BIOCHEMISTRY, BA

Email Department Coordinator

Degree: Bachelor of Arts (BA)
Major: Biochemistry

Program Overview
Biochemistry is a central discipline in the biomedical sciences. It provides the molecular approach that is one of the foundations of modern biology. The Biochemistry Department offers majors leading to BA and BS degrees. Both majors permit students to follow many options after graduation. Graduates are well prepared for further studies in the biomedical sciences, for degrees in the health sciences (MD, DO, DDS, PharmD), for employment in the chemical, pharmaceutical, and biotechnology industries, or as research assistants in research laboratories.

Both the BA and BS programs require courses in biochemistry, math, chemistry, biology, and physics. The BA in Biochemistry major makes a considerable amount of elective time available, which allows students to concentrate on biochemistry more intensively than the curriculum requires, or earn minors in other science or liberal arts subjects.

Research in faculty laboratories is required and is a strength of the major. At least six credits of laboratory research (BIOC 391 Research Project) are highly recommended. Students present their research during their last semester (BIOC 393 Senior Capstone Experience) as a written thesis and a presentation at the Biochemistry Undergraduate Retreat.

Undergraduate Policies
For undergraduate policies and procedures, please review the Office of Undergraduate Studies section of the General Bulletin.

Accelerated Master's Programs
Undergraduate students may participate in accelerated programs toward graduate or professional degrees. For more information and details of the policies and procedures related to accelerated studies, please visit the Office of Undergraduate Studies section of the General Bulletin.

Program Requirements
Students seeking to complete this major and degree program must meet the general requirements for bachelor's degrees and the general requirements of the College of Arts and Sciences. Students completing this program as a secondary major while completing another undergraduate degree program do not need to satisfy the latter set of requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 307</td>
<td>Introduction to Biochemistry: From Molecules To Medical Science</td>
<td>4</td>
</tr>
<tr>
<td>BIOC 308</td>
<td>Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOC 373</td>
<td>Biochemistry SAGES Seminar (SAGES Departmental Seminar)</td>
<td>3</td>
</tr>
</tbody>
</table>

Biochemistry elective:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 312</td>
<td>Proteins and Enzymes</td>
<td>3</td>
</tr>
<tr>
<td>or BIOC 334</td>
<td>Structural Biology</td>
<td></td>
</tr>
</tbody>
</table>

Two approved technical electives in biochemistry 6

BIOC 393 | Senior Capstone Experience | 3     |

Additional Required Courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 214 &amp; 214L</td>
<td>Genes, Evolution and Ecology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 215 &amp; 215L</td>
<td>Cells and Proteins Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 105 or CHEM 111</td>
<td>Principles of Chemistry I</td>
<td>3-4</td>
</tr>
<tr>
<td>or ENGR 145</td>
<td>Chemistry of Materials</td>
<td></td>
</tr>
<tr>
<td>CHEM 106 or CHEM 111</td>
<td>Principles of Chemistry II</td>
<td>3-4</td>
</tr>
<tr>
<td>CHEM 113</td>
<td>Principles of Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 223 or CHEM 323</td>
<td>Introductory Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 224 or CHEM 324</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 233</td>
<td>Introductory Organic Chemistry Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 234</td>
<td>Introductory Organic Chemistry Laboratory II</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 301</td>
<td>Introductory Physical Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 125 or MATH 121</td>
<td>Math and Calculus Applications for Life, Managerial, and Social Sci I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 126 or MATH 122</td>
<td>Math and Calculus Applications for Life, Managerial, and Social Sci II</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 124</td>
<td>Calculus II</td>
<td></td>
</tr>
<tr>
<td>PHYS 115 or PHYS 121</td>
<td>Introductory Physics I</td>
<td>4</td>
</tr>
<tr>
<td>or PHYS 123</td>
<td>General Physics I - Mechanics</td>
<td></td>
</tr>
<tr>
<td>or PHYS 116</td>
<td>Introductory Physics II</td>
<td>4</td>
</tr>
<tr>
<td>or PHYS 122</td>
<td>General Physics II - Electricity and Magnetism</td>
<td>4</td>
</tr>
<tr>
<td>or PHYS 124</td>
<td>Physics and Frontiers II - Electricity and Magnetism</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours 66-68

Departmental Honors
Biochemistry majors who have excellent academic records may be awarded Biochemistry Undergraduate Honors. To graduate with departmental honors in biochemistry, a student must satisfy the following requirements:

a. A grade point average of at least 3.6

b. A minimum of 6 credit hours of undergraduate research (BIOC 391) in one laboratory

c. A BIOC 393 capstone report approved by the Undergraduate Education Committee of the department on the basis of the quality of the research, the written report, and an oral presentation. An acceptable report:

i. Should follow a standard journal format

ii. Should demonstrate the student's understanding of the research area, experimental techniques, goals and implications of the project
iii. Should show that the student has advanced his/her knowledge of the applicable techniques and the underlying scientific concepts.

d. Using all or part of the capstone research, the student must be a co-author on a manuscript either submitted, in press, or published in a peer reviewed journal.

