Biomedical Sciences, B.S.

Learning Outcomes
Graduates of the biomedical sciences program will achieve the following.

Foundational Knowledge: Comprehension of Fundamental Principles and Concepts in the Natural and Social Sciences
Graduates will be able to:
- integrate across the natural and social sciences;
- apply foundational knowledge and conceptual frameworks to biomedicine;
- recognize the consequences of evolutionary history in the understanding of human biology and disease; and
- evaluate new information reported in the news and/or in scientific publications against prior knowledge.

New Discovery: Scientific Reasoning and Experimental Process in Biomedicine
Graduates will be able to:
- perform basic laboratory procedures, including correct operation of devices;
- formulate questions about natural processes based on current knowledge;
- construct a hypothesis to guide experimental enquiry;
- design experiments, identifying variables of analysis and controls for error;
- consider appropriate strategies or technologies applicable to investigate a novel problem;
- collect, organize, summarize, and interpret data;
- analyze and evaluate experimental results to inform a hypothesis; and
- distinguish between necessary and sufficient causes.

Quantitative Skills: Mathematical Reasoning and Basic Numeracy Applied to Biomedicine
Graduates will be able to:
- perform essential mathematical operations such as unit conversions, dilutions, and molarity calculations;
- apply mathematical concepts and rules of probability to make predictions;
- select and apply appropriate statistical tests to determine significance of experimental results; and
- use mathematical and/or statistical expressions to evaluate hypotheses with experimental data.

Information Literacy: Acquisition, Analysis, and Summary of Published Biomedical Information
Graduates will be able to:
- locate and evaluate the relevance and credibility of information from electronic and print sources;
- navigate and obtain relevant information from public databases;
- recognize and appropriately cite sources of information;
- identify questions addressed and methodologies used; and
- assess findings reported and conclusions drawn in published scientific articles.

Communication Proficiency: Written and Oral Presentation of Biomedical Information
Graduates will be able to:
- write concise scientific reports based on findings or literature searches;
- construct visual presentations of results or findings from the scientific literature; and
- present findings or results from the literature orally with appropriate media.

Requirements
The Bachelor of Science with a major in biomedical sciences requires a minimum of 120 s.h., including at least 77-83 s.h. of work for the major. Students must maintain a g.p.a. of at least 2.00 in all courses for the major and in all UI courses for the major. They also must complete the College of Liberal Arts and Sciences GE CLAS Core.

The interdisciplinary major provides an excellent foundation for medical training and for research and/or practice in the chemical, genetic, cellular, and physiological bases of human disease. The curriculum includes required and elective coursework in biochemistry and molecular biology, biology, chemistry, health and human physiology, mathematics, microbiology and immunology, physics, psychology, sociology, and statistics. Students who wish to apply transfer credit toward the major should consult their departmental advisor.

The B.S. with a major in biomedical sciences requires the following coursework.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Courses</td>
<td>65-66</td>
<td></td>
</tr>
<tr>
<td>Elective Courses</td>
<td>12-17</td>
<td></td>
</tr>
<tr>
<td>Total Hours</td>
<td>77-83</td>
<td></td>
</tr>
</tbody>
</table>

Required Courses
Students complete the following coursework (65-66 s.h.).

Chemistry

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of these:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL:3120</td>
<td>Biochemistry and Molecular Biology I</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3130</td>
<td>Biochemistry and Molecular Biology II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM:1110</td>
<td>Principles of Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM:1120</td>
<td>Principles of Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM:2210</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM:2220</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
</tbody>
</table>
CHEM:2410  Organic Chemistry Laboratory  3

Life Sciences

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of these:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL:1411</td>
<td>Foundations of Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:2211</td>
<td>Genes, Genomes, and the Human Condition</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3373</td>
<td>Human Population Genetics and Variation</td>
<td>3</td>
</tr>
<tr>
<td>HHP:3500</td>
<td>Human Physiology</td>
<td>3</td>
</tr>
<tr>
<td>MICR:2157</td>
<td>General Microbiology Laboratory</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>(both courses should be taken in the same semester)</td>
<td></td>
</tr>
</tbody>
</table>

Mathematics

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>One of these:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH:1460</td>
<td>Calculus for the Biological Sciences</td>
<td>4</td>
</tr>
<tr>
<td>MATH:1550</td>
<td>Engineering Mathematics I: Single Variable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH:1850</td>
<td>Calculus I</td>
<td>4</td>
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</table>

Statistics

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT:3510</td>
<td>Biostatistics</td>
<td>3</td>
</tr>
</tbody>
</table>

Physics

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>One of these sequences:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS:1511-1512</td>
<td>College Physics I-II</td>
<td>8</td>
</tr>
<tr>
<td>PHYS:1611-1612</td>
<td>Introductory Physics I-II</td>
<td>8</td>
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</tbody>
</table>

Social Sciences

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of these:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSY:1001</td>
<td>Elementary Psychology</td>
<td>3</td>
</tr>
<tr>
<td>PSY:2130</td>
<td>Advanced Psychology for Pre-Medical Track</td>
<td>3</td>
</tr>
<tr>
<td>SOC:1010</td>
<td>Introduction to Sociology</td>
<td>3-4</td>
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</tbody>
</table>

Elective Courses

Students complete a total of 12-17 s.h. of elective coursework chosen from the following lists.

