

# Microbiology, B.S.

Microbiology is an excellent major for undergraduate students who want a good general education with emphasis on an important and interesting branch of biological sciences.

## Requirements

The Bachelor of Science with a major in microbiology requires a minimum of 120 s.h., including 60–64 s.h. of work for the major, depending on the track. Students must maintain a grade-point average of at least 2.00 in all courses for the major and in all UI courses for the major. Courses for the major may not be taken pass/nonpass. Students also must complete the College of Liberal Arts and Sciences GE CLAS Core.

Students must complete at least 12 s.h. of the required 18–19 s.h. in Department of Microbiology and Immunology courses at the University of Iowa.

The major in microbiology can be pursued on either a pre-medicine or a scholar track.

Students in the pre-medicine track complete admission requirements for the Carver College of Medicine and for most colleges of medicine as an integral part of the completion of their major requirements. This track is recommended for pre-medical, pre-dental, and pre-pharmacy students.

Students in the scholar track pursue a curriculum with streamlined organic chemistry and physics requirements and expanded microbiology and immunology courses, including advanced laboratory and global health studies coursework. The scholar track is recommended for students interested in pursuing graduate training or in developing a career as a microbiologist.

Students may shift from one track to the other during their program of study.

The B.S. with a major in microbiology in the pre-medicine or the scholar track requires the following coursework.

## Pre-Medicine Track

Students in the pre-medicine track complete the following coursework.

Code	Title	Hours
Supporting Coursework		42-43
Microbiology and Immunology Courses		18
Advanced Elective Coursework		3
<b>Total Hours</b>		<b>63-64</b>

## Pre-Medicine Track: Supporting Coursework

Code	Title	Hours
All of these:		
BIOL:1411- BIOL:1412	Foundations of Biology - Diversity of Form and Function	8
BMB:3120 & BMB:3130	Biochemistry and Molecular Biology I-II	6
CHEM:1110 & CHEM:1120	Principles of Chemistry I-II	8

CHEM:2210 & CHEM:2220	Organic Chemistry I-II	6
CHEM:2410	Organic Chemistry Laboratory	3
One of these:		
BIOS:4120	Introduction to Biostatistics	3
MATH:1460	Calculus for the Biological Sciences	4
MATH:1550	Engineering Mathematics I: Single Variable Calculus	4
MATH:1850	Calculus I	4
STAT:3510/ IGPI:3510	Biostatistics	3
One of these sequences:		
PHYS:1511- PHYS:1512	College Physics I-II	8
PHYS:1611- PHYS:1612	Introductory Physics I-II	8

## Pre-Medicine Track: Microbiology and Immunology Courses

Students earn a minimum of 18 s.h. in Department of Microbiology and Immunology courses from the following.

Code	Title	Hours
MICR:2157	General Microbiology (required with a grade of C or higher)	3
MICR:2158	General Microbiology Laboratory (required with a grade of C or higher)	2
MICR:3145	Honors in Microbiology Thesis Preparation (required for honors in microbiology)	1

Additional microbiology and immunology courses (prefix MICR) numbered MICR:3147 or above, excluding MICR:3164; students select from the following:

MICR:3147	Immunology and Human Disease	3
MICR:3150	Eukaryotic Pathogens and Human Disease	2
MICR:3159	Bacteria and Human Disease	3
MICR:3165	Genetics of Bacterial Pathogens Lab and Discussion	3
MICR:3168	Viruses and Human Disease	3
MICR:3170	Microbial Genetics and Physiology	3
MICR:3177	Virology Discussion	2
MICR:3178	Virology Laboratory	2
MICR:4161	Undergraduate Research in Microbiology	arr.
MICR:4171	Honors Undergraduate Research in Microbiology	arr.
MICR:5218	Microscopy for Biomedical Research	arr.
MICR:5264	Directed Study in Microbiology	arr.

A maximum of 4 s.h. earned in either MICR:4161 Undergraduate Research in Microbiology or MICR:4171 Honors Undergraduate Research in Microbiology may be

counted toward the major. However, students earning honors in the major must complete 6 s.h. in MICR:4171 Honors Undergraduate Research in Microbiology; see Honors [p. 3] in this section of the catalog.

