BACHELOR OF ARTS (BA) DEGREE WITH A MAJOR IN BIOCHEMISTRY AND CELL BIOLOGY

Program Learning Outcomes for the BA Degree with a Major in Biochemistry and Cell Biology

Upon completing the BA degree with a major in Biochemistry and Cell Biology, students will be able to:

1. Demonstrate a comprehensive knowledge of biology with particular emphasis on biochemistry, genetics, and cell biology.
2. Demonstrate the ability to apply the modern scientific method, including designing experiments and/or building mathematical models, and collecting, analyzing, and interpreting data using common statistical methods and software programs.
3. Demonstrate effective oral and written communication skills, including an ability to communicate effectively and work with diverse groups and the ability to interpret and communicate the results of original research.
4. Locate primary scientific literature and demonstrate the ability to use critical thinking and problem solving skills to evaluate published and proposed research in the biological sciences and to apply these skills.
5. Demonstrate understanding of the practice and culture of science, scientific ethics, and the relationship between science and society.
6. Develop quantitative reasoning via the construction of models and/or the analysis of data.

Requirements for the BA Degree with a Major in Biochemistry and Cell Biology

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

- A minimum of 26 courses (63 credit hours) to satisfy major requirements. Additional credit hours may be required depending on course selection.
- A minimum of 123 credit hours to satisfy degree requirements. Additional credit hours may be required depending on course selection.
- A minimum of 60 credit hours outside of major requirements.
- A minimum of 10 courses (25 credit hours) taken at the 300-level or above.

The BA degree program offers greater flexibility than the BS due to 2 fewer required courses as detailed below.

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Credit Hours Required for the Major in Biochemistry and Cell Biology</td>
<td>Minimum of 63</td>
</tr>
<tr>
<td></td>
<td>Total Credit Hours Required for the BA with a Major in Biochemistry and Cell Biology</td>
<td>Minimum of 123</td>
</tr>
</tbody>
</table>

### Degree Requirements

#### Core Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Core Lecture Courses</td>
<td></td>
</tr>
<tr>
<td>BIOC 201</td>
<td>INTRODUCTORY BIOLOGY</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 301</td>
<td>BIOCHEMISTRY I</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 341</td>
<td>CELL BIOLOGY</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Select 2 courses from the following:</td>
<td>6</td>
</tr>
<tr>
<td>BIOC 302</td>
<td>BIOCHEMISTRY II</td>
<td></td>
</tr>
<tr>
<td>BIOC 344</td>
<td>MOLECULAR BIOLOGY AND GENETICS</td>
<td></td>
</tr>
<tr>
<td>BIOC 352</td>
<td>PHYSICAL CHEMISTRY FOR THE BIOSCIENCES 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core Laboratory Courses</td>
<td></td>
</tr>
<tr>
<td>BIOC 211</td>
<td>INTERMEDIATE EXPERIMENTAL BIOSCIENCES 3</td>
<td>2</td>
</tr>
<tr>
<td>BIOC 311</td>
<td>ADVANCED EXPERIMENTAL BIOSCIENCES</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Advanced Laboratory Courses</td>
<td></td>
</tr>
</tbody>
</table>
Select 2 courses from the following:  

- **BIOC 313** INTRODUCTORY SYNTHETIC BIOLOGY
- **BIOC 318** MICROBIOLOGY LABORATORY
- **BIOC 320 / BIOE 342** LABORATORY IN TISSUE CULTURE
- **BIOC 333** BIOINNOVATION STUDIO: FROM BASIC RESEARCH AND IDEATION TO TECHNOLOGY DEVELOPMENT
- **BIOC 413** EXPERIMENTAL MOLECULAR BIOLOGY
- **BIOC 415** EXPERIMENTAL PHYSIOLOGY
- **BIOC 530** LAB MODULE IN NMR SPECTROSCOPY AND MOLECULAR MODELING
- **BIOC 535** PRACTICAL X-RAY CRYSTALLOGRAPHY

