

# CHEMICAL BIOLOGY AND PHARMACOLOGY, B.S.

Saint Louis University's Bachelor of Science in Chemical Biology and Pharmacology is an interdisciplinary degree in which students gain a strong foundation in chemistry, biology and pharmacology. The degree is customizable to align with students' interests in medicinal chemistry, pharmacology, or molecular biology.

Chemical biology is the application of chemistry toward solving biological problems and pharmacology is the study of the action of drug molecules. The B.S. in chemical biology and pharmacology provides excellent preparation for students seeking employment in industry (biotechnology, pharmaceutical, agriculture, etc.), as well as for those who want to continue their studies in professional school (medical, pharmacy, dental, veterinary, law, etc.) and graduate school.

## Program Highlights

- A rigorous program that makes graduates competitive for employment in STEM areas.
- Opportunities for students to strengthen their scientific communication skills through research activities that pair an undergraduate with a faculty researcher.
- A mentoring program that runs freshman through senior year and provides guidance and support to students.

## Curriculum Overview

This program places a great emphasis on undergraduate research. Students have ample opportunity to pursue research projects under the close mentorship of a full-time faculty member in the Department of Chemistry, Department of Biology and the School of Medicine's Department of Pharmacology and Physiology. Students use a variety of specialized equipment and computers in their laboratories and in their research. Students in upper-level courses enjoy small classes and personalized attention.

- **First year:** General Chemistry I and II with labs, Principles of Biology I and II with labs, Calculus I and II
- **Second year:** Organic Chemistry I and II with labs, Analytical Chemistry I with lab, Physics I and II with labs
- **Third year:** Human Physiology, Biochemistry I and II with labs, Molecular Pharmacology, Physical Chemistry, Undergraduate Research, Chemistry Literature
- **Fourth year:** Chemical biology electives (three selected from upper-level chemistry, biology and pharmacology coursework), Undergraduate Research, Medicinal Chemistry

## Fieldwork and Research Opportunities

Benefits of this program also include career opportunities. Undergraduate students work with faculty in undergraduate laboratories as laboratory assistants.

Undergraduates who study chemical biology at SLU can attend professional meetings and present their research results. In recent years, SLU students have presented numerous talks and poster presentations at regional and national meetings of the American Chemical Society and other scientific conferences.

## Careers

Career options in chemical biology and pharmacology include:

- Education
- Chemical research and development in industry or government laboratories
- Pharmaceutical research and drug development
- Biotechnology
- Pharmacy
- Management and administration in the pharmaceutical and biotechnology industries and health care
- Chemical, pharmaceutical, biotech and scientific instrumentation sales

This degree provides excellent preparation for medical, veterinary and pharmacy school. Other graduates continue through law school and specialize in patent law. The public health sector is also a common area to work.

## Admission Requirements

### Begin Your Application (<http://www.slu.edu/apply.php>)

Saint Louis University also accepts the Common Application.

### Freshman

All applications are thoroughly reviewed with the highest degree of individual care and consideration to all credentials that are submitted. Solid academic performance in college preparatory coursework is a primary concern in reviewing a freshman applicant's file.

To be considered for admission to any Saint Louis University undergraduate program, applicants must be graduating from an accredited high school, have an acceptable HiSET exam score or take the General Education Development (GED) test.

### Transfer

Applicants must be a graduate of an accredited high school or have an acceptable score on the GED.

Students who have attempted fewer than 24 semester credits (or 30 quarter credits) of college credit must follow the above freshman admission requirements. Students who have completed 24 or more semester credits (or 30 quarter credits) of college credit must submit transcripts from all previously attended college(s).

In reviewing a transfer applicant's file, the Office of Admission holistically examines the student's academic performance in college-level coursework as an indicator of the student's ability to meet the academic rigors of Saint Louis University. Where applicable, transfer students will be evaluated on any courses outlined in the continuation standards of their preferred major.