## Pre-Medicine Track: Advanced Elective Coursework

Code	Title	Hours
Up to 3 s.h. from these:		
BIOL:2723	Cell Biology	3
BIOL:3212/ IGPI:3212	Bioinformatics for Beginners	3
BIOL:3314/ IGPI:3314	Genomics	3
BIOL:4213/ GENE:4213/ IGPI:4213	Bioinformatics	2,4
BMB:3310/ CBIO:3310/ MMED:3310	Practical Data Science and Bioinformatics	3
CPH:2230	Finding Patient Zero: The Exploration of Infectious Disease Transmission and Pandemic Threats	3
GHS:2000/ ANTH:2103	Introduction to Global Health Studies	3
GHS:2320/ ANTH:2320	Origins of Human Infectious Disease	3
Additional microbiology and immunology course (prefix MICR) numbered MICR:3147 or above, excluding MICR:3164		3

## Scholar Track

Students in the scholar track complete the following coursework.

Code	Title	Hours
Supporting Coursework		35-36
Microbiology and Immunology Courses		19
Advanced Elective Coursework		6
<b>Total Hours</b>		<b>60-61</b>

## Scholar Track: Supporting Coursework

Code	Title	Hours
All of these:		
BIOL:1411- BIOL:1412	Foundations of Biology - Diversity of Form and Function	8
BMB:3120 & BMB:3130	Biochemistry and Molecular Biology I-II	6
CHEM:1110 & CHEM:1120	Principles of Chemistry I-II	8
CHEM:2210	Organic Chemistry I	3
PHYS:1400	Basic Physics	4
One of these:		
BIOS:4120	Introduction to Biostatistics	3
MATH:1460	Calculus for the Biological Sciences	4
MATH:1550	Engineering Mathematics I: Single Variable Calculus	4
MATH:1850	Calculus I	4

STAT:3510/ IGPI:3510	Biostatistics	3
One of these:		
GHS:2000/ ANTH:2103	Introduction to Global Health Studies	3
GHS:2320/ ANTH:2320	Origins of Human Infectious Disease	3
In addition, this course may be recommended for some students:		
CNW:2680	The Art and Craft of Creative Nonfiction	3

## Scholar Track: Microbiology and Immunology Courses

Students earn a minimum of 19 s.h. in Department of Microbiology and Immunology courses from the following.

Code	Title	Hours
MICR:2157	General Microbiology (required with a grade of C or higher)	3
MICR:2158	General Microbiology Laboratory (required with a grade of C or higher)	2
MICR:3145	Honors in Microbiology Thesis Preparation (required for honors in microbiology)	1
One of these:		
MICR:3165	Genetics of Bacterial Pathogens Lab and Discussion	3
MICR:3178	Virology Laboratory	2
MICR:4161	Undergraduate Research in Microbiology (must be taken for at least 2 s.h.)	arr.
MICR:4171	Honors Undergraduate Research in Microbiology (must be taken for at least 2 s.h.)	arr.

Additional microbiology and immunology courses (prefix MICR) numbered MICR:3147 or above, excluding MICR:3164; students select from the following:

MICR:3147	Immunology and Human Disease	3
MICR:3150	Eukaryotic Pathogens and Human Disease	2
MICR:3159	Bacteria and Human Disease	3
MICR:3165	Genetics of Bacterial Pathogens Lab and Discussion	3
MICR:3168	Viruses and Human Disease	3
MICR:3170	Microbial Genetics and Physiology	3
MICR:3177	Virology Discussion	2
MICR:3178	Virology Laboratory	2
MICR:4161	Undergraduate Research in Microbiology	arr.
MICR:4171	Honors Undergraduate Research in Microbiology	arr.
MICR:5218	Microscopy for Biomedical Research	arr.

MICR:5264	Directed Study in Microbiology	arr.
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A maximum of 4 s.h. earned in either MICR:4161 Undergraduate Research in Microbiology or MICR:4171 Honors Undergraduate Research in Microbiology may be counted toward the major. However, students earning honors in the major must complete 6 s.h. in MICR:4171 Honors Undergraduate Research in Microbiology; see Honors [p. 3] in this section of the catalog.