**Sample Plan of Study**

**First Year**

**Fall**

- MATH 125 or MATH 121: Math and Calculus Applications for Life, Managerial, and Social Sci I or Calculus for Science and Engineering I (4 hours)
- CHEM 105 or CHEM 111: Principles of Chemistry I or Principles of Chemistry for Engineers (3 hours)
- PHED 100: Independent Activity (0 hours)
- SAGES First Seminar (4 hours)
- BIOL 214 or BIOL 214L: Genes, Evolution and Ecology or Genes, Evolution and Ecology Lab (4 hours)

**Hours**: 15

**Spring**

Select one of the following:

- MATH 126: Math and Calculus Applications for Life, Managerial, and Social Sci II (4 hours)
- MATH 121: Calculus for Science and Engineering I
- MATH 124: Calculus II
- CHEM 106 or ENGR 145: Principles of Chemistry II or Chemistry of Materials (3 hours)
- CHEM 113: Principles of Chemistry Laboratory II (2 hours)
- SAGES University Seminar I (3 hours)
- BIOL 215 or BIOL 215L: Cells and Proteins or Cells and Proteins Laboratory (4 hours)
- PHED 100: Independent Activity (0 hours)

**Hours**: 16

**Second Year**

**Fall**

- CHEM 223 or CHEM 323: Introductory Organic Chemistry I or Organic Chemistry I (3 hours)
- CHEM 233: Introductory Organic Chemistry Laboratory I (2 hours)

Select one of the following:

- PHYS 115: Introductory Physics I
- PHYS 121: General Physics I - Mechanics
- PHYS 123: Physics and Frontiers I - Mechanics

- GER Course (3 hours)
- SAGES University Seminar II (3 hours)

**Hours**: 15

**Spring**

- CHEM 224 or CHEM 324: Introductory Organic Chemistry II or Organic Chemistry II (3 hours)
- CHEM 234: Introductory Organic Chemistry Laboratory II (2 hours)

Select one of the following:

- PHYS 116: Introductory Physics II
- PHYS 122: General Physics II - Electricity and Magnetism
- PHYS 124: Physics and Frontiers II - Electricity and Magnetism
- GER Course (3 hours)
- Elective (3 hours)

**Third Year**

**Fall**

- CHEM 301 or CHEM 335: Introductory Physical Chemistry I or Physical Chemistry I (3 hours)
- BIOC 307: Introduction to Biochemistry: From Molecules To Medical Science (4 hours)
- GER Course (3 hours)
- Electives (6 hours)

**Hours**: 16

**Spring**

- BIOC 308: Molecular Biology (4 hours)
- Approved Technical Elective (3 hours)
- BIOC 391: Research Project (3 hours)
- Electives or GER Courses (6 hours)

**Hours**: 15

**Fourth Year**

**Fall**

- BIOC 373: Biochemistry SAGES Seminar (3 hours)
- BIOC 391: Research Project (3 hours)
- Electives (6 hours)
- BIOC 312: Proteins and Enzymes (or Approved Technical Electives) c (3 hours)

**Hours**: 15

**Spring**

- BIOC 393: Senior Capstone Experience (3 hours)
- BIOC 334: Structural Biology (or Approved Biochem or Technical Elective) c (3 hours)

**Electives**: 6-9

**Hours**: 12-15

**Total Hours**: 120-123

Note: At least 3 credits of undergraduate research, BIOC 391, is recommended for the Capstone. An additional 3 credits of BIOC 391 is highly recommended. Students should consult their academic advisers about the elective parts of the curriculum. A course in statistics or quantitative biology is suggested but not required.

a. Selected students may be invited to take CHEM 323 Organic Chemistry I or CHEM 324 Organic Chemistry II

b. Selected students may be invited to take PHYS 123 Physics and Frontiers I - Mechanics and PHYS 124 Physics and Frontiers II - Electricity and Magnetism in place of PHYS 121 General Physics I - Mechanics and PHYS 122 General Physics II - Electricity and Magnetism

c. BA students must take either BIOC 312 or BIOC 334. For BA students who take both courses, one course will serve as a technical elective.