

# MICROBIOLOGY, BS (CALs)

The smallest living things – including bacteria, viruses, and yeast – may not be visible to the human eye, but they have big effects on health, food, medicine, energy, and the environment. These tiny organisms, called microbes, were the first life forms on Earth and continue to influence the planet in significant ways. Microbiomes – communities of microbes – are increasingly studied by researchers focusing on human health, global warming, infectious disease, environmental remediation, bioenergy, and much more.

The microbiology major prepares students for modern research in microbiology with a heavy emphasis on practical laboratory experiences. Students learn the cellular biology, genetics, ecology, evolution, and physiology of microbes. Through courses, students learn laboratory techniques – gaining the type of hands-on experiences with modern equipment that employers and graduate and professional schools seek. Additionally, students can conduct mentored and independent research projects in faculty laboratories where they will learn to critically evaluate scientific data, carry out laboratory experiments, and communicate scientific information.

Microbiology majors graduate prepared for careers in biotechnology, education, healthcare, information technology, and food safety. Many students pursue graduate and professional studies, including medical school, dental school, and biological sciences PhD programs.

## LEARN THROUGH HANDS-ON, REAL-WORLD EXPERIENCES

With so many microbiologists on the faculty, students have numerous opportunities to conduct research in faculty labs. As one of the largest research buildings on campus, students have access to state-of-the-art facilities and are able to conduct cutting-edge experiments using novel techniques that few other undergraduate programs allow. Through a senior-year capstone course, students conduct research under the direction of a professor or as part of class projects that have included culturing microbes from the gut of hibernating ground squirrels, comparing bacteria from the mouths of athletes and non-athletes, and culturing microbes found in deep sea vents. This kind of hands-on experience distinguishes microbiology majors from other graduates and enhances the real-world skills that are valued by post-secondary schools and employers.

## BUILD COMMUNITY AND NETWORKS

Through the Microbiology Club, students establish study groups, explore careers, and teach others on campus and in the community about microbiology. Through events like cheese, yogurt, and kombucha making, the club offers opportunities for community-building both within the program and with the broader university community. This student organization is the official American Society of Microbiology undergraduate chapter for the UW–Madison and provides annual travel and research awards to outstanding students.

## CUSTOMIZE A PATH OF STUDY

Core courses focus on the diversity, genetics, biochemistry, and physiology of microorganisms. A variety of elective courses provide the

opportunity to study environmental microbiology, food microbiology, microbial pathogenesis, immunology, virology, microbiomes, microbial biotechnology, and public health, as well as advanced topics in microbial genetics and physiology. Students may also pursue honors in microbiology.

## MAKE A STRONG START

All courses in the program, including entry-level courses, are taught by faculty who specialize in teaching microbiology.

## GAIN GLOBAL PERSPECTIVE

Majors can also choose from a variety of study abroad programs including short-term field experiences, summer research opportunities, and semester-long exchange programs at top universities around the world. A study abroad program in Thailand specifically tailored for microbiology majors is frequently offered and led by microbiology faculty from UW–Madison. Students can explore studying abroad as a microbiology major by utilizing the Microbiology Major Advising Page. Students work with their advisor and the CALS study abroad office to identify appropriate programs.

## HOW TO GET IN

### HOW TO GET IN

| Requirements               | Details  |
|----------------------------|--|
| How to get in              | No application required. All students who meet the requirements listed below are eligible to declare. For information on how to declare, visit Advising & Careers.   |
| Courses required to get in | None   |
| GPA requirements to get in | None   |
| Credits required to get in | Must have fewer than 86 credits.   |
| Other                      | Students who do not meet the requirements above or are not in good academic standing should schedule a meeting with CALS Dean on Call ( <a href="https://go.wisc.edu/g85h79">https://go.wisc.edu/g85h79</a> ) to discuss exceptions. |

## PROSPECTIVE UW-MADISON STUDENTS

All prospective UW–Madison students must apply through the Office of Admissions and Recruitment (<https://www.admissions.wisc.edu/>).

Students interested in this major should select it as the first choice major on their UW–Madison application. Admitted students who enroll at UW–Madison and attend Student Orientation, Advising, and Registration (SOAR) with the College of Agricultural and Life Sciences have the option to declare this major at SOAR.