### Scholar Track: Advanced Elective Coursework

Code	Title	Hours
Up to 6 s.h. from these:		
BIOL:3172	Evolution	4
BIOL:3212/ IGPI:3212	Bioinformatics for Beginners	3
BIOL:3314/ IGPI:3314	Genomics	3
BIOL:4213/ GENE:4213/ IGPI:4213	Bioinformatics	2,4
BMB:3310/ CBIO:3310/ MMED:3310	Practical Data Science and Bioinformatics	3
PCOL:3101	Pharmacology I: A Drug's Fantastic Journey	3
Additional microbiology and immunology course (prefix MICR) numbered MICR:3147 or above, excluding MICR:3164		3
May include one of these:		
BIOL:2512	Fundamental Genetics	4
BIOL:2723	Cell Biology	3
CPH:2230	Finding Patient Zero: The Exploration of Infectious Disease Transmission and Pandemic Threats	3
GHS:2000/ ANTH:2103	Introduction to Global Health Studies (if not taken as supporting coursework option)	3
GHS:2320/ ANTH:2320	Origins of Human Infectious Disease (if not taken as supporting coursework option)	3

### Combined Programs

#### B.S./Ph.D. in Microbiology

Students majoring in microbiology who are interested in earning a doctoral degree may apply to the combined Bachelor of Science/Doctor of Philosophy in microbiology program. The combined program permits students to count 12 s.h. of credit toward both the B.S. and Ph.D. degree requirements before they have been granted the B.S. degree.

Separate application to each degree program is required. Applicants must be admitted to both programs before they may be admitted to the combined degree program. For more information, contact the Department of Microbiology and Immunology.

### Honors

#### Honors in the Major

Students majoring in microbiology (either track) have the opportunity to graduate with honors in the major. They must maintain a cumulative University of Iowa grade-point average (GPA) of at least 3.33 and a GPA of at least 3.33 in work for the major. To graduate with honors in the microbiology major, students must complete an additional 3 s.h. of coursework in microbiology and immunology beyond that required for the major. This must include 6 s.h. in MICR:4171 Honors Undergraduate Research in Microbiology that introduces them to experimental research. The final semester before graduation, students must complete MICR:3145 Honors in Microbiology Thesis Preparation, and must successfully present written and oral presentations of their research projects.

#### 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 microbiology major.

### Career Advancement

Graduates find employment opportunities in government, hospitals, public health laboratories, research laboratories, and industrial laboratories (food, dairy, chemical, pharmaceutical, and biotechnology companies). Those who pursue advanced degrees have more advanced career opportunities in these same areas, with greater responsibilities and higher salaries, as well as in college and university teaching.

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 third semester begins:** BIOL:1411 Foundations of Biology, CHEM:1110 Principles of Chemistry I, CHEM:1120 Principles of Chemistry II, and an approved calculus or biostatistics course.

**Before the fifth semester begins:** BIOL:1412 Diversity of Form and Function, CHEM:2210 Organic Chemistry I, MICR:2157 General Microbiology, and MICR:2158 General Microbiology Laboratory.

**Before the seventh semester begins:** seven more courses in the major and at least 90 s.h. earned toward the degree.

**Before the eighth semester begins:** another 10-12 s.h. of coursework.

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

## Sample Plans 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.

### Microbiology, B.S.

- Pre-Medicine Track [p. 4]
- Scholar Track [p. 5]

#### Pre-Medicine Track

Course	Title	Hours
<b>Academic Career</b>		
<b>Any Semester</b>		
GE CLAS Core: Sustainability <sup>a</sup>		
<b>Hours</b>		<b>0</b>
<b>First Year</b>		
<b>Fall</b>		
CHEM:1110	Principles of Chemistry I <sup>b, c</sup>	4
MATH:1460	Calculus for the Biological Sciences <sup>c, d, e</sup>	4
RHET:1030 or ENGL:1200	Rhetoric or The Interpretation of Literature	3 - 4
CSI:1600	Success at Iowa	2
Elective course <sup>f</sup>		1
<b>Hours</b>		<b>14-15</b>
<b>Spring</b>		
BIOL:1411	Foundations of Biology <sup>c, g</sup>	4
CHEM:1120	Principles of Chemistry II	4
RHET:1030 or ENGL:1200	Rhetoric or The Interpretation of Literature	3 - 4
GE CLAS Core: Diversity and Inclusion <sup>h</sup>		3
<b>Hours</b>		<b>14-15</b>
<b>Second Year</b>		
<b>Fall</b>		
BIOL:1412	Diversity of Form and Function	4
CHEM:2210	Organic Chemistry I	3
GE CLAS Core: Historical Perspectives <sup>h</sup>		3
GE CLAS Core: World Languages First Level Proficiency or elective course <sup>f, i</sup>		4 - 5
Elective course <sup>f</sup>		2
<b>Hours</b>		<b>16-17</b>
<b>Spring</b>		
MICR:2157	General Microbiology <sup>g</sup>	3
MICR:2158	General Microbiology Laboratory <sup>g</sup>	2
CHEM:2220	Organic Chemistry II	3
GE CLAS Core: International and Global Issues <sup>h</sup>		3
GE CLAS Core: World Languages Second Level Proficiency or elective course <sup>f, i</sup>		4 - 5
<b>Hours</b>		<b>15-16</b>

