a BA and a BS in the same major. Students pursuing the BS Degree with a Major in Biosciences and a Major Concentration in Integrative Biology may not additionally pursue the BA Degree with a major in Biosciences.
- Students pursuing the major in Biosciences may pursue only one major concentration within the major.
- Students pursuing the major in Biosciences and a major concentration in Integrative Biology may not additionally declare the minor in Biochemistry and Cell Biology.
- Students pursuing the major in Biosciences and a major concentration in Integrative Biology may not additionally declare the minor in Ecology and Evolutionary Biology.

Transfer Credit

For Rice University's policy regarding transfer credit, see Transfer Credit (https://ga.rice.edu/undergraduate-students/academic-policies-procedures/transfer-credit/). Some departments and programs have additional restrictions on transfer credit. Requests for transfer credit must be approved for Rice equivalency by the designated transfer credit advisor for the appropriate academic department offering the Rice equivalent course (corresponding to the subject code of the course content). The Office of Academic Advising maintains the university's official list of transfer credit advisors (https://oaa.rice.edu/advising-network/transfer-credit-advisors/) on their website: https://oaa.rice.edu. Students are encouraged to meet with the applicable transfer credit advisor as well as their academic program director when considering transfer credit possibilities.

Additional Information

For additional information, please see the BioSciences website: https://biosciences.rice.edu/.

Opportunities for the BS Degree with a Major in Biosciences and a Major Concentration in Integrative Biology

Academic Honors

The university recognizes academic excellence achieved over an undergraduate's academic history at Rice. For information on university honors, please see Latin Honors (https://ga.rice.edu/undergraduate-students/honors-distinctions/university/) (*summa cum laude*, *magna cum laude*, and *cum laude*) and Distinction in Research and Creative Work (https://ga.rice.edu/undergraduate-students/honors-distinctions/university/). Some departments have department-specific Honors awards or designations.

Departmental Honors

Instructions on applying for the Distinction in Research and Creative Work (https://ga.rice.edu/undergraduate-students/honors-distinctions/university/) award from the Department of BioSciences can be found by clicking on the *Undergraduate Program* tab on the department website (https://biosciences.rice.edu/).

Research in the BioSciences

Research is highly encouraged for all biosciences majors, and there are many opportunities for independent research at Rice. Information about research for credit and research internships specific to the Department of BioSciences can be found by clicking on the *Research* tab on the department website (https://biosciences.rice.edu/).

Additional Information

For additional information, please see the BioSciences website: https://biosciences.rice.edu/.