## REQUIREMENTS

### UNIVERSITY REQUIREMENTS

All undergraduate students must complete both the following Core General Education (Core GenEd) and University Degree and Quality of Work requirements. The requirements below apply to students whose

first term at UW-Madison or whose earliest post-high school college attendance at any institution is Summer 2026 or later.

Students whose first term at UW-Madison or whose earliest post-high school college attendance at any institution occurred before Summer 2026 should refer to the archived Guide (<https://guide.wisc.edu/archive/>) for the requirements that apply to them.

## CORE GENERAL EDUCATION (CORE GENED) REQUIREMENTS

Civics & Perspectives 3 credits of Civics & Perspectives coursework.

Communication & Literacy 6 credits of Communication & Literacy coursework. This requirement may be partially satisfied by a qualifying placement test score. More information: <https://go.wisc.edu/qualifyingenglishplacement> (<https://go.wisc.edu/qualifyingenglishplacement/>)

Humanities & Arts 6 credits of Humanities & Arts coursework.

Mathematics & Quantitative Reasoning 6 credits of Mathematics & Quantitative Reasoning coursework. This requirement may be partially satisfied by a qualifying placement test score. More information: <https://go.wisc.edu/qualifyingmathplacement> (<https://go.wisc.edu/qualifyingmathplacement/>)

Natural Science & Wellness Complete both:
 

- 6 credits of Natural Science & Wellness or Natural Science & Wellness + Laboratory coursework.
- one course must be in Natural Science & Wellness + Laboratory coursework.

Social & Behavioral Science 3 credits of Social & Behavioral Science coursework.

Total Credits 30 credits.

For more information see the policy (<https://policy.wisc.edu/library/UW-1095/>).

## UNIVERSITY DEGREE AND QUALITY OF WORK REQUIREMENTS

All undergraduate degree recipients must complete the following minimum requirements. Requirements for some programs will exceed these requirements; see program requirements for additional information.

Total Degree 120 degree credits.

Residency Complete 30 credits in residence. A course is considered "in residence" if it is taken when in undergraduate degree-seeking status and:
 

- is offered by UW-Madison and completed on the UW-Madison campus or at an approved off-site location, or
- is offered by UW-Madison in an online or distance format, or is completed during participation in a UW-Madison study abroad/study away program.

Quality of Work Achieve at least the minimum grade point average specified by the school, college, and/or academic program.

Math Demonstrate minimal mathematics competence by:
 

- placing above MATH#160;96, or
- successfully completing MATH#160;96, or
- successfully completing a more advanced mathematics course such as MATH#160;112, MATH#160;113, MATH#160;114, MATH#160;141, MATH#160;211, or MATH#160;221.

English Language If required to take the UW-Madison English as a Second Language Assessment Test (MSN-ESLAT), demonstrate minimal English language competence by:
 

- earning credit for ESL#160;118, or
- achieving a qualifying MSN-ESLAT placement test score.

Language Complete one:
 

- 2 high school units of a single language other than English, or
- one course with the second semester Language designation.

Major Declaration Declare and complete the requirements for at least one major.

## COLLEGE OF AGRICULTURAL AND LIFE SCIENCES REQUIREMENTS

### CALS GRADUATION REQUIREMENTS

Cumulative Credits
 

- Students must earn 120 degree credits.
- Students declared in Biological Systems Engineering BS must earn 125 degree credits.

Quality of Work Students must maintain a minimum cumulative grade point average of 2.000 to remain in good standing and be eligible for graduation.

Residency Students must complete 30 degree credits in residence at UW-Madison after earning 86 credits toward their undergraduate degree.

In addition to the university's general requirements, all undergraduate students in CALS must satisfy a set of college and major requirements. Courses may not double count within university requirements, CALS college requirements, or major requirements. A course may count toward university requirements and a college and/or a major requirement; similarly, a course counted toward college requirements may also be used to satisfy a university and/or a major requirement.

### CALS COLLEGE REQUIREMENTS

CALS First-Year Seminar 1 credit. See the full list of eligible courses below or use this link: <https://go.wisc.edu/calsfirstyearseminars> (<https://go.wisc.edu/calsfirstyearseminars/>)

Ethnic Studies 3 credits with the Ethnic Studies designation.