Lecture Courses

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two of these:</td>
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<td></td>
</tr>
<tr>
<td>BIOL:4241</td>
<td>Biophysical Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:2254</td>
<td>Endocrinology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:2723</td>
<td>Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:2753</td>
<td>Introduction to Neurobiology</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL:3233</td>
<td>Introduction to Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3343</td>
<td>Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:4213</td>
<td>Bioinformatics</td>
<td>2,4</td>
</tr>
<tr>
<td>MICR:3147</td>
<td>Immunology and Human Disease</td>
<td>3</td>
</tr>
<tr>
<td>MICR:3159</td>
<td>Bacteria and Human Disease</td>
<td>3</td>
</tr>
<tr>
<td>MICR:3168</td>
<td>Viruses and Human Disease</td>
<td>3</td>
</tr>
</tbody>
</table>

Investigative Lab

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>One of these:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL:3626</td>
<td>Cell Biology Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3656</td>
<td>Neurobiology Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3676</td>
<td>Evolution Lab</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3716</td>
<td>Genetics and Biotechnology Lab</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3736</td>
<td>Developmental Biology Lab</td>
<td>4</td>
</tr>
<tr>
<td>MICR:3165</td>
<td>Bacteria and Human Disease Laboratory and Discussion</td>
<td>3</td>
</tr>
</tbody>
</table>

Experiential Learning

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>One of these (4-6 s.h.):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL:4999</td>
<td>Honors Research in Biology</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Another approved honors research course</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>An additional &quot;Investigative Lab&quot; course from list above</td>
<td>4</td>
</tr>
</tbody>
</table>

Honors

Honors in the Major

Students majoring in biomedical sciences are encouraged to graduate with honors in the major.

Honor students in the major may enroll in courses with honors sections offered by the Department of Biology and by other departments and programs. They also are advised to participate in the Iowa Center for Research by Undergraduates (ICRU) and to apply for research scholarships.

Students who earn honors in the major must maintain a cumulative University of Iowa g.p.a. of at least 3.33, as required by the College of Liberal Arts and Sciences.

To graduate with honors, students additionally must fulfill the following requirements:

- complete the requirements for a major in biomedical sciences with a g.p.a. of at least 3.33 in all University of Iowa coursework in the major;
- complete 1 s.h. in BIOL:4898 Communicating Research;
- complete 2 s.h. in either BIOL:4998 Honors Seminar in Biology or an advanced biology seminar course;
- complete a minimum of 6 s.h. (taken over two or more semesters) in BIOL:4999 Honors Research in Biology or equivalent research credit approved by the program director;
- write a brief research proposal summarizing the background and goals of their proposed honors research;
- upon completion of their research, submit an acceptable honors thesis; and
- give an oral presentation of their research findings.
Biomedical sciences majors interested in graduating with honors in the major should contact the biomedical sciences honors advisor as early as possible, preferably during their sophomore or junior year, so that they may be matched with an appropriate lab. Contact the Department of Biology to learn more about honors in the major.

**University of Iowa Honors Program**

In addition to honors in the major, students have opportunities for honors study and activities through membership in the University of Iowa Honors Program. Visit Honors at Iowa to learn about the University’s honors program. Membership in the UI Honors Program is not required to earn honors in the biomedical sciences major.

**Career Advancement**

The Pomerantz Career Center offers multiple resources to help students find internships and jobs.

**Academic Plans**

**Four-Year Graduation Plan**

The following checkpoints list the minimum requirements students must complete by certain semesters in order to stay on the University’s Four-Year Graduation Plan. Courses in the major are those required to complete the major; they may be offered by departments other than the major department.


**Before the seventh semester begins:** BIOC:3120 Biochemistry and Molecular Biology I, BIOC:3130 Biochemistry and Molecular Biology II, CHEM:2410 Organic Chemistry Laboratory, MICR:2158 General Microbiology Laboratory, PHYS:1511 College Physics I, PHYS:1512 College Physics II, and HHP:3500 Human Physiology.

**During the eighth semester:** enrollment in all remaining coursework in the major, all remaining GE CLAS Core courses, and a sufficient number of semester hours to graduate.

**Sample Plan of Study**

Sample plans represent one way to complete a program of study. Actual course selection and sequence will vary and should be discussed with an academic advisor. For additional sample plans, see MyUI.

