

CHEMICAL BIOLOGY MAJOR

Learning Goals and Outcomes

Goal 1: Students will understand the role of chemical properties in biological systems and processes.

Outcome 1.1: Students will understand and be able to describe biochemical processes of living organisms and the role of macromolecules in these processes.

Outcome 1.2: Students will understand and be able to describe how organisms interact with their abiotic and biotic environment.

Goal 2: Students will gain an appreciation of the integration of chemistry and biology to solve scientific problems.

Outcome 2.1: Students will understand and be able to apply fundamental chemical principles of bonding, molecular structure and interactions, stoichiometry, kinetics, and thermodynamics to explain biological systems, processes, and structure.

Goal 3: Students will acquire research experience through faculty-supervised independent projects in chemistry or biology.

Outcome 3.1: Students will search the literature for published work relevant to a problem of interest.

Outcome 3.2: Students will be able to design an experiment, operate basic laboratory equipment, reduce and present data that includes the interpretation of statistical tests.

Goal 4: Students will effectively communicate scientific information.

Outcome 4.1: Students will be able to develop cogent written and oral presentations of scientific content.

Requirements

The traditional undergraduate programs includes a minimum of 120 credits distributed across three components: A General Education component divided into Signature Courses, Variable Courses, and an Integrative Learning requirement; a Major and Divisional component; and Free Electives. In addition to course requirements as specified in each area, students must complete one certified course in each of the following overlay areas¹:

1. Diversity, Globalization or Non-western Area Studies,
2. Ethics Intensive
3. Writing Intensive, and
4. Diversity

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Overlay requirements are part of the 120 credit requirements

General Education Signature Courses

See this page about Signature courses (<https://academiccatalog.sju.edu/curricula/#signature>).

General Education Variable Courses

See this page about Variable courses (<https://academiccatalog.sju.edu/curricula/#variable>). Six to Nine courses

| Code | Title | Hours |
|------------------------------|---------------------------------------------------------|-------|
| Mathematics | | |
| MAT 155 or MAT 161 | Fundamentals of Calculus Calculus I | 3 |
| Natural Science | | |
| Select one of the following: | | |
| PHY 102 & 102L | General Physics II and General Physics Laboratory II | |
| PHY 106 & 106L | University Physics II and University Physics Lab II | |

General Education Overlays

See this page about Overlays (<https://academiccatalog.sju.edu/curricula/#overlay>).

General Education Integrative Learning Component

See this page about Integrative Learning Component (<https://academiccatalog.sju.edu/curricula/#integrative-learning>). Three courses:

| Code | Title | Hours |
|----------------------------------|----------------------------------------------------------------|-------|
| Biology | | |
| BIO 101 & 101L or BIO 150L | Bio I: Cells and Bio I: Cells Lab Bio I: Cells Lab Phage | 4 |
| Select one of the following: | | |
| CHM 120 & 120L | General Chemistry I and General Chemistry Lab I | |
| CHM 121 & CHM 120L | General Chemistry Honors I and General Chemistry Lab I | |
| Select one of the following: | | |
| PHY 101 & 101L | General Physics I and General Physics Laboratory I | |
| PHY 105 & 105L | University Physics I and University Physics Lab I | |

GEP Electives

At least six courses

Major Requirements:

Fourteen courses

| Code | Title | Hours |
|----------------------------------|-------------------------------------------------------------------------------------|-------|
| Required Courses: | | |
| MAT 128 or MAT 162 | Applied Statistics Calculus II | 3-4 |
| BIO 102 & 102L or BIO 151L | Bio II: Genetics and Bio II: Genetics Lab Phage Lab | 4 |
| BIO 201 & 201L | Bio III: Organismic Biology and Bio III: Organismic Biol Lab | 4 |
| CHM 125 & 125L or CHM 126 | General Chemistry II and General Chemistry Lab II General Chemistry Honors II | 3-4 |

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|-----------------------|--------------------------------------------------------|---|
| CHM 330 & 330L | Instrumental Analysis and Instrumental Analysis Lab | 5 |
| CHM 210 & 210L | Organic Chemistry I and Organic Chemistry Lab I | 4 |
| CHM 215 & 215L | Organic Chemistry II and Organic Chemistry Lab II | 4 |
| CHM 320 or CHM 310 | Physical Chem for Chem Bio Physical Chemistry I | 3 |

*The research requirement can also be satisfied with CMB 490 "Introduction to Research" and an in-depth Chemistry course or a Biology elective course listed above.

Select three of the following: 12

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|-------------------|----------------------------------------------------------------|--|
| BIO 402 & 402L | Advanced Cell Biology and Advanced Cell Biology Lab | |
| BIO 411 & 411L | Molecular Genetics and Molecular Genetics Lab | |
| BIO 412 & 412L | Neurobiology and Neurobiology Lab | |
| BIO 415 & 415L | Immunology and Immunology Lab | |
| BIO 416 & 416L | Microbiology and Microbiology Lab | |
| BIO 422 & 422L | Applied&Environ Microbio and Applied & Environ Micro Lab | |
| BIO 421 & 421L | Molecular&Cellular Biophysics and Mol & Cell Biophysics Lab | |
| BIO 424 & 424L | Biotechnology and Biotechnology Lab | |
| BIO 425 & 425L | Bacterial Pathogenesis and Bacterial Pathogenesis Lab | |

Select one of the following in-depth Chemistry courses: 3

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|---------|--------------------------------|--|
| CHM 360 | Nanochemistry | |
| CHM 400 | Chemistry of the Earth | |
| CHM 410 | Biophysical Chemistry | |
| CHM 420 | Atmospheric Environmental Chem | |
| CHM 430 | Mechanisms in Organic Chem | |
| CHM 435 | Tech Applications of Chemistry | |
| CHM 440 | Organometallic Chemistry | |
| CHM 460 | Aqueous Environmental Chem | |
| CHM 480 | Inorganic Biochemistry | |
| CHM 490 | Spectroscopy | |

Select one of the following: 3-4

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| BIO 404 | Biochemistry | |
| CHM 340 | Biochemistry | |

Select one of the following: * 3

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|-----------------------|----------------------------------------------------------------|--|
| BIO 493 or BIO 494 | Undergraduate Research in Bio Undergraduate Research in Bio | |
| CHM 393 or CHM 394 | Junior Research I Junior Research II | |
| CHM 493 or CHM 494 | Senior Research I Senior Research II | |

Total Hours 51-54

A Chemical Biology major must register for Chemical Biology Seminar each semester as a junior and a senior (4 total).