The department of Biochemistry, Biophysics & Molecular Biology (http://www.bbmb.iastate.edu) offers majors in biochemistry or biophysics in the College of Liberal Arts and Sciences and a major in agricultural biochemistry in the College of Agriculture and Life Sciences.

Biochemists and biophysicists seek to understand life processes in terms of chemical and physical principles. They conduct research in the frontiers of biology such as metabolic networking; structure and function of enzymes, membranes, and hormones; computational approaches; genomic and proteomic technology; protein engineering; plant biotechnology; muscle structure and function; and the design and evaluation of drugs for the treatment of disease. Biochemistry, biophysics and molecular biology provide the basis for much of modern biotechnology. Graduates have opportunities in industry, especially the biotechnology sector, in universities, veterinary and medical schools, and government laboratories. Students who meet the necessary high scholastic standards have the opportunity to continue their education to pursue advanced degrees in graduate school, medicine, pharmacy or veterinary medicine.

Graduates of biochemistry, agricultural biochemistry and biophysics understand the chemical principles of biological systems including molecular biology. They have developed laboratory expertise in modern biochemical techniques, including the ability to analyze data and prepare scientific reports. Most have participated in undergraduate research and have developed the skills necessary for both written and oral presentations at a level that will serve the student both within the university and in postgraduate professional life. Graduates have the experience of interacting with persons of different disciplines and cultures. Students have the training in biological and physical science and mathematics to solve problems of broad scope in biological, biomedical and environmental sciences and to provide leadership in diverse scientific and technological arenas.

A program that combines a bachelor of science and masters of science in biochemistry or biophysics is offered.

Biochemistry or Biophysics Majors in the College of Liberal Arts and Sciences

For the undergraduate curriculum leading to the degree bachelor of science, see College of Agriculture, Agricultural biochemistry.

Biochemistry and biophysics are recommended to students whose career interests involve advanced graduate or medical study or employment in biochemistry or biophysics, or in related areas of the biological or medical sciences.

Biochemistry undergraduate major program of study
Total Degree Requirement: 120 cr.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBMB 101</td>
<td>Introduction to Biochemistry</td>
<td>1</td>
</tr>
<tr>
<td>BBMB 102</td>
<td>Introduction to Biochemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>BBMB 201</td>
<td>Chemical Principles in Biological Systems</td>
<td>2</td>
</tr>
<tr>
<td>BBMB 404</td>
<td>Biochemistry I</td>
<td>3</td>
</tr>
<tr>
<td>or (4 credits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BBMB 504</td>
<td>Amino Acids and Proteins</td>
<td></td>
</tr>
<tr>
<td>BBMB 505</td>
<td>Bioenergetics and Metabolism</td>
<td></td>
</tr>
<tr>
<td>BBMB 405</td>
<td>Biochemistry II</td>
<td>3</td>
</tr>
<tr>
<td>or (4 credits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BBMB 506</td>
<td>Membrane Biochemistry</td>
<td></td>
</tr>
<tr>
<td>BBMB 507</td>
<td>Biochemistry of Nucleic Acids</td>
<td></td>
</tr>
<tr>
<td>BBMB 411</td>
<td>Techniques in Biochemical Research</td>
<td>4</td>
</tr>
<tr>
<td>BBMB 461</td>
<td>Molecular Biophysics</td>
<td>2</td>
</tr>
<tr>
<td>or BBMB 561</td>
<td>Molecular Biophysics</td>
<td></td>
</tr>
<tr>
<td>BBMB 561L</td>
<td>Laboratory in Molecular Biophysics</td>
<td>2-3</td>
</tr>
<tr>
<td>or CHEM 322L</td>
<td>Laboratory in Physical Chemistry</td>
<td></td>
</tr>
<tr>
<td>BBMB 490</td>
<td>Independent Study (Not required)</td>
<td>1-3</td>
</tr>
<tr>
<td>BBMB 499</td>
<td>Undergraduate Research (Not required but strongly encouraged)</td>
<td>1-5</td>
</tr>
</tbody>
</table>