Communication Complete either:
 

- 1 course with the Communication A designation, or
- satisfaction of Communication A based on UW Placement Test.

|                          |   |
|--------------------------|---|
| Quantitative Reasoning A | Complete either: <ul style="list-style-type: none"> <li>• 1 course with the Quantitative Reasoning A designation, or</li> <li>• satisfaction of Quantitative Reasoning A based on UW Placement Test.</li> </ul> |
|--------------------------|---|

|                        |  |
|------------------------|--|
| Introductory Chemistry | Complete one: <ul style="list-style-type: none"> <li>• CHEM#160;103</li> <li>• CHEM#160;108</li> <li>• CHEM#160;109</li> </ul> |
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|                                |  |
|--------------------------------|--|
| CALS International Comparisons | 3 credits. See the full list of eligible courses below or use this link: <a href="https://go.wisc.edu/calsinternationalcomparisons/">https://go.wisc.edu/calsinternationalcomparisons/</a> ( <a href="https://go.wisc.edu/calsinternationalcomparisons/">https://go.wisc.edu/calsinternationalcomparisons/</a> ) |
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|                 |  |
|-----------------|--|
| Communication B | 1 course with the Communication B designation. |
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| Quantitative Reasoning B | 1 course with the Quantitative Reasoning B designation. |
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| Biological Science | 5 credits with the Biological Science designation. |
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| Additional Science | 3 credits with the Biological, Physical, or Natural Science designations. |
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|-----------------|---|
| Science Breadth | 3 credits with the Biological, Physical, Natural, or Social Science designations. |
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|            |  |
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| Humanities | 6 credits with the Humanities or Literature designation. |
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|-----------------|---|
| Social Sciences | 3 credits with the Social Sciences designation. |
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|------------------------------|---|
| Capstone Learning Experience | Each major articulates the required capstone learning experience. |
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### CALS First-Year Seminars

| Code                  | Title  | Credits |
|-----------------------|--|---------|
| AN SCI 135            | Grand Challenges and Career Opportunities in Animal and Dairy Sciences | 1       |
| BIOCHEM 100           | Biochemistry First-Year Seminar  | 1       |
| COUN PSY 125          | The Wisconsin Experience Seminar                                       | 1       |
| F&W ECOL 101          | Orientation to Wildlife Ecology  | 1       |
| F&W ECOL 105          | Environment, Pollutants, and You                                       | 3       |
| GENETICS 155          | Freshman Seminar in Genetics   | 1       |
| INTEGSCI 100          | Exploring Biology  | 2       |
| INTEGSCI 140          | Exploring Service in STEM  | 1       |
| INTER-AG 155          | Issues in Agriculture, Environment, and Life Sciences                  | 1       |
| LSC 155               | First-Year Seminar in Science Communication                            | 1       |
| MICROBIO 150          | Microbiomes and Microbiology - First-Year Seminar                      | 1       |
| PLANTSCI/AGROECOL 100 | First-Year Seminar in Agroecology and Plant Science                    | 1       |
| PL PATH 155           | Food Frontlines: Security, Sustainability, and Survival                | 1       |
| SOIL SCI 155          | First-year Seminar in Soil and Environmental Sciences                  | 1       |

### Learning Community/Student Group Courses

The following learning community/student group courses are approved as CALS First-Year Seminars.

|              |  |   |
|--------------|--|---|
| COUN PSY 117 | PEOPLE First Year Seminar                      | 1 |
| INTEGSCI 110 | BioHouse Seminar: Biology for the 21st Century | 1 |
| INTER-AG 117 | GreenHouse Roots Seminar                       | 1 |
| INTER-AG 140 | CALS QuickStart: Foundations                   | 1 |
| INTER-AG 175 | WISE Seminar                                   | 1 |