### International Applicants

All admission policies and requirements for domestic students apply to international students along with the following:

- Demonstrate English Language Proficiency (<https://catalog.slu.edu/academic-policies/office-admission/undergraduate/english-language-proficiency/>)
- Proof of financial support must include:

- A letter of financial support from the person(s) or sponsoring agency funding the time at Saint Louis University
- A letter from the sponsor's bank verifying that the funds are available and will be so for the duration of study at the University
- Academic records, in English translation, of students who have undertaken postsecondary studies outside the United States must include the courses taken and/or lectures attended, practical laboratory work, the maximum and minimum grades attainable, the grades earned or the results of all end-of-term examinations, and any honors or degrees received. WES and ECE transcripts are accepted.

## Tuition

Tuition	Cost Per Year
Undergraduate Tuition	\$52,260

Additional charges may apply. Other resources are listed below:

Net Price Calculator (<https://www.slu.edu/financial-aid/tuition-and-costs/calculator.php>)

Information on Tuition and Fees (<https://catalog.slu.edu/academic-policies/student-financial-services/tuition/>)

Miscellaneous Fees (<https://catalog.slu.edu/academic-policies/student-financial-services/fees/>)

Information on Summer Tuition (<https://catalog.slu.edu/academic-policies/student-financial-services/tuition-summer/>)

## Scholarships and Financial Aid

There are two principal ways to help finance a Saint Louis University education:

- **Scholarships:** Scholarships are awarded based on academic achievement, service, leadership and financial need.
- **Financial Aid:** Financial aid is provided through grants and loans, some of which require repayment.

Saint Louis University makes every effort to keep our education affordable. In fiscal year 2022, 99% of first-time freshmen and 90% of all students received financial aid (<https://www.slu.edu/financial-aid/>) and students received more than \$445 million in aid University-wide.

For priority consideration for merit-based scholarships, apply for admission by December 1 and complete a Free Application for Federal Student Aid (FAFSA) by March 1.

For information on other scholarships and financial aid, visit [www.slu.edu/financial-aid](http://www.slu.edu/financial-aid) (<https://www.slu.edu/financial-aid/>).

## Learning Outcomes

1. Graduates will be able to explain major principles in organic chemistry, biochemistry and pharmacology.
2. Graduates will be able to conduct laboratory techniques and experiments safely.
3. Graduates will be able to analyze quantitative data.
4. Graduates will be able to apply chemistry principles to biology.
5. Graduates will be able to articulate scientific results in both oral and written forms.

## Requirements

Chemical biology and pharmacology students must complete a minimum total of **78 credits** for the major. Twelve hours from the math and science college core requirements are satisfied within the required major coursework.

Code	Title	Credits
<b>University Undergraduate Core (<a href="https://catalog.slu.edu/academic-policies/academic-policies-procedures/university-core/">https://catalog.slu.edu/academic-policies/academic-policies-procedures/university-core/</a>)</b>		
<b>Major Requirements</b>		
BIOL 1240 & BIOL 1245	General Biology: Information Flow and Evolution and Principles of Biology I Laboratory	4
BIOL 1260 & BIOL 1265	General Biology: Transformations of Energy and Matter and Principles of Biology II Laboratory	4
CHEB 3970	Chemical Biology Research	3
or CHEM 3970	Undergraduate Research	
or BIOL 4980	Advanced Independent Study	
CHEM 1130 & CHEM 1115	General Chemistry 1 for Majors and General Chemistry 1 Laboratory	4
CHEM 1140 & CHEM 1125	General Chemistry 2 for Majors and General Chemistry 2 Laboratory	4
CHEM 2200 & CHEM 2205	Analytical Chemistry 1 and Analytical Chemistry 1 Laboratory	4
CHEM 2430 & CHEM 2435	Organic Chemistry 1 for Majors and Organic Chemistry 1 Lab for Majors	4
CHEM 2440 & CHEM 2445	Organic Chemistry 2 for Majors and Organic Chemistry 2 Laboratory for Majors	4
CHEM 3330	Physical Chemistry 1	3
or CHEM 3340	Physical Chemistry 2	
CHEM 3100	The Chemical Literature	1
CHEM 4470	Medicinal Chemistry	3
CHEM 4610 & CHEM 4615	Biochemistry 1 and Biochemistry 1 Laboratory	4
CHEM 4620 & CHEM 4625	Biochemistry 2 and Biochemistry 2 Laboratory	4
MATH 1510	Calculus I	4
MATH 1520	Calculus II	4
PHYS 1310 & PHYS 1320	Physics I and Physics I Laboratory	4
or PHYS 1610 & PHYS 1620	University Physics I and University Physics I Laboratory	
PHYS 1330 & PHYS 1340	Physics II and Physics II Laboratory	4
or PHYS 1630 & PHYS 1640	University Physics II and University Physics II Laboratory	
PPY 2540	Human Physiology	4
or HSCI 3300 & HSCI 3310	Anatomy & Physiology I and Anatomy & Physiology I Lab	
PPY 4410	Molecular Pharmacology	3
<b>Chemical Biology Electives<sup>‡</sup></b>		
9		
Nine credit hours selected from courses with the 'Chemical Biology Elective' attribute, examples include:		
ANAT 1000	Basic Human Anatomy (Recommended for pairing with PPY 2540 or HSCI 3400. HSCI 3410 must be taken concurrently)	