Take one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 201</td>
<td>Advanced General Chemistry</td>
<td></td>
</tr>
<tr>
<td>or CHEM 17:General Chemistry I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 17:8 and General Chemistry II</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Take one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 201L</td>
<td>Laboratory in Advanced General Chemistry</td>
<td></td>
</tr>
<tr>
<td>or CHEM 17:Laboratory in General Chemistry I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or CHEM 17:Laboratory in General Chemistry I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 211</td>
<td>Quantitative and Environmental Analysis and Quantitative and Environmental Analysis Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>&amp; 211L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 324</td>
<td>Introductory Quantum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 325</td>
<td>Chemical Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 331</td>
<td>Organic Chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>&amp; CHEM 332</td>
<td>and Organic Chemistry II</td>
<td></td>
</tr>
<tr>
<td>CHEM 333L</td>
<td>Laboratory in Organic Chemistry I (for Chemistry and Biochemistry Majors)</td>
<td>1-2</td>
</tr>
<tr>
<td>or CHEM 331L</td>
<td>Laboratory in Organic Chemistry I</td>
<td></td>
</tr>
<tr>
<td>CHEM 334L</td>
<td>Laboratory in Organic Chemistry II (for Chemistry and Biochemistry Majors)</td>
<td>1-2</td>
</tr>
<tr>
<td>or CHEM 332L</td>
<td>Laboratory in Organic Chemistry II</td>
<td></td>
</tr>
<tr>
<td>MATH 165</td>
<td>Calculus I</td>
<td>4</td>
</tr>
</tbody>
</table>
### Biochemistry and Biophysics

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 166</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 265</td>
<td>Calculus III</td>
<td>3-4</td>
</tr>
<tr>
<td>or MATH 266</td>
<td>Elementary Differential Equations</td>
<td></td>
</tr>
<tr>
<td>or MATH 267</td>
<td>Elementary Differential Equations and Laplace Transforms</td>
<td></td>
</tr>
<tr>
<td>PHYS 221</td>
<td>Introduction to Classical Physics I</td>
<td>6</td>
</tr>
<tr>
<td>&amp; PHYS 222</td>
<td>and Introduction to Classical Physics II</td>
<td></td>
</tr>
<tr>
<td>BIOL 211</td>
<td>Principles of Biology I</td>
<td>6</td>
</tr>
<tr>
<td>&amp; BIOL 212</td>
<td>Principles of Biology II</td>
<td></td>
</tr>
<tr>
<td>BIOL 211L</td>
<td>Principles of Biology Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>or BIOL 212L</td>
<td>Principles of Biology Laboratory II</td>
<td></td>
</tr>
<tr>
<td>or BIOL 313L</td>
<td>Genetics Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIOL 313</td>
<td>Principles of Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 314</td>
<td>Principles of Molecular Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>Biological Science electives</td>
<td>from Biochemistry, Biology, Chemistry, Genetics, Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>Total Credits</td>
<td></td>
<td>81-93</td>
</tr>
</tbody>
</table>

### Communication Proficiency: A grade of C or better is required in ENGL 250. For students fulfilling the upper-level requirement with BBMB 411, a grade of 80% or better must be earned on two journal-style written reports.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIB 160</td>
<td>Information Literacy</td>
<td>1</td>
</tr>
<tr>
<td>ENGL 150</td>
<td>Critical Thinking and Communication</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 250</td>
<td>Written, Oral, Visual, and Electronic Composition</td>
<td>3</td>
</tr>
<tr>
<td>One course from the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BBMB 411</td>
<td>Techniques in Biochemical Research</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 305</td>
<td>Creative Writing: Nonfiction</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 309</td>
<td>Proposal and Report Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 314</td>
<td>Technical Communication</td>
<td>3</td>
</tr>
<tr>
<td>Total Credits</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### General Education Area

<table>
<thead>
<tr>
<th>Area</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts and Humanities</td>
<td>12</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>9</td>
</tr>
<tr>
<td>International Perspectives</td>
<td>3</td>
</tr>
<tr>
<td>U.S. Diversity</td>
<td>3</td>
</tr>
</tbody>
</table>

