# BIOCHEMISTRY, B.S. TO CHEMICAL BIOLOGY, MASTER'S ACCELERATED PROGRAM

Saint Louis University's bachelor's-to-master's program in chemical biology provides a strong foundation in chemistry and branches out into medicinal chemistry, pharmacology and molecular biology.

A five-year course schedule is provided to SLU undergraduates that demonstrates how to complete the undergraduate B.S. degree in biochemistry or biology together with a master's degree in chemical biology. The master's degree can either be a coursework-based M.A. degree or a thesis-based M.S. degree. This program provides excellent preparation for a career in the pharmaceutical and biotech industries.

For additional information, see the catalog entries for the following SLU programs:

Biochemistry, B.S. (https://catalog.slu.edu/colleges-schools/science-engineering/chemistry/biochemistry-bs/)

Chemical Biology, M.A. (https://catalog.slu.edu/colleges-schools/science-engineering/chemistry/chemical-biology-ma/)

Chemical Biology, M.S. (https://catalog.slu.edu/colleges-schools/science-engineering/chemistry/chemical-biology-ms/)

## Accreditation

The Bachelor of Science in Biochemistry has been continuously certified by the American Chemical Society since 2004.

## Requirements

Existing SLU undergraduates pursuing a B.S. in biochemistry may apply to the accelerated bachelor's-master's (ABM) program after completing 75 credits (typically during the spring semester of their third year) if they have a GPA of 3.00 or higher, commensurate with the admission standards for the master's program in chemical biology. The application will include a personal statement and three letters of support, of which at least two must be from members of the SLU faculty.

If accepted into the program, students who have completed 90 undergraduate credits (typically during their fourth year) may apply up to 15 credits of graduate-level courses (5000-level and up) towards both the undergraduate and graduate degree requirements, assuming a grade of "B" or better. Students targeting a coursework-based M.A. degree will be mentored by the chemical biology program coordinator. Students targeting a thesis-based M.S. will take CHEB-5110 in the summer after having completed 90 credits (typically between years three and four) and select a research mentor.

Prior to 120 credits, students enrolled in the program will need to adhere to the continuation standards of their undergraduate major. After 120 credits (typically the fifth year), the chemical biology master's level program continuation requirements apply.

## 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.

## M.A. in Chemical Biology Option

| Course | Title | Credits |
|---|---|---|
| **Year One** | | |
| **Fall** | | |
| ! CHEM 1130<br>& CHEM 1115 | General Chemistry 1 for Majors<br>and General Chemistry 1 Laboratory (! Satisfies CORE 3800: Ways of Thinking: Natural and Applied Sciences) | 4 |
| ! BIOL 1240<br>& BIOL 1245 | General Biology: Information Flow and Evolution<br>and Principles of Biology I Laboratory | 4 |
| MATH 1510 | Calculus I (! Satisfies CORE 3200: Ways of Thinking: Quantitative Reasoning) | 4 |
| Core courses | | 3-5 |
| | **Credits** | **15-17** |
| **Spring** | | |
| ! CHEM 1140<br>& CHEM 1125 | General Chemistry 2 for Majors<br>and General Chemistry 2 Laboratory | 4 |
| ! BIOL 1260<br>& BIOL 1265 | General Biology: Transformations of Energy and Matter<br>and Principles of Biology II Laboratory | 4 |
| MATH 1520 | Calculus II | 4 |
| Core course | | 3 |
| | **Credits** | **15** |
| **Year Two** | | |
| **Fall** | | |
| ! CHEM 2430<br>& CHEM 2435 | Organic Chemistry 1 for Majors<br>and Organic Chemistry 1 Lab for Majors | 4 |
| ! CHEM 2200<br>& CHEM 2205 | Analytical Chemistry 1<br>and Analytical Chemistry 1 Laboratory (! Analytical 1 Lecture/Lab sequence can be taken either Fall or Spring semester) | 4 |
| PHYS 1610<br>& PHYS 1620<br>or PHYS 1310<br>or PHYS 1320 | University Physics I [1]<br>or College Physics I<br>or College Physics I Laboratory | 4 |
| Core courses | | 6 |
| | **Credits** | **18** |
| **Spring** | | |
| ! CHEM 2440<br>& CHEM 2445 | Organic Chemistry 2 for Majors<br>and Organic Chemistry 2 Laboratory for Majors | 4 |