### CALS International Comparisons

| Code  | Title  | Credits |
|---|--|---------|
| The 3 credit requirement may be fulfilled as either a stand-alone 3 credit course or as a set of courses as listed below. |  |         |
| A A E/ENVIR ST 244  | The Environment and the Global Economy   | 4       |
| A A E 319   | The International Agricultural Economy   | 3       |
| A A E/NUTR SCI 350  | World Hunger and Malnutrition  | 3       |
| A A E 352   | Global Health: Economics, Natural Systems, and Policy (approved for enrollments Summer 2021 and later) | 4       |
| A A E/INTL ST 373   | Globalization, Poverty and Development   | 3       |
| A A E/INTL ST 374   | The Growth and Development of Nations in the Global Economy  | 3       |
| A A E/ECON 473  | Economic Growth and Development in Southeast Asia  | 3       |
| A A E/ECON 474  | Economic Problems of Developing Areas  | 3       |
| A A E/ECON/INTL BUS 462   | Latin American Economic Development  | 3       |
| A A E/ECON 477  | Agricultural and Economic Development in Africa  | 3       |
| AGROECOL 377  | Global Food Production and Health  | 3       |
| AN SCI/DY SCI 370   | Livestock Production and Health in Agricultural Development  | 3       |
| ASIAN/HISTORY/POLI SCI 255  | Introduction to East Asian Civilizations (approved for enrollments Summer 2021 and later)              | 3-4     |
| C&E SOC/SOC 341   | Labor in Global Food Systems (approved for enrollments Summer 2020 and later)                          | 3       |
| C&E SOC/ENVIR ST/SOC 540  | Sociology of International Development, Environment, and Sustainability                                | 3       |
| CSCS 500  | Global Health and Communities: From Research to Praxis   | 3       |
| DY SCI 471  | Food Production Systems and Sustainability   | 3       |
| ENTOM/ENVIR ST 201  | Insects and Human Culture-a Survey Course in Entomology  | 3       |
| ENTOM/ENVIR ST 205  | Our Planet, Our Health (approved for enrollments Fall 2026 and later)                                  | 3       |
| ENTOM/ZOOLOGY 371   | Medical Entomology: Biology of Vector and Vector-borne Diseases  | 3       |

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|---|--|---|
| F&W ECOL/<br>ENVIR ST 100   | Forests of the World (approved for enrollments Summer 2020 and later)  | 3 |
| F&W ECOL/<br>ENVIR ST/<br>ZOOLOGY 360   | Extinction of Species  | 3 |
| LSC 251   | Science, Media and Society (approved for enrollments Summer 2020 and later)  | 3 |
| PL PATH/<br>BOTANY 123  | Plants, Parasites, and People  | 3 |
| PL PATH 311   | Global Food Security   | 3 |
| PLANTSCI 370  | World Vegetable Crops  | 3 |
| The following study abroad courses fulfill the CALS International Comparisons requirement. Only the specific course numbers and titles listed, including Topics titles (in parentheses), are approved to meet the CALS International Comparisons requirement. |  |   |
| BIOCHEM 307   | Study Abroad: Introduction to Biological Sciences Research in Japan (approved for enrollments Fall 2026 and later)   | 3 |
| NUTR SCI/INTER-<br>AG 421   | Global Health Field Experience (UW Mobile Clinics and Health Care in Uganda)   | 3 |
| INTER-AG 321<br>& INTER-AG/<br>NUTR SCI 421   | Study Abroad Pre-Departure Seminar and Global Health Field Experience (UW Global Health Community Health and Asset-Based Community Development in Sri Lanka) | 3 |
| INTER-AG 321<br>& INTER-AG/<br>NUTR SCI 421   | Study Abroad Pre-Departure Seminar and Global Health Field Experience (UW Agriculture, Health and Nutrition in Uganda)                                       | 3 |
| INTER-AG/<br>NUTR SCI 421   | Global Health Field Experience (UW Health, Education and Tanzanian Culture)  | 3 |

## MAJOR REQUIREMENTS

| Code                           | Title   | Credits |
|--------------------------------|---|---------|
| <b>Mathematics</b>             |   |         |
| Complete the following:        |   | 5       |
| MATH 221                       | Calculus and Analytic Geometry I                                    |         |
| <b>Statistics</b>              |   |         |
| Complete one of the following: |   | 3       |
| STAT 371                       | Introductory Applied Statistics for the Life Sciences (Recommended) |         |
| STAT 301                       | Introduction to Statistical Methods                                 |         |
| STAT 240                       | Data Science Modeling I   |         |
| <b>General Chemistry</b>       |   |         |
| Complete one of the following: |   | 5-10    |
| CHEM 103<br>& CHEM 104         | General Chemistry I and General Chemistry II                        |         |
| CHEM 109                       | Advanced General Chemistry  |         |

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|------------------------|--|
| CHEM 115<br>& CHEM 116 | Chemical Principles I and Chemical Principles II |
|------------------------|--|

### Organic Chemistry

Complete ALL of the following:

|          |   |
|----------|---|
| CHEM 343 | Organic Chemistry I                       |
| CHEM 344 | Introductory Organic Chemistry Laboratory |
| CHEM 345 | Organic Chemistry II                      |