### Third Year

#### Fall

BMB:3120	Biochemistry and Molecular Biology I	3
CHEM:2410	Organic Chemistry Laboratory	3
PHYS:1511 or PHYS:1611	College Physics I or Introductory Physics I	4
GE CLAS Core: Values and Culture <sup>h</sup>		3
GE CLAS Core: World Languages Third Level Proficiency or elective course <sup>f, i</sup>		4 - 5
<b>Hours</b>		<b>17-18</b>

#### Spring

BMB:3130	Biochemistry and Molecular Biology II	3
PHYS:1512 or PHYS:1612	College Physics II or Introductory Physics II	4
Major: advanced elective course <sup>j</sup>		3
GE CLAS Core: Literary, Visual, and Performing Arts <sup>h</sup>		3
GE CLAS Core: World Languages Fourth Level Proficiency or elective course <sup>f, i</sup>		4 - 5
<b>Hours</b>		<b>17-18</b>

### Fourth Year

#### Fall

Major: advanced microbiology course <sup>k</sup>		3
Major: advanced microbiology course <sup>k</sup>		3
Major: optional research		1 - 3
GE CLAS Core: Social Sciences <sup>h</sup>		3
Elective course <sup>f</sup>		3
Elective course <sup>f</sup>		1
<b>Hours</b>		<b>14-16</b>

#### Spring

Major: advanced microbiology course <sup>k</sup>		3
Major: advanced microbiology course <sup>k</sup>		4
Major: optional research		1 - 3
Elective course <sup>f</sup>		3
Elective course <sup>f</sup>		3
Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall) <sup>l</sup>		
<b>Hours</b>		<b>14-16</b>
<b>Total Hours</b>		<b>121-131</b>

a Sustainability must be completed by choosing a course that has been approved for Sustainability AND for one of these General Education areas: Natural Sciences; Quantitative and Formal Reasoning; Social Sciences; Historical Perspectives; International and Global Issues; Literary, Visual, and Performing Arts; or Values and Culture.

b Enrollment in chemistry courses requires completion of a placement exam.

c Fulfills a major requirement and may fulfill a GE requirement.

d Other course options include BIOS:4120, MATH:1550, MATH:1850, STAT:3510; selecting a course that satisfies the Quantitative or Formal Reasoning GE requirement is recommended.

e Enrollment in math courses requires completion of a placement exam.

f Students may use elective courses to earn credit towards the total s.h. required for graduation or to complete a double major, minors, or certificates.

- g Students must earn a grade of C or higher in BIOL:1411, or in MICR:2157 and MICR:2158, in order to take more advanced Department of Microbiology and Immunology courses.
- h 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.
- i 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.
- j See the General Catalog for list of approved courses.
- k Complete at least 13 s.h. of advanced microbiology and immunology courses (prefix MICR) numbered MICR:3147 or above, excluding MICR:3164; see the General Catalog for list of approved courses.
- l 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.