### Biophysics undergraduate major program of study

**Total Degree Requirement: 120 cr,**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBMB 101</td>
<td>Introduction to Biochemistry</td>
<td>1</td>
</tr>
<tr>
<td>BBMB 102</td>
<td>Introduction to Biochemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>BBMB 201</td>
<td>Chemical Principles in Biological Systems</td>
<td>2</td>
</tr>
<tr>
<td>BBMB 404</td>
<td>Biochemistry I</td>
<td>3</td>
</tr>
<tr>
<td>or BBMB 420</td>
<td>Mammalian Biochemistry</td>
<td></td>
</tr>
<tr>
<td>BBMB 411</td>
<td>Techniques in Biochemical Research</td>
<td>4</td>
</tr>
<tr>
<td>BBMB 461</td>
<td>Molecular Biophysics</td>
<td>2</td>
</tr>
<tr>
<td>or BBMB 561</td>
<td>Molecular Biophysics</td>
<td></td>
</tr>
<tr>
<td>BBMB 561L</td>
<td>Laboratory in Molecular Biophysics</td>
<td>2-3</td>
</tr>
<tr>
<td>or CHEM 322L</td>
<td>Laboratory in Physical Chemistry</td>
<td></td>
</tr>
</tbody>
</table>

One course from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 201</td>
<td>Advanced General Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHEM 177</td>
<td>General Chemistry I</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 178</td>
<td>and General Chemistry II</td>
<td></td>
</tr>
<tr>
<td>CHEM 201L</td>
<td>Laboratory in Advanced General Chemistry</td>
<td>1</td>
</tr>
<tr>
<td>or CHEM 177N</td>
<td>Laboratory in General Chemistry I</td>
<td></td>
</tr>
<tr>
<td>or CHEM 177L</td>
<td>Laboratory in General Chemistry I</td>
<td></td>
</tr>
<tr>
<td>CHEM 321</td>
<td>Quantitative and Environmental Analysis</td>
<td>4</td>
</tr>
<tr>
<td>&amp; 211L</td>
<td>and Quantitative and Environmental Analysis Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 324</td>
<td>Introductory Quantum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 325</td>
<td>Chemical Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 331</td>
<td>Organic Chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>&amp; CHEM 332</td>
<td>and Organic Chemistry II</td>
<td></td>
</tr>
<tr>
<td>MATH 165</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 166</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 265</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 266</td>
<td>Elementary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 207</td>
<td>Matrices and Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>&amp; MATH 317</td>
<td>Theory of Linear Algebra</td>
<td></td>
</tr>
<tr>
<td>PHYS 221</td>
<td>Introduction to Classical Physics I</td>
<td>6</td>
</tr>
<tr>
<td>&amp; PHYS 222</td>
<td>and Introduction to Classical Physics II</td>
<td></td>
</tr>
</tbody>
</table>

One course from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 481</td>
<td>Numerical Methods for Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>STAT 407</td>
<td>Methods of Multivariate Analysis</td>
<td></td>
</tr>
<tr>
<td>STAT 430</td>
<td>Empirical Methods for the Computational Sciences</td>
<td></td>
</tr>
<tr>
<td>COM S 207</td>
<td>Fundamentals of Computer Programming</td>
<td>3</td>
</tr>
<tr>
<td>STAT 305</td>
<td>Engineering Statistics</td>
<td>3-4</td>
</tr>
<tr>
<td>or STAT 231</td>
<td>Probability and Statistical Inference for Engineers</td>
<td></td>
</tr>
<tr>
<td>BIOL 211</td>
<td>Principles of Biology I</td>
<td>6</td>
</tr>
<tr>
<td>&amp; BIOL 212</td>
<td>Principles of Biology II</td>
<td></td>
</tr>
<tr>
<td>BIOL 211L</td>
<td>Principles of Biology Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>or BIOL 212L</td>
<td>Principles of Biology Laboratory II</td>
<td></td>
</tr>
</tbody>
</table>

Additional 300+ or higher level courses in biochemistry, biophysics, biological sciences, chemistry or physics.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Credits</td>
<td></td>
<td>85-89</td>
</tr>
</tbody>
</table>
Communication Proficiency: A grade of C or better is required in ENGL 250. For students fulfilling the upper-level requirement with BBMB 411, a grade of 80% or better must be earned on two journal-style written reports.