### Biology Foundation

Complete one of the following: 10-13

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|--|--|
| BIOLOGY/<br>BOTANY/<br>ZOOLOGY 151<br>& BIOLOGY/<br>BOTANY/<br>ZOOLOGY 152       | Introductory Biology and Introductory Biology (Recommended)  |
| BIOCORE 381<br>& BIOCORE 382<br>& BIOCORE 383<br>& BIOCORE 384<br>& BIOCORE 485  | Evolution, Ecology, and Genetics and Evolution, Ecology, and Genetics Laboratory and Cellular Biology and Cellular Biology Laboratory and Principles of Physiology |
| ZOOLOGY/<br>BIOLOGY 101<br>& ZOOLOGY/<br>BIOLOGY 102<br>& BOTANY/<br>BIOLOGY 130 | Animal Biology and Animal Biology Laboratory and General Botany  |

### Physics

Select one of the following: 8-10

|                              |                                     |
|------------------------------|-------------------------------------|
| PHYSICS 103<br>& PHYSICS 104 | General Physics and General Physics |
| PHYSICS 207<br>& PHYSICS 208 | General Physics and General Physics |
| PHYSICS 201<br>& PHYSICS 202 | General Physics and General Physics |

### Biochemistry

Complete one of the following: 3-6

|                              |  |
|------------------------------|--|
| BIOCHEM 501                  | Introduction to Biochemistry                       |
| BIOCHEM 507<br>& BIOCHEM 508 | General Biochemistry I and General Biochemistry II |

### Microbiology Courses

#### Microbiology Core:

Complete all of the following courses (except where noted, all microbiology core courses are offered every fall and spring semester):

|              |  |   |
|--------------|--|---|
| MICROBIO 303 | Biology of Microorganisms  | 3 |
| MICROBIO 304 | Biology of Microorganisms Laboratory                             | 2 |
| MICROBIO 305 | Critical Analyses in Microbiology                                | 1 |
| MICROBIO 450 | Diversity, Ecology and Evolution of Microorganisms (Spring only) | 3 |
| MICROBIO 470 | Microbial Genetics & Molecular Machines                          | 3 |
| MICROBIO 526 | Physiology of Microorganisms                                     | 3 |

|              |  |   |
|--------------|--|---|
| MICROBIO 527 | Advanced Laboratory Techniques in Microbiology (Fall only) | 2 |
|--------------|--|---|

*Microbiology Capstone (required):*

|              |   |   |
|--------------|---|---|
| MICROBIO 551 | Capstone Research Project in Microbiology (Spring only) | 2 |
|--------------|---|---|

*Microbiology Electives*

Complete at least 6 credits; at least 3 credits must come from Set A. Note that not all elective courses are offered every semester.

|        |  |     |
|--------|--|-----|
| Set A: |  | 3-6 |
|--------|--|-----|

|                           |                              |  |
|---------------------------|------------------------------|--|
| MICROBIO/<br>FOOD SCI 324 | Food Microbiology Laboratory |  |
|---------------------------|------------------------------|--|

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|---------------------------|-------------------|--|
| MICROBIO/<br>FOOD SCI 325 | Food Microbiology |  |
|---------------------------|-------------------|--|

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|-------------------------|---|--|
| MICROBIO/<br>BOTANY 335 | The Microbiome of Plants, Animals, and Humans |  |
|-------------------------|---|--|

|              |                                 |  |
|--------------|---------------------------------|--|
| MICROBIO 345 | Introduction to Disease Biology |  |
|--------------|---------------------------------|--|

|              |  |  |
|--------------|--|--|
| MICROBIO 357 | General Bioinformatics for Microbiologists |  |
|--------------|--|--|

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| MICROBIO/SOIL<br>SCI 425 | Environmental Microbiology |  |
|--------------------------|----------------------------|--|

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|--------------|--|--|
| MICROBIO 520 | Planetary Microbiology: What Life Here Tells Us About Life Out There |  |
|--------------|--|--|

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| MICROBIO/SOIL<br>SCI 523 | Soil Microbiology and Biochemistry |  |
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| MICROBIO 525 | Field Studies of Planetary Microbiology and Life in the Universe |  |
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| MICROBIO/<br>ONCOLOGY 545 | Topics in Biotechnology (topics vary by semester) |  |
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| MICROBIO/<br>BIOCHEM/<br>GENETICS 612 | Prokaryotic Molecular Biology |  |
|---------------------------------------|-------------------------------|--|

|              |                                     |  |
|--------------|-------------------------------------|--|
| MICROBIO 626 | Microbial and Cellular Metabolomics |  |
|--------------|-------------------------------------|--|

|                           |                                   |  |
|---------------------------|-----------------------------------|--|
| MICROBIO/<br>BMOLCHEM 668 | Microbiology at Atomic Resolution |  |
|---------------------------|-----------------------------------|--|