## Scholar Track

Course	Title	Hours
<b>Academic Career</b>		
<b>Any Semester</b>		
GE CLAS Core: Sustainability <sup>a</sup>		
<b>Hours</b>		<b>0</b>
<b>First Year</b>		
<b>Fall</b>		
CHEM:1110	Principles of Chemistry I <sup>b, c</sup>	4
MATH:1460	Calculus for the Biological Sciences <sup>b, d, e</sup>	4
RHET:1030 or ENGL:1200	Rhetoric or The Interpretation of Literature	3 - 4
Elective course <sup>f</sup>		1
CSI:1600	Success at Iowa	2
<b>Hours</b>		<b>14-15</b>
<b>Spring</b>		
BIOL:1411	Foundations of Biology <sup>b, g</sup>	4
CHEM:1120	Principles of Chemistry II	4
ENGL:1200 or RHET:1030	The Interpretation of Literature or Rhetoric	3 - 4
GE CLAS Core: Diversity and Inclusion <sup>h</sup>		3
Elective course <sup>f</sup>		1
<b>Hours</b>		<b>15-16</b>
<b>Second Year</b>		
<b>Fall</b>		
BIOL:1412	Diversity of Form and Function	4
CHEM:2210	Organic Chemistry I	3
MICR:2157	General Microbiology <sup>g</sup>	3
MICR:2158	General Microbiology Laboratory <sup>g</sup>	2
GE CLAS Core: World Languages First Level Proficiency or elective course <sup>i</sup>		4 - 5
<b>Hours</b>		<b>16-17</b>
<b>Spring</b>		
PHYS:1400	Basic Physics	4

GE CLAS Core: Values and Culture <sup>h</sup>		3
GE CLAS Core: International and Global Issues <sup>h</sup>		3
GE CLAS Core: World Languages Second Level Proficiency or elective course <sup>i</sup>		4 - 5
Elective course <sup>f</sup>		2
<b>Hours</b>		<b>16-17</b>

### Third Year

<b>Fall</b>		
GHS:2320 or GHS:2000	Origins of Human Infectious Disease or Introduction to Global Health Studies	3
BMB:3120	Biochemistry and Molecular Biology I	3
Major: advanced microbiology course <sup>j</sup>		3
Major: advanced microbiology course <sup>j</sup>		3
GE CLAS Core: World Languages Third Level Proficiency or elective course <sup>i</sup>		4 - 5
<b>Hours</b>		<b>16-17</b>

### Spring

BMB:3130	Biochemistry and Molecular Biology II	3
Major: advanced elective course <sup>k</sup>		3
GE CLAS Core: Literary, Visual, and Performing Arts <sup>h</sup>		3
GE CLAS Core: World Languages Fourth Level Proficiency or elective course <sup>i</sup>		4 - 5
Elective course <sup>f</sup>		3
<b>Hours</b>		<b>16-17</b>

### Fourth Year

<b>Fall</b>		
Major: advanced elective course <sup>k</sup>		3
Major: advanced microbiology course <sup>j</sup>		4
Major: optional research		1 - 3
GE CLAS Core: Historical Perspectives <sup>h</sup>		3
Elective course <sup>f</sup>		2
<b>Hours</b>		<b>13-15</b>

### Spring

Major: advanced microbiology course <sup>j</sup>		4
Major: optional research		1 - 3
GE CLAS Core: Social Sciences <sup>h</sup>		3
Elective course <sup>f</sup>		3
Elective course <sup>f</sup>		3
Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall) <sup>l</sup>		
<b>Hours</b>		<b>14-16</b>
<b>Total Hours</b>		<b>120-130</b>

a Sustainability must be completed by choosing a course that has been approved for Sustainability AND for one of these General Education areas: Natural Sciences; Quantitative and Formal Reasoning; Social Sciences; Historical Perspectives; International and Global Issues; Literary, Visual, and Performing Arts; or Values and Culture.

b Fulfills a major requirement and may fulfill a GE requirement.

c Enrollment in chemistry courses requires completion of a placement exam.

d Other course options include BIOS:4120, MATH:1550, MATH:1850, STAT:3510; selecting a course that satisfies

- the Quantitative or Formal Reasoning GE requirement is recommended.
- e Enrollment in math courses requires completion of a placement exam.
  - f Students may use elective courses to earn credit towards the total s.h. required for graduation or to complete a double major, minors, or certificates.
  - g Students must earn a grade of C or higher in BIOL:1411, or in MICR:2157 and MICR:2158, in order to take more advanced Department of Microbiology and Immunology courses.
  - h 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.
  - i 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.
  - j Complete at least 14 s.h. of advanced microbiology and immunology courses (prefix MICR) numbered MICR:3147 or above, excluding MICR:3164; see the General Catalog for list of approved courses.
  - k See the General Catalog for list of approved courses.
  - l 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.