

# B.S. Biochemistry

(This degree appears in the Biomedical Sciences and Chemistry sections of the catalog.)

Two departments - Biomedical Sciences and Chemistry - jointly offer the B.S. degree in Biochemistry. The curriculum is designed to prepare the student for graduate work in biochemistry and related fields, as well as for admission to medical, dental, or other health professional schools. The graduate is also prepared to go directly into research or industrial positions which require preparation only at the B.S. level.

The purpose of the B.S. in Biochemistry is to serve students who seek to develop a strong background in biochemistry and the supporting sciences of biology, chemistry, and physics. Majors also gain experience in the broad areas of biochemistry, molecular biology, biotechnology, and medical and/or ecological applications of each. Majors gain experience that will prepare them to participate in research development, planning and implementation, and to be competent to carry out standard biochemical and molecular biology techniques in the laboratory. The B.S. in Biochemistry prepares students to be competitive for positions in research, graduate schools, health profession schools, and in the biotechnology industry.

## Core Requirements

Students pursuing a Bachelor of Science must satisfy all of the General Education Objectives (a minimum of 24 credits; Objectives 3 and 5 are satisfied in the core--see the General Education Requirements (<https://coursecat.isu.edu/undergraduate/academicinformation/generaleducation/>) described in the Academic Information section of this catalog). Students must also satisfy the core requirements listed below and at least **20** credits of elective courses selected from Biological Sciences, Chemistry, Mathematics, and Biomedical and Pharmaceutical Sciences. In order to make timely progress toward the degree, it is imperative that the student work closely with a major advisor. All graduates of this program will earn a B.S. in Biochemistry.

## General Education

The listing below includes program requirements that also fulfill General Education requirements.

| Code                                                                   | Title | Credits   |
|------------------------------------------------------------------------|-------|-----------|
| Objective 1 - ENGL 1101, ENGL 1102 <sup>1</sup>                        |       | 6         |
| Objective 2                                                            |       | 3         |
| Objective 3 - MATH 1170                                                |       | 4         |
| Objective 4                                                            |       | 6         |
| Objective 5 - BIOL 1101/BIOL 1101L & CHEM 1111/CHEM 1111L <sup>1</sup> |       | 9         |
| Objective 6                                                            |       | 6         |
| <b>Students must fulfill Objective 7 or Objective 8</b>                |       | <b>3</b>  |
| Objective 7                                                            |       |           |
| Objective 8                                                            |       |           |
| Objective 9                                                            |       | 3         |
| <b>Total Credits</b>                                                   |       | <b>40</b> |

## Core Requirements <sup>1</sup>

| Code                  | Title                                                                                                               | Credits   |
|-----------------------|---------------------------------------------------------------------------------------------------------------------|-----------|
| BIOL 1101 & 1101L     | Biology I and Biology I Lab (Partially satisfies General Education Objective 5)                                     | 4         |
| BIOL 1102 & 1102L     | Biology II and Biology II Lab                                                                                       | 4         |
| BIOL 2233 & 2233L     | Principles of Microbiology and Principles of Microbiology Lab <sup>2</sup>                                          | 4         |
| BIOL 3358             | Genetics                                                                                                            | 3         |
| BIOL 4437/CHEM 4438   | Experimental Biochemistry                                                                                           | 1         |
| BIOL 4444 & 4444L     | Molecular Biology and Molecular Biology Lab                                                                         | 4         |
| BIOL/CHEM 4445        | Biochemistry I                                                                                                      | 3         |
| BIOL/CHEM 4447        | Biochemistry II                                                                                                     | 3         |
| BIOL/CHEM 4498        | Seminar in Biochemistry, Microbiology, and Molecular Biology                                                        | 1         |
| CHEM 1111 & 1111L     | General Chemistry I and General Chemistry I Lab (Partially satisfies General Education Objective 5)                 | 5         |
| CHEM 1112 & 1112L     | General Chemistry II and General Chemistry II Lab (Partially satisfies General Education Objective 5)               | 4         |
| CHEM 2232 & CHEM 2234 | Quantitative Analysis and Quantitative Analysis Laboratory                                                          | 4         |
| CHEM 3301 & CHEM 3303 | Organic Chemistry I and Organic Chemistry Laboratory I                                                              | 4         |
| CHEM 3302 & CHEM 3304 | Organic Chemistry II and Organic Chemistry Laboratory II                                                            | 4         |
| CHEM 3341             | Topics in Physical Chemistry I <sup>3</sup>                                                                         | 3         |
| CHEM 3342             | Topics in Physical Chemistry II <sup>3</sup>                                                                        | 3         |
| MATH 1170             | Calculus I (Satisfies General Education Objective 3)                                                                | 4         |
| MATH 1175             | Calculus II                                                                                                         | 4         |
| PHYS 1111 & PHYS 1113 | General Physics I and General Physics I Laboratory (Partially satisfies General Education Objective 5) <sup>4</sup> | 4         |
| PHYS 1112 & PHYS 1114 | General Physics II and General Physics II Laboratory <sup>4</sup>                                                   | 4         |
| ENGL 1101             | Writing and Rhetoric I (Partially satisfies General Education Objective 1)                                          | 3         |
| ENGL 1102             | Writing and Rhetoric II (Partially satisfies General Education Objective 1)                                         | 3         |
| <b>Total Credits</b>  |                                                                                                                     | <b>76</b> |