LIB 160 Information Literacy 1
ENGL 150 Critical Thinking and Communication 3
ENGL 250 Written, Oral, Visual, and Electronic Composition 3
One course from the following:
BBMB 411 Techniques in Biochemical Research 4
ENGL 305 Creative Writing: Nonfiction 3
ENGL 309 Proposal and Report Writing 3
ENGL 314 Technical Communication 3

General Education Area
Arts and Humanities 12
Social Sciences 9
U.S. Diversity 3
International Perspectives 3

Biochemistry minor is offered in both the College of Liberal Arts and Sciences and Agriculture and Life Sciences
BBMB 404 Biochemistry I 3
BBMB 405 Biochemistry II 3
BBMB 411 Techniques in Biochemical Research 4
One course from the following: 2-3
BBMB 461 Molecular Biophysics (2 crs)
BBMB 561 Molecular Biophysics (2 crs)
CHEM 325 Chemical Thermodynamics
300+ level courses in BBMB or CHEM to 15 or total 3-4
Total Credits 15-17

These lists of courses should not be regarded as statements of fixed requirements or as complete outlines of the work necessary for the major. They are given solely for the convenience of students or advisers who wish to estimate the amount of basic study that may be needed.

See also the B.S./M.S. program under Graduate Study.

Biochemistry, B.S.

Freshman

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBMB 101</td>
<td>1 BBMB 102</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CHEM 201</td>
<td>5 CHEM 211</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CHEM 201L</td>
<td>1 CHEM 211L</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>MATH 165</td>
<td>4 MATH 166</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Sophomore

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 331</td>
<td>3 BBMB 201</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CHEM 331L or 333L</td>
<td>1-2 CHEM 332</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MATH 265 or 266</td>
<td>3-4 CHEM 332L or 334L</td>
<td>1-2</td>
<td></td>
</tr>
<tr>
<td>BIOL 212</td>
<td>3 PHYS 222</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>PHYS 221</td>
<td>5 ENGL 250</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Junior

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBMB 404</td>
<td>3 BBMB 405</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIOL 313</td>
<td>3 BIOL 314</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>LAS General Education</td>
<td>3 LAS General Education Requirement</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>LAS General Education</td>
<td>3 LAS General Education Requirement</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>LAS World Language</td>
<td>4 LAS World Language Requirement</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Senior

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBMB 411</td>
<td>4 BBMB 461</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CHEM 324</td>
<td>3 Biological Science Elective</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>LAS General Education</td>
<td>3 CHEM 325</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>LAS General Education</td>
<td>3 BBMB 561L</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>BBMB 499</td>
<td>var BBMB 499</td>
<td>var</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits: 116-119

* General Chemistry I and II (177, 177N or 177L and 178) are acceptable substitutes for CHEM 201 and 201L.
** ALEKS assessment determines math placement.
1 Communication Proficiency: A grade of C or better is required in ENGL 250. For students fulfilling the upper-level requirement with BBMB 411, a grade of 80% or better must be earned on two journal-style written reports.
Liberal Arts and Sciences (LAS) General Education requirements include:
12 cr. Arts and Humanities, 9 cr. Social Sciences and 11 cr. Natural Sciences (8 cr.) and Math (3 cr.). Students in all ISU majors must complete a 3 cr. course in U.S. Diversity and a 3 cr. course in International Perspectives. Discuss with your adviser how the two courses you select can be applied to address general education requirements. Check for a list of approved courses at: http://www.registrar.iastate.edu/courses/divip-guide.html

One Biology laboratory course is required. Choose BIOL 211L, 212L or 313L.

Students have the option of choosing the senior level biochemistry sequence for 6 credits (BBMB 404 and BBMB 405) or the graduate-level biochemistry sequence for 8 credits (BBMB 504, 505 and BBMB 506, 507).

Undergraduate study or research, BBMB 490 or 499, is recommended but not required. Credit value is variable.

Four credits of electives in Biological Sciences are required.

CHEM 322L may be taken as a substitute for BBMB 561L.