| | | |
|---|---|---|
| PHYS 1630<br>& PHYS 1640<br>or PHYS 1330<br>or PHYS 1340 | University Physics II [1]<br>or College Physics II<br>or College Physics II Laboratory | 4 |
| Core courses | | 6 |
| | **Credits** | **14** |
| **Year Three** | | |
| **Fall** | | |
| ! CHEM 4610<br>& CHEM 4615 | Biochemistry 1<br>and Biochemistry 1 Laboratory | 4 |
| CHEM 3330 | Physical Chemistry 1 | 3 |
| CHEM 3100 | The Chemical Literature | 1 |
| Core courses | | 8-9 |
| | **Credits** | **16-17** |
| **Spring** | | |
| ! CHEM 4620<br>& CHEM 4625 | Biochemistry 2<br>and Biochemistry 2 Laboratory | 4 |
| ! CHEM 3340<br>& CHEM 3345 | Physical Chemistry 2<br>and Physical Chemistry Laboratory | 4 |
| CHEB 3970 | Independent Research in Chemical Biology | 1-3 |
| General Electives | | 9 |
| | **Credits** | **18-20** |
| **Year Four** | | |
| **Fall** | | |
| CHEM 5500<br>or CHEM 4500 | Inorganic Chemistry (! Satisfies both Biochem BS requirement and MS elective)<br>or Inorganic Chemistry | 3 |
| CHEB 3970 | Independent Research in Chemical Biology | 1-3 |
| CHEM 5630 | Introduction to Chemical Biology and Biotechnology (Only offered even years) | 3 |
| BIOL/BME elective [2] | | 3 |
| Core course | | 1 |
| General Electives [6] | | |
| | **Credits** | **11-13** |
| **Spring** | | |
| CHEM 5470 | Medicinal Chemistry (! Satisfies Biochem BS elective requirement. Offered every Spring. Evening course.) | 3 |
| CHEB 3970 | Independent Research in Chemical Biology (Requires completion of Senior Thesis) | 1-3 |
| PPY 5410 | Molecular Pharmacology (Offered every Spring) [3] | 3 |
| CHEB 5970 | Research Topics | 3 |
| Core Course | | 2-3 |
| General Elective | | 3 |
| | **Credits** | **15-18** |
| **Summer** | | |
| CHEB 5980 | Graduate Independent Study in Chemical Biology | 3 |
| | **Credits** | **3** |
| **Year Five** | | |
| **Fall** | | |
| BIOL 5700 | Advanced Molecular Biology | 3 |
| Elective [2] | | 3 |
| Elective [2] | | 3 |
| | **Credits** | **9** |
| **Spring** | | |
| ! Elective [2] | | 3 |
| Elective [2] | | 3 |
| Oral Examination | | |
| | **Credits** | **6** |
| | **Total Credits** | **140-150** |

# M.S. in Chemical Biology Option

| Course | Title | Credits |
|---|---|---|
| **Year One** | | |
| **Fall** | | |
| ! CHEM 1130<br>& CHEM 1115 | General Chemistry 1 for Majors<br>and General Chemistry 1 Laboratory | 4 |
| ! BIOL 1240<br>& BIOL 1245 | General Biology: Information Flow and Evolution<br>and Principles of Biology I Laboratory | 4 |
| MATH 1510 | Calculus I | 4 |
| Core course | | 3-4 |
| | **Credits** | **15-16** |
| **Spring** | | |
| ! CHEM 1140<br>& CHEM 1125 | General Chemistry 2 for Majors<br>and General Chemistry 2 Laboratory | 4 |
| ! BIOL 1260<br>& BIOL 1265 | General Biology: Transformations of Energy and Matter<br>and Principles of Biology II Laboratory | 4 |
| MATH 1520 | Calculus II | 4 |
| Core course | | 3 |
| | **Credits** | **15** |
| **Year Two** | | |
| **Fall** | | |
| ! CHEM 2430<br>& CHEM 2435 | Organic Chemistry 1 for Majors<br>and Organic Chemistry 1 Lab for Majors | 4 |
| ! CHEM 2200<br>& CHEM 2205 | Analytical Chemistry 1<br>and Analytical Chemistry 1 Laboratory | 4 |
| ! PHYS 1610<br>& PHYS 1620<br>or PHYS 1310<br>***and***<br>PHYS 1320 | University Physics I [1]<br>or College Physics I ***and*** College Physics I Laboratory | 4 |
| Core course | | 6 |
| | **Credits** | **18** |
| **Spring** | | |
| ! CHEM 2440<br>& CHEM 2445 | Organic Chemistry 2 for Majors<br>and Organic Chemistry 2 Laboratory for Majors | 4 |
| ! PHYS 1330<br>& PHYS 1340<br>or PHYS 1610<br>***and***<br>PHYS 1640 | College Physics II<br>or University Physics I ***and*** University Physics II Laboratory | 4 |