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**Biomedical Sciences, B.S.**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Any Semester</strong></td>
<td>Begin volunteering at a hospital or other healthcare facility in the first year or as early as possible.</td>
<td>0</td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM:1110</td>
<td>Principles of Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>SOC:1010</td>
<td>Introduction to Sociology</td>
<td>3</td>
</tr>
<tr>
<td>RHET:1030 or ENGL:1200</td>
<td>Rhetoric or The Interpretation of Literature</td>
<td>3 - 4</td>
</tr>
<tr>
<td>MATH:1460</td>
<td>Calculus for the Biological Sciences</td>
<td>4</td>
</tr>
<tr>
<td>CSI:1600</td>
<td>Success at Iowa</td>
<td>2</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL:1411</td>
<td>Foundations of Biology</td>
<td>4</td>
</tr>
<tr>
<td>CHEM:1120</td>
<td>Principles of Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>PSY:1001</td>
<td>Elementary Psychology</td>
<td>3</td>
</tr>
<tr>
<td>RHET:1030 or ENGL:1200</td>
<td>Rhetoric or The Interpretation of Literature</td>
<td>3 - 4</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>16-17</td>
</tr>
<tr>
<td><strong>Second Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Any Semester</strong></td>
<td>Shadow a doctor and learn more about the field of medicine in the second year. Start the search process for a research lab in the second year.</td>
<td></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MICR:2157</td>
<td>General Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>MICR:2158</td>
<td>General Microbiology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>PHYS:1511</td>
<td>College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM:2210</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>GE CLAS Core: World Languages First Level Proficiency or elective course</td>
<td>4 - 5</td>
<td></td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>14-15</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HHP:3500</td>
<td>Human Physiology</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:1512</td>
<td>College Physics II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM:2220</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>STAT:3510</td>
<td>Biostatistics</td>
<td>3</td>
</tr>
<tr>
<td>GE CLAS Core: World Languages Second Level Proficiency or elective course</td>
<td>4 - 5</td>
<td></td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>16-17</td>
</tr>
<tr>
<td><strong>Third Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Any Semester</strong></td>
<td>Students should request letters of reference for medical school applications in the third year.</td>
<td></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL:2211</td>
<td>Genes, Genomes, and the Human Condition</td>
<td>3</td>
</tr>
<tr>
<td>BIOC:3120</td>
<td>Biochemistry and Molecular Biology I</td>
<td>3</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>17-18</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Hours</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>CHEM:2410</td>
<td>Organic Chemistry Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>GE CLAS Core: Historical Perspectives f</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GE CLAS Core: World Languages Second Level</td>
<td>4 - 5</td>
<td></td>
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**Hours:** 16-17

**Spring**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL:3373</td>
<td>Human Population Genetics and Variation</td>
<td>3</td>
</tr>
<tr>
<td>BIOC:3130</td>
<td>Biochemistry and Molecular Biology II</td>
<td>3</td>
</tr>
<tr>
<td>PSY:2130</td>
<td>Advanced Psychology for Pre-Medical Track</td>
<td>3</td>
</tr>
<tr>
<td>GE CLAS Core: World Languages Fourth Level</td>
<td>4 - 5</td>
<td></td>
</tr>
<tr>
<td>Exam: Take MCAT in spring or summer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Hours:** 13-14

**Summer**

Admission Application: Apply to medical school

**Hours:** 0

**Fourth Year**

**Fall**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major: elective lecture I course g</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Major: experiential elective or elective course g, h</td>
<td>3 - 4</td>
<td></td>
</tr>
<tr>
<td>GE CLAS Core: International and Global Issues f</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GE CLAS Core: Diversity and Inclusion f</td>
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<td></td>
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</tbody>
</table>

**Hours:** 12-13

**Spring**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major: elective lecture II course g</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Major: investigative lab i</td>
<td>3 - 4</td>
<td></td>
</tr>
<tr>
<td>Major: experiential elective or elective course g, h</td>
<td>3 - 4</td>
<td></td>
</tr>
<tr>
<td>GE CLAS Core: Literary, Visual, and Performing Arts f</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GE CLAS Core: Values and Culture f</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall) j</td>
<td></td>
<td></td>
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</tbody>
</table>

**Hours:** 15-17

**Total Hours:** 119-128

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a  Fulfills a major requirement and may fulfill a GE requirement.
b  Enrollment in chemistry courses requires completion of a placement exam.
c  Enrollment in math courses requires completion of a placement exam.
d  MICR:2157 and MICR:2158 should be taken in the same semester.
e  Students who have completed four years of a single language in high school have satisfied the GE CLAS Core World Languages requirement. Enrollment in world languages courses requires a placement exam, unless enrolling in a first-semester-level course.
f  GE CLAS Core courses may be completed in any order unless used as a prerequisite for another course. Students should consult with an advisor about the best sequencing of courses.
g  Students complete a total of 12-17 s.h. of elective coursework from approved lists of courses.
h  Experiential elective is honors in the major or a second investigative lab course.
i  See General Catalog for list of approved courses.
j  Please see Academic Calendar, Office of the Registrar website for current degree application deadlines. Students should apply for a degree for the session in which all requirements will be met. For any questions on appropriate timing, contact your academic advisor or Graduation Services.