One independent research experience

<table>
<thead>
<tr>
<th>Footnotes and Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Includes coursework completed as distribution credit, FWIS, LPAP, upper-level, residency (hours taken at Rice), 60 hours outside of the major (if applicable), and any additional academic program requirements. The “hours outside of the major” requirement may include all of the above university requirements.</td>
</tr>
<tr>
<td>1 Permissible Substitutions: MATH 105 or MATH 111 and MATH 112 may be substituted for MATH 101; MATH 106 may be substituted for MATH 102; CHEM 151 and CHEM 153 may be substituted for CHEM 121 and CHEM 123; CHEM 152 and CHEM 154 may be substituted for CHEM 122 and CHEM 124; CHEM 320 may be substituted for CHEM 212; CHEM 365 may be substituted for CHEM 215; PHYS 101 and PHYS 103 or PHYS 111 may be substituted for PHYS 125; PHYS 102 and PHYS 104 or PHYS 112 may be substituted for PHYS 126.</td>
</tr>
<tr>
<td>2 CHEM 301 and CHEM 302 may substitute for BIOC 352.</td>
</tr>
<tr>
<td>3 BIOC 212 may be substituted for BIOC 211.</td>
</tr>
<tr>
<td>4 These advanced labs must be taken concurrently with or after completion of BIOC 482.</td>
</tr>
</tbody>
</table>
| 5 All Biochemistry and Cell Biology majors must take at least 1 of the listed additional advanced laboratory courses. If desired, the second advanced laboratory requirement may be satisfied by completing:  
  1. BIOC 310 if taken for at least 3 credits; or  
  2. HONS 470 and HONS 471, if the research supervisor is from one of the biosciences departments or if the research is biological in nature and pre-approved by the student’s major advisor; or  
  3. honors research (BIOC 401 and BIOC 402 and BIOC 412). |
| 6 This substitution may be used only once regardless of the number of semesters of independent research taken.  
  The combined courses BIOC 401 and BIOC 402 are considered a single BIOC 400-level course and can be counted as one capstone course together as a series and/or as the independent research experience, provided that this substitution has not been used previously; this 3-course series can count as a single lab at 300-level or higher. To be applied toward the major all 3 courses must be completed. |
| 7 Students must complete a total of 2 courses (6 credit hours) from courses offered by the School of Natural Sciences or the School of Engineering. Courses in Natural Sciences/Engineering include any course taken at the 300-level or higher, for at least 3 credit hours from any department in the Wiess School of Natural Sciences (including BioSciences) or George R. Brown School of Engineering, except independent research courses such as BIOC 310, BIOC 401 and BIOC 402, BIOE 400 and BIOE 401, or EBIOL 306, EBIOL 403, and EBIOL 404, which cannot be used to fulfill this requirement. A maximum of 3 credit hours from BIOC 390 (transfer credit in Biochemistry and Cell Biology) may be applied to this requirement. Courses offered by the School of Natural Science and the School of Engineering include the following subject codes: ASTR, BIO, CAAM, CEVE, CHBE, CHEM, COMP, ELEC, ENGI, ENST, ESCI, GLHT, HEAL, KINE, MATH, MECH, MSNE, NSCI, PHYS, and STAT. BIOC 300 is only allowed to fulfill this elective requirement when it is taken prior to BIOC 301 and BIOC 341, or their equivalent transfer course.  
  To fulfill the remaining BIOC major requirements, students pursuing the BA degree must complete 1 additional course (3 credit hours) as a capstone. Only BIOC 400-level lecture courses from the list above which are explicitly designed for the BIOC major, can be used to satisfy this requirement. |

Elective Lecture Courses

Select 2 elective courses from courses offered by Natural Sciences/Engineering

Capstone Requirement

Select 1 course from the following:

- **BIOC 401** UNDERGRADUATE HONORS RESEARCH
- **BIOC 402** UNDERGRADUATE HONORS RESEARCH
- **BIOC 412** UNDERGRADUATE RESEARCH SEMINAR
- **BIOC 424** MICROBIOLOGY AND BIOTECHNOLOGY
- **BIOC 425** PLANT MOLECULAR GENETICS AND DEVELOPMENT
- **BIOC 442** MOLECULES, MEMORY AND MODEL ANIMALS: METHODS IN BEHAVIORAL NEUROSCIENCE
- **BIOC 443** ADVANCED CONCEPTS AND CRITICAL ANALYSIS IN MODERN DEVELOPMENTAL BIOLOGY
- **BIOC 445** ADVANCED MOLECULAR BIOLOGY AND GENETICS
- **BIOC 447** EXPERIMENTAL BIOLOGY AND THE FUTURE OF MEDICINE
- **BIOC 449** ADVANCED CELL AND MOLECULAR NEUROSCIENCE
- **BIOC 450** VIRUSES AND INFECTIOUS DISEASES
- **BIOC 455** COMPUTATIONAL SYNTHETIC BIOLOGY
- **BIOC 460** CANCER BIOLOGY
- **BIOC 464 / BIOE 464** EXTRACELLULAR MATRIX
- **BIOC 470** COMPUTATION WITH BIOLOGICAL DATA
- **BIOC 481** MOLECULAR BIOPHYSICS I
- **BIOC 482** STRUCTURAL BIOLOGY

Total Credit Hours Required for the Major in Biochemistry and Cell Biology

University Graduation Requirements (ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements)

Total Credit Hours

Minimum of 63

Minimum of 123
Policies for the BA Degree with a Major in Biochemistry and Cell 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 at the department website by clicking on the tab for Undergraduate Studies: http://biosciences.rice.edu/.

Program Restrictions and Exclusions

Students pursuing the major in Biochemistry and Cell Biology should be aware of the following program restrictions:

• Students pursuing the major in Biochemistry and Cell Biology may not additionally declare the major in Biological Sciences.

Transfer Credit

For Rice University’s policy regarding transfer credit, see Transfer Credit (ga.rice.edu/undergraduate-students/academic-policies-procedures/transfer-credit). Some departments and programs have additional restrictions on transfer credit. The Office of Academic Advising maintains the university’s official list of transfer credit advisors on their website: https://oaa.rice.edu. Students are encouraged to meet with their academic program’s transfer credit advisor when considering transfer credit possibilities.

Departmental Transfer Credit Guidelines

Students pursuing the major in Biochemistry and Cell Biology should be aware of the following departmental transfer credit guidelines:

• Requests for transfer credit will be considered by the program director (and/or the program’s official transfer credit advisor) on an individual case-by-case basis.

Additional Information

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

Opportunities for the BA Degree with a Major in Biochemistry and Cell 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 (ga.rice.edu/undergraduate-students/honors-distinctions/university) (summa cum laude, magna cum laude, and cum laude) and Distinction in Research and Creative Work (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 award from the Department of BioSciences can be found at the department website, by clicking on the link for Undergraduate Studies, at: http://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 at the department website, by clicking on the link for Undergraduate Studies, at: http://biosciences.rice.edu/.

Additional Information

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