BIOL 3030	Principles of Genetics
BIOL 3040	Cell Structure & Function
BIOL 3490	Plant Physiology
BIOL 4520	Biochemical Pharmacology
BIOL 4630	Foundations of Immunobiology
BIOL 4640	General Microbiology
BIOL 4700	Molecular Biology
BIOL 4790	Biometry
CHEM 4200	Analytical Chemistry 2
CHEM 4400	Organic Spectroscopy
CHEM 4500	Inorganic Chemistry
CHEM 5440	Bioorganic Chemistry
CHEM 5450	Advanced Organic Chemistry
CHEM 5460	Synthetic Organic Chemistry
CHEM 5620	Biophysical Chemistry
CSCI 1020	Introduction to Computer Science: Bioinformatics
STAT 1300	Elementary Statistics with Computers (STAT 3850 is recommended) or STAT 3850 Foundation of Statistics
<b>General Electives</b>	<b>7-18</b>
<b>Total Credits</b>	<b>120</b>

† Students take three semesters, one credit per semester, regardless of which course is taken.

‡ A student interested in tailoring their degree towards a particular emphasis may customize their degree as follows:

- **Medicinal Chemistry Emphasis:** CHEM 5460 (Synthetic Organic Chemistry), CHEM 4400 (Organic Spectroscopy), plus 1 other Chemical Biology Elective.
- **Pharmacology Emphasis:** BIOL 3030 Genetics, BIOL 4930 Biochemical Pharmacology, plus 1 other Chemical Biology Elective.
- **Molecular Biology Emphasis:** BIOL 3030 Genetics, BIOL 4700 Molecular Biology, plus 1 other Chemical Biology Elective.
- **Pre-Med:** BIOL 3030 Genetics, plus 2 other Chemical Biology Electives.
- **Pre-Dental/PA/Pharmacy/Vet:** ANAT 1000 Basic Human Anatomy, PPY 2540 Human Physiology, STAT 3850 Foundation of Statistics, BIOL 4640 General Microbiology; OR, if anatomy/physiology lab is a required pre-requisite for the professional program you plan to apply to, select HSCI 3300/3310 Anatomy & Physiology I + Lab (in place of PPY 2540 Human Physiology) and select HSCI 3400 Anatomy & Physiology II as an elective in place of ANAT 1000 Basic Human Anatomy. Note that some professional programs may require Microbiology plus lab.

## Non-Course Requirements

All undergraduate majors must complete an exit interview with the department chair during their final semester. B.S. majors are required to submit an undergraduate thesis and present their research prior to graduation.

## Continuation Standards

The following standards apply to all new freshmen and transfer students:

- Students must earn "C-" or better in CHEM 1110 General Chemistry 1 or CHEM 1130 General Chemistry 1 for Majors) and a "C-" or better in CHEM 1120 General Chemistry 2 or CHEM 1140 General Chemistry 2 for Majors, or the equivalent in transfer.
- Students must earn a "C-" or better in Analytical Chemistry 1 (CHEM 2200 Analytical Chemistry 1).