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|--------|--|-----|
| Set B: |  | 0-3 |
|--------|--|-----|

|                       |                           |  |
|-----------------------|---------------------------|--|
| AN SCI/<br>DY SCI 320 | Animal Health and Disease |  |
|-----------------------|---------------------------|--|

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|------------------------|--------------------|--|
| BIOCHEM/M M &<br>I 575 | Biology of Viruses |  |
|------------------------|--------------------|--|

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|-------------|---|--|
| BIOCHEM 601 | Protein and Enzyme Structure and Function |  |
|-------------|---|--|

|            |       |  |
|------------|-------|--|
| BOTANY 330 | Algae |  |
|------------|-------|--|

|                       |       |  |
|-----------------------|-------|--|
| BOTANY/PL PATH<br>332 | Fungi |  |
|-----------------------|-------|--|

|                                 |  |  |
|---------------------------------|--|--|
| BOTANY/<br>ENTOM/PL PATH<br>505 | Plant-Microbe Interactions: Molecular and Ecological Aspects |  |
|---------------------------------|--|--|

|          |                       |  |
|----------|-----------------------|--|
| CHEM 665 | Biophysical Chemistry |  |
|----------|-----------------------|--|

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|------------------------|--------------------------------|--|
| COMP SCI/<br>B M I 576 | Introduction to Bioinformatics |  |
|------------------------|--------------------------------|--|

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| F&W ECOL/SURG<br>SCI 548 | Diseases of Wildlife |  |
|--------------------------|----------------------|--|

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| FOOD SCI 550 | Fermented Foods and Beverages |  |
|--------------|-------------------------------|--|

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|-------------|-------------------------|--|
| M M & I 301 | Pathogenic Bacteriology |  |
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|             |            |  |
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| M M & I 341 | Immunology |  |
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| M M & I/ENTOM/<br>PATH-BIO/<br>ZOOLOGY 350 | Parasitology |  |
|--|--------------|--|

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|-------------|---|--|
| M M & I 554 | Emerging Infectious Diseases and Bioterrorism |  |
|-------------|---|--|

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|--------------------------------------|--|--|
| ONCOLOGY/<br>M M & I/<br>PL PATH 640 | General Virology-Multiplication of Viruses |  |
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| PATH-BIO/<br>M M & I 528 | Immunology |  |
|--------------------------|------------|--|

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|-------------|------------------------------|--|
| PL PATH 622 | Plant-Bacterial Interactions |  |
|-------------|------------------------------|--|

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| PL PATH/<br>BOTANY/<br>GENETICS/<br>M M & I 655 | Biology and Genetics of Fungi |  |
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|----------------------|--------------|
| <b>Total Credits</b> | <b>56-75</b> |
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## HONORS IN THE MAJOR ADMISSIONS CRITERIA

Students admitted to the university and to the College of Agricultural and Life Sciences are invited to apply to be considered for admission to the CALS Honors Program.

### New First-Year Students

- Complete program application including essay questions

### Transfer and Continuing UW-Madison Students

- UW-Madison cumulative GPA of at least 3.25
- Complete program application including essay questions

## HOW TO APPLY

The application is available on the CALS Honors Program website (<https://cals.wisc.edu/academics/undergraduate/current-students/honors-program/>). Applications are accepted at any time.

New first-year students with accepted applications will automatically be enrolled in Honors in Research. It is possible to switch to Honors in the Major in the student's first semester on campus after receiving approval from the advisor for that major. Transfer and continuing students may apply directly to Honors in Research or Honors in the Major (after approval from the major advisor).

## REQUIREMENTS

All CALS Honors programs have the following requirements:

- Earn at least a cumulative 3.25 GPA at UW-Madison (some programs have higher requirements)
- Complete the program-specific requirements listed below
- Submit completed thesis documentation to CALS Academic Affairs

## MICROBIOLOGY HONORS IN THE MAJOR REQUIREMENTS

To earn honors in the major in Microbiology, students must satisfy the requirements for the major (above) as well as the following requirements. All courses used for honors in the major requirements must receive "B" or better grades to fulfill requirements.