World Language Requirement: (www.las.iastate.edu/academics/learning_goals.shtml)

**Biophysics, B.S.**

**Freshman**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBMB 101</td>
<td>1</td>
<td>BBMB 102</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 201*</td>
<td></td>
<td>CHEM 211</td>
<td>2</td>
</tr>
<tr>
<td>or CHEM 177 and CHEM</td>
<td></td>
<td>CHEM 211L</td>
<td>2</td>
</tr>
<tr>
<td>178</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 201L or 177L*</td>
<td>1</td>
<td>MATH 166</td>
<td>4</td>
</tr>
<tr>
<td>MATH 165**</td>
<td></td>
<td>4 BIOL 211</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 150</td>
<td>3</td>
<td>BIOL 211L*</td>
<td>1</td>
</tr>
<tr>
<td>LIB 160†</td>
<td>1</td>
<td>COM S 207</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

**Sophomore**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 331</td>
<td>3</td>
<td>BBMB 201</td>
<td>2</td>
</tr>
<tr>
<td>MATH 265</td>
<td>4</td>
<td>CHEM 332</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 212</td>
<td>3</td>
<td>MATH 266</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 221</td>
<td>5</td>
<td>PHYS 222</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENGL 250†</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

**Junior**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBMB 404*</td>
<td>3</td>
<td>CHEM 325</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 324</td>
<td>3</td>
<td>BBMB 461</td>
<td>2</td>
</tr>
<tr>
<td>LAS World Language</td>
<td></td>
<td>BBMB 561L†</td>
<td>2</td>
</tr>
<tr>
<td>Requirement†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science Elective 6</td>
<td>3</td>
<td>MATH 317</td>
<td>4</td>
</tr>
<tr>
<td>LAS General Education</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirement2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAS World Language</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirement3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13</td>
<td></td>
<td>18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBMB 411†</td>
<td>4</td>
<td>Science Elective</td>
<td>3</td>
</tr>
<tr>
<td>Science Elective 300+</td>
<td>3</td>
<td>LAS General Educaton</td>
<td>3</td>
</tr>
<tr>
<td>Requirement2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAS General Education</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirement2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 231 or 305</td>
<td>4</td>
<td>LAS General Education</td>
<td>3</td>
</tr>
<tr>
<td>Requirement2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAS General Education</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BBMB 499§</td>
<td>var</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13</td>
<td></td>
<td>18</td>
</tr>
</tbody>
</table>

**Total Credits: 119**

* General Chemistry I and II (177, 177n or 177L and 178) are acceptable substitutes for CHEM 201 and 201L.
** ALEKS assessment determines math placement.
† Communication Proficiency: A grade of C or better is required in ENGL 250. For students fulfilling the upper-level requirement with BBMB 411, a grade of 80% or better must be earned on two journal-style written reports.
‡ Liberal Arts and Sciences (LAS) General Education Requirements include a minimum of: 12 cr. Arts and Humanities, 9 cr. Social Sciences and 11 cr Natural Sciences (8 cr.) and Math (3 cr.). Students in all ISU majors must complete a 3-cr. course in U.S. Diversity and a 3-cr. course in International Perspectives. Discuss with your adviser how the two courses you select can be applied to address general education requirements. Check for a list of approved courses at: http://www.registrar.iastate.edu/courses/divip-guide.html
§ One Biology laboratory course is required. Choose BIOL 211L or 212L.
Students have the option of choosing BBMB 405 or BBMB 420.
Undergraduate study or research, BBMB 490 or 499, is recommended but not required. Credit value is variable.
Seven additional science elective credits 300+: biochemistry, biophysics, biological sciences, chemistry or physics.
CHEM 322L can substitute for BBMB 561L.
World Language Requirement:  (www.las.iastate.edu/academics/learning_goals.shtml)

Graduate Study
The department offers work for the degrees master of science and doctor of philosophy with majors in biochemistry and biophysics and with interdepartmental majors in bioinformatics and computational biology, genetics and genomics, immunobiology, molecular, cellular, and developmental biology, neuroscience, plant biology, and toxicology. Minor work is offered to students taking major work in other departments.

Prerequisite to graduate work is a sound undergraduate background in biology, chemistry, mathematics, and physics.

All graduate students are required by the department to teach as part of their training for an advanced degree.

The department offers a B.S./M.S. program in biochemistry and biophysics that allows students to obtain both the B.S. and M.S. degrees in five years. The program is open to students in the College of Liberal Arts and Sciences and in the College of Agriculture and Life Sciences. Students interested in this program should contact the department office for details. Application for admission to the Graduate College should be made near the end of the junior undergraduate (third) year. Students would begin research for the M.S. thesis during the summer semester after their junior year and are eligible for research assistantships.