Students who do not earn a "C-" in any of the identified courses must retake the course at SLU in the following semester. If a "C-" is not earned on the second attempt the student will be dismissed from the major. A student who withdraws from one of these courses on the first attempt will only have one more attempt to earn a "C-".

Students must maintain a 2.00 grade point average (GPA) in their major (CHEB or CHEM) and required related courses (BIOL, PHYS, MATH, etc.). If a student falls below a 2.00 major GPA, the student must meet with the program coordinator to review their academic performance. If the student cannot raise the major GPA to 2.00 in two semesters, the student will be dismissed from the major.

## Roadmap

Roadmaps are recommended semester-by-semester plans of study for programs and assume full-time enrollment unless otherwise noted.

Courses and milestones designated as critical (marked with !) must be completed in the semester listed to ensure a timely graduation. Transfer credit may change the roadmap.

This roadmap should not be used in the place of regular academic advising appointments. All students are encouraged to meet with their advisor/mentor each semester. Requirements, course availability and sequencing are subject to change.

Course	Title	Credits
<b>Year One</b>		
<b>Fall</b>		
! BIOL 1240 & BIOL 1245	General Biology: Information Flow and Evolution and Principles of Biology I Laboratory	4
! CHEM 1130 & CHEM 1115	General Chemistry 1 for Majors and General Chemistry 1 Laboratory	4
MATH 1510	Calculus I	4
University Core		3-4
<b>Credits</b>		<b>15-16</b>
<b>Spring</b>		
! BIOL 1260 & BIOL 1265	General Biology: Transformations of Energy and Matter and Principles of Biology II Laboratory	4
! CHEM 1140 & CHEM 1125	General Chemistry 2 for Majors and General Chemistry 2 Laboratory	4
MATH 1520	Calculus II	4
University Core		3
<b>Credits</b>		<b>15</b>
<b>Year Two</b>		
<b>Fall</b>		
! CHEM 2430 & CHEM 2435	Organic Chemistry 1 for Majors and Organic Chemistry 1 Lab for Majors	4
PHYS 1310 & PHYS 1320	College Physics I and College Physics I Laboratory	4

! CHEM 2200	Analytical Chemistry 1	4
& CHEM 2205	and Analytical Chemistry 1 Laboratory	
University Core		3

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**Credits** **15**

**Spring**

! CHEM 2440	Organic Chemistry 2 for Majors	4
& CHEM 2445	and Organic Chemistry 2 Laboratory for Majors	
PHYS 1330	College Physics II	4
& PHYS 1340	and College Physics II Laboratory	
University Core		6

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**Credits** **14**

**Year Three****Fall**

CHEM 3100	The Chemical Literature	1
! CHEM 4610	Biochemistry 1	4
& CHEM 4615	and Biochemistry 1 Laboratory	
CHEM 3330	Physical Chemistry 1	3
PPY 2540	Human Physiology	4
CHEB 3970	Chemical Biology Research	1
or CHEM 3970	or Undergraduate Research	
or BIOL 4980	or Advanced Independent Study	
University Core		2-3

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**Credits** **15-16**

**Spring**

! CHEM 4620	Biochemistry 2	4
& CHEM 4625	and Biochemistry 2 Laboratory	
CHEB 3970	Chemical Biology Research	1
or CHEM 3970	or Undergraduate Research	
or BIOL 4980	or Advanced Independent Study	
PPY 4410	Molecular Pharmacology	3
University Core		3
General Elective		4

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**Credits** **15**

**Year Four****Fall**

! Chemical Biology Electives		6
CHEB 3970	Chemical Biology Research	1
or CHEM 3970	or Undergraduate Research	
or BIOL 4980	or Advanced Independent Study	
University Core		3
General Electives		6

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**Credits** **16**

**Spring**

! Chemical Biology Elective		3
CHEM 4470	Medicinal Chemistry	3
University Core		3-4
General Electives		6

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**Credits** **15-16**

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**Total Credits** **120-123**