- Earn a 3.300 overall university GPA.
- Earn a 3.300 GPA for all MICROBIO courses, and all courses accepted in the major.
- Complete a two-semester senior honors thesis (MICROBIO 681 and MICROBIO 682) for 6 credits total and present research in a public forum. Students completing their senior honors theses in laboratories or departments outside of microbiology should talk to an advisor, as they may be able to count that thesis toward honors in the major.
- Complete a minimum of 6 credits of courses taken for honors from the Core and Foundation Honors Coursework#list. Courses completed from this list may count towards both major requirements and honors requirements.

### Core and Foundation Honors Coursework

| Code         | Title   | Credits |
|--------------|---|---------|
| MICROBIO 303 | Biology of Microorganisms                             | 3       |
| MICROBIO 304 | Biology of Microorganisms Laboratory                  | 2       |
| MICROBIO 305 | Critical Analyses in Microbiology                     | 1       |
| MICROBIO 450 | Diversity, Ecology and Evolution of Microorganisms    | 3       |
| MICROBIO 470 | Microbial Genetics & Molecular Machines               | 3       |
| MICROBIO 526 | Physiology of Microorganisms                          | 3       |
| MICROBIO 527 | Advanced Laboratory Techniques in Microbiology        | 2       |
| MICROBIO 551 | Capstone Research Project in Microbiology             | 2       |
| BIOCHEM 507  | General Biochemistry I                                | 3       |
| BIOCHEM 508  | General Biochemistry II                               | 3-4     |
| PHYSICS 201  | General Physics                                       | 5       |
| PHYSICS 202  | General Physics                                       | 5       |
| PHYSICS 207  | General Physics                                       | 5       |
| PHYSICS 208  | General Physics                                       | 5       |
| STAT 301     | Introduction to Statistical Methods                   | 3       |
| STAT 371     | Introductory Applied Statistics for the Life Sciences | 3       |

- Complete a minimum of 14 credits from the following coursework. Independent study and thesis credits do not count to meet this honors requirement.
  - Any additional credits taken from the Core and Foundations Honors Coursework above the minimum 6 required credits can satisfy some of these 14 credits (see above requirement for list).
  - Courses taken for honors in the Statistics Requirement or Biology Foundation Requirements that fulfill requirements for the major (if options are available; see major requirements above).
  - Microbiology Set A elective coursework completed above and beyond the minimum 6 credits required for the "Microbiology Electives" major requirements. This coursework does not need to be taken for honors.
  - Honors coursework in MATH, CHEM, PHYSICS, or BIOCORE# from the lists below.

### Math

| Code     | Title  | Credits |
|----------|--|---------|
| MATH 341 | Linear Algebra   | 3       |
| MATH 375 | Topics in Multi-Variable Calculus and Linear Algebra         | 5       |
| MATH 376 | Topics in Multi-Variable Calculus and Differential Equations | 5       |
| MATH 521 | Analysis I   | 3       |
| MATH 522 | Analysis II  | 3       |
| MATH 541 | Modern Algebra 1   | 3       |
| MATH 542 | Modern Algebra 2   | 3       |

### Chemistry

| Code     | Title                              | Credits |
|----------|------------------------------------|---------|
| CHEM 109 | Advanced General Chemistry         | 5       |
| CHEM 115 | Chemical Principles I              | 5       |
| CHEM 116 | Chemical Principles II             | 5       |
| CHEM 343 | Organic Chemistry I                | 3       |
| CHEM 345 | Organic Chemistry II               | 3       |
| CHEM 329 | Fundamentals of Analytical Science | 4       |
| CHEM 547 | Advanced Organic Chemistry         | 3       |
| CHEM 561 | Physical Chemistry I               | 3       |
| CHEM 563 | Physical Chemistry Laboratory I    | 1       |
| CHEM 562 | Physical Chemistry II              | 3       |
| CHEM 564 | Physical Chemistry Laboratory II   | 1       |
| CHEM 665 | Biophysical Chemistry              | 3       |

### Physics

| Code        | Title                            | Credits |
|-------------|----------------------------------|---------|
| PHYSICS 201 | General Physics                  | 5       |
| PHYSICS 202 | General Physics                  | 5       |
| PHYSICS 207 | General Physics                  | 5       |
| PHYSICS 208 | General Physics                  | 5       |
| PHYSICS 241 | Introduction to Modern Physics   | 3       |
| PHYSICS 247 | A Modern Introduction to Physics | 5       |
| PHYSICS 248 | A Modern Introduction to Physics | 5       |
| PHYSICS 249 | A Modern Introduction to Physics | 4       |