<sup>1</sup> Students must pass core classes with a grade of C- or better.

<sup>2</sup> May elect to take BIOL 2206 (<https://coursecat.isu.edu/search/?P=BIOL%202206>) and BIOL 2207 (<https://coursecat.isu.edu/search/?P=BIOL%202207>) instead of BIOL 2233 (<https://coursecat.isu.edu/search/?P=BIOL%202233>) and BIOL 2233L (<https://coursecat.isu.edu/search/?P=BIOL%202233L>).

<sup>1</sup> "P" courses are equivalent to the original course.

<sup>3</sup> May elect to take CHEM 3351 (<https://coursecat.isu.edu/search/?P=CHEM%203351>) and CHEM 3352 (<https://coursecat.isu.edu/search/?P=CHEM%203352>) instead of CHEM 3341 (<https://coursecat.isu.edu/search/?P=CHEM%203341>) and CHEM 3342 (<https://coursecat.isu.edu/search/?P=CHEM%203342>).

<sup>4</sup> PHYS 2211 (<https://coursecat.isu.edu/search/?P=PHYS%202211>), PHYS 2212 (<https://coursecat.isu.edu/search/?P=PHYS%202212>), PHYS 2213 (<https://coursecat.isu.edu/search/?P=PHYS%202213>), and PHYS 2214 (<https://coursecat.isu.edu/search/?P=PHYS%202214>) may be taken to fulfill the Physics requirement in the core curriculum.

## Electives

Students must take a minimum of **20** elective credits from the list below, with at least **8** credits in Biological Sciences (BIOL), **8** credits in Chemistry (CHEM), and **4** additional credits in either Biological Sciences (BIOL), Chemistry (CHEM), Mathematics (MATH), or Biomedical and Pharmaceutical Sciences (PSCI).

### Courses in Biological Sciences:

| Code              | Title                                                                                   | Credits |
|-------------------|-----------------------------------------------------------------------------------------|---------|
| BIOL 3301 & 3301L | Advanced Human Anatomy and Physiology 1 and Advanced Human Anatomy and Physiology 1 Lab | 4       |
| BIOL 3302 & 3302L | Advanced Human Anatomy and Physiology 2 and Advanced Human Anatomy and Physiology 2 Lab | 4       |
| BIOL 3303 & 3303L | Principles of Animal Physiology and Principles of Animal Physiology Lab                 | 4       |
| BIOL 3314 & 3314L | Comparative Vertebrate Anatomy and Comparative Vertebrate Anatomy Lab                   | 4       |
| BIOL 3324 & 3324L | Developmental Biology and Developmental Biology Lab                                     | 4       |
| BIOL 4404 & 4404L | Plant Physiology and Plant Physiology Lab                                               | 4       |
| BIOL 4417         | Organic Evolution                                                                       | 3       |
| BIOL 4433 & 4433L | Microbial Physiology and Microbial Physiology Laboratory                                | 4       |
| BIOL 4434 & 4434L | Microbial Diversity and Microbial Diversity Lab                                         | 4       |
| BIOL 4436         | Food Microbiology                                                                       | 3       |
| BIOL 4443         | Endocrinology                                                                           | 3       |
| BIOL 4449         | Human Physiology I                                                                      | 4       |
| BIOL 4451 & 4451L | Immunology and Immunology Laboratory                                                    | 4       |
| BIOL 4453         | Foundations in Neuroscience                                                             | 3       |
| BIOL 4455 & 4455L | Pathogenic Microbiology and Pathogenic Microbiology Laboratory                          | 4       |
| BIOL 4456         | Human Physiology II                                                                     | 4       |
| BIOL 4461         | Microbial Genetics                                                                      | 3       |

|                       |                                                                                   |       |
|-----------------------|-----------------------------------------------------------------------------------|-------|
| BIOL 4473 & 4473L     | Applied and Environmental Microbiology and Applied Environmental Microbiology Lab | 4     |
| BIOL 4475             | General Virology                                                                  | 3     |
| BIOL 4481 & BIOL 4482 | Independent Problems and Independent Problems                                     | max 2 |
| BIOL 4489             | Field Ecology                                                                     | 4     |

### Courses in Chemistry:

| Code                  | Title                                                                   | Credits |
|-----------------------|-------------------------------------------------------------------------|---------|
| CHEM 2211             | Inorganic Chemistry I                                                   | 3       |
| CHEM 2213             | Inorganic Chemistry I Laboratory                                        | 1       |
| CHEM 3311 & CHEM 3312 | Introduction to Research and Introduction to Research                   | max 2   |
| CHEM 3331 & CHEM 3334 | Instrumental Analysis and Instrumental Analysis Laboratory              | 4       |
| CHEM 4465 & CHEM 4466 | Synthetic Methods and Synthetic Methods Laboratory                      | 4       |
| CHEM 4407             | Inorganic Chemistry II                                                  | 2       |
| CHEM 4433 & CHEM 4437 | Environmental Chemistry and Environmental Chemistry Laboratory          | 3       |
| CHEM 4451             | Physical Chemistry Laboratory I                                         | 1       |
| CHEM 4452             | Physical Chemistry Laboratory II                                        | 1       |
| CHEM 4481 & CHEM 4482 | Independent Problems in Chemistry and Independent Problems in Chemistry | max 2   |
| CHEM 4485             | Senior Research                                                         | max 1   |
| CHEM 4491             | Seminar                                                                 | 1       |

### Courses in Mathematics:

| Code      | Title                  | Credits |
|-----------|------------------------|---------|
| MATH 2240 | Linear Algebra         | 3       |
| MATH 2275 | Calculus III           | 4       |
| MATH 3360 | Differential Equations | 3       |

### Courses in Biomedical and Pharmaceutical Sciences:

| Code      | Title                                              | Credits |
|-----------|----------------------------------------------------|---------|
| PSCI 2205 | Drugs in Society                                   | 2       |
| PSCI 3301 | Introduction to Pharmacology                       | 3       |
| PSCI 3308 | Drug Discovery                                     | 2       |
| PSCI 3353 | Introduction to Methods in Pharmaceutical Sciences | 2       |
| PSCI 4407 | Pharmacogenomics                                   | 2       |
| PSCI 4408 | Medicinal Chemistry                                | 3       |
| PSCI 4440 | Fundamentals of Nanoscience                        | 3       |

<sup>1</sup> Prerequisites include CHEM 2211 (<https://coursecat.isu.edu/search/?P=CHEM%202211>), CHEM 2213 (<https://coursecat.isu.edu/search/?P=CHEM%202213>), and CHEM 3351 (<https://coursecat.isu.edu/search/?P=CHEM%203351>).

<sup>2</sup> Corequisite is CHEM 3351 (<https://coursecat.isu.edu/search/?P=CHEM%203351>).

<sup>3</sup> Corequisite is CHEM 3352 (<https://coursecat.isu.edu/search/?P=CHEM%203352>).

### Degree Totals

| Code                 | Title                                                            | Credits    |
|----------------------|------------------------------------------------------------------|------------|
|                      | Program Admission Requirements                                   | 0          |
|                      | General Education                                                | 40         |
|                      | Major Requirements (Required General Education credits removed.) | 67         |
|                      | Upper Division Free Electives                                    | 0          |
|                      | Free Electives                                                   | 13         |
| <b>Total Credits</b> |                                                                  | <b>120</b> |

ISU Degree Requirements (<http://coursecat.isu.edu/undergraduate/degreerequirements/>)

ISU General Education (<http://coursecat.isu.edu/undergraduate/academicinformation/generaleducation/>)

Major Academic Plan (MAP) (<https://www.isu.edu/advising/maps/>)