| | | |
|---|---|---|
| ! PHYS 1630<br>& PHYS 1640<br>or PHYS 1310<br>***and***<br>PHYS 1340 | University Physics II [1]<br>or College Physics I ***and*** College Physics II Laboratory | 4 |
| Core courses | | 6 |
| | **Credits** | **18** |
| **Year Three** | | |
| **Fall** | | |
| ! CHEM 4610<br>& CHEM 4615 | Biochemistry 1<br>and Biochemistry 1 Laboratory | 4 |
| CHEM 3330 | Physical Chemistry 1 | 3 |
| CHEM 3100 | The Chemical Literature | 1 |
| Core courses | | 8-9 |
| | **Credits** | **16-17** |
| **Spring** | | |
| ! CHEM 4620<br>& CHEM 4625 | Biochemistry 2<br>and Biochemistry 2 Laboratory | 4 |
| ! CHEM 3340<br>& CHEM 3345 | Physical Chemistry 2<br>and Physical Chemistry Laboratory | 4 |
| CHEM 3970 | Independent Research in Chemistry | 1 |
| General Electives | | 6 |
| | **Credits** | **15** |
| **Summer** | | |
| CHEB 5110 | Introduction to Chemical Biology Research I | 1 |
| | **Credits** | **1** |
| **Year Four** | | |
| **Fall** | | |
| CHEM 5500<br>or CHEM 4500 | Inorganic Chemistry (! Satisfies both Biochem BS requirement and MS elective.)<br>or Inorganic Chemistry | 3 |
| BIOL 5700 | Advanced Molecular Biology | 3 |
| CHEM 5630 | Introduction to Chemical Biology and Biotechnology (Only offered every other year) | 3 |
| CHEM 3970 | Independent Research in Chemistry | 1 |
| CHEM 5000 | Introduction to Chemical Research | 1 |
| BIOL/BME elective [2] | | 3 |
| Core course | | 1 |
| General Elecetive | | 3 |
| | **Credits** | **18** |
| **Spring** | | |
| CHEM 5470 | Medicinal Chemistry (Satisfies Biochem BS elective requirement. Offered every Spring. Evening Course.) | 3 |
| CHEB 5120 | Introduction to Chemical Biology Research II | 2 |
| CHEM 3970 | Independent Research in Chemistry (! Requires completion of Senior Thesis) | 1 |
| Core course | | 2-3 |
| General Elective | | 9 |
| | **Credits** | **17-18** |
| **Summer** | | |
| CHEB 5970 | Research Topics | 3 |
| | **Credits** | **3** |
| **Year Five** | | |
| **Fall** | | |
| CHEB 5990 | Thesis Research | 3 |
| Elective [2] | | 3 |
| Submit Research Progress Report | | |
| | **Credits** | **6** |
| **Spring** | | |
| CHEB 5990 | Thesis Research | 3 |
| PPY 5410 | Molecular Pharmacology (Offered Every Spring) [3] | 3 |
| Submit and defend Master's Thesis | | |
| | **Credits** | **6** |
| | **Total Credits** | **148-151** |

[1] Engineering Physics (PHYS 1610-1640) is recommended. However, Physics (PHYS 1310-1340) also fulfills the physics requirement.

[2] Elective must be selected from a 5000+ course. Electives should be selected in consultation with the chemical biology program coordinator from the chemistry, biology, pharmacology or biochemistry departments.

BIOL/BME Elective: Students must complete three credit hours of a biology/BME course. These credits must be fulfilled by:

i. BIOL 3010 – Evolutionary Biology
ii. BIOL 3030 – Principles of Genetics
iii. BIOL 3400 – Intro to Neuroscience
iv. BIOL 4070 – Advanced Biological Chemistry
v. BIOL 4250 – Neurobiology of Disease
vi. BIOL 4430 – Principles of Virology
vii. BIOL 4460 – Exercise Physiology
viii. BIOL 4520 – Biochemical Pharmacology
ix. BIOL 4540 – Human Systemic Physiology
x. BIOL 4600 – Developmental Biology
xi. BIOL 4630 – Foundations of Immunobiology
xii. BIOL 4640 – General Microbiology
xiii. BIOL 4720 – Cancer Biology
xiv. BME 2200 – Applied Physiology for Engineers

[3] The PPY 5110 and PPY 5120 sequence may be taken in place of PPY 5410. PPY 5110 and 5120 are fall semester courses.