### Biocore

| Code        | Title                                       | Credits |
|-------------|---|---------|
| BIOCORE 381 | Evolution, Ecology, and Genetics            | 3       |
| BIOCORE 382 | Evolution, Ecology, and Genetics Laboratory | 2       |
| BIOCORE 383 | Cellular Biology                            | 3       |
| BIOCORE 384 | Cellular Biology Laboratory                 | 2       |
| BIOCORE 485 | Principles of Physiology                    | 3       |
| BIOCORE 486 | Principles of Physiology Laboratory         | 2       |
| BIOCORE 587 | Biological Interactions                     | 3       |

## LEARNING OUTCOMES

### LEARNING OUTCOMES

1. Develop a fundamental understanding of the principles of microbiology and the necessary skills for a professional career in microbiology
2. Apply the scientific method to questions. Formulate a hypothesis, gather data, and analyze that data to assess the degree to which their work supports the hypothesis.
3. Demonstrate proficiency in the techniques used in microbiology and an ability to critically analyze data and integrate ideas for problem solving
4. Access the primary and secondary literature and, in combination with their own findings, effectively communicate their ideas both orally and in written form.
5. Learn about and demonstrate personal and professional ethics.

## FOUR-YEAR PLAN

### FOUR-YEAR PLAN

This sample four-year plan is a tool to assist students and their advisors.

Students should use their DARS report, the degree planner, Guide requirements, and the course search & enroll tools to make their own four-year plan based on their placement scores, credit for transferred courses and approved examinations, and individual interests. Students must complete at least 120 total credits to be eligible for graduation.

Students planning to pursue graduate studies in a biological science are encouraged to take MATH 222, PHYSICS 201/PHYSICS 202 or PHYSICS 207/PHYSICS 208, and BIOCHEM 507/BIOCHEM 508. CHEM 665 Biophysical Chemistry and MICROBIO/BIOCHEM/GENETICS 612 Prokaryotic Molecular Biology may also be recommended for some bioscience graduate programs. Students should consult with their advisor to develop an individual plan.

### SAMPLE MICROBIOLOGY FOUR-YEAR PLAN

#### Freshman

| Fall                              | Credits Spring                                   | Credits   |
|-----------------------------------|--|-----------|
| MICROBIO 150 (First Year Seminar) | 1 CHEM 104 (required if took CHEM 103)           | 5         |
| CHEM 103 or 109                   | 4-5 STAT 371, 301, or 240 (STAT 371 Recommended) | 3         |
| MATH 221                          | 5 General Education                              | 6         |
| General Education                 | 3  |           |
| <b>13-14</b>                      |  | <b>14</b> |

#### Sophomore

| Fall                        | Credits Spring                | Credits |
|-----------------------------|-------------------------------|---------|
| BIOLOGY/BOTANY/ ZOOLOGY 151 | 5 BIOLOGY/BOTANY/ ZOOLOGY 152 | 5       |
| CHEM 343                    | 3 CHEM 344                    | 2       |
| General Education           | 6 CHEM 345                    | 3       |

|  |     |
|--|-----|
| CALS International Comparisons Requirement | 3   |
| Breadth or elective courses                | 0-3 |
| <b>14</b>                                  |     |

**13-16**

#### Junior

| Fall                        | Credits Spring                  | Credits      |
|-----------------------------|---------------------------------|--------------|
| MICROBIO 303                | 3 MICROBIO 470                  | 3            |
| MICROBIO 304                | 2 BIOCHEM 501                   | 3            |
| MICROBIO 305                | 1 PHYSICS 104, 208, or 202      | 4-5          |
| PHYSICS 103, 207, or 201    | 4-5 Research (optional)         | 1-4          |
| Research (optional)         | 1-4 Breadth or elective courses | 1-3          |
| Breadth or elective courses | 1-3                             |              |
| <b>12-18</b>                |                                 | <b>12-18</b> |

#### Senior

| Fall                                 | Credits Spring                         | Credits      |
|--------------------------------------|--|--------------|
| MICROBIO 526                         | 3 MICROBIO 450 (Spring only)           | 3            |
| MICROBIO 527 (Fall only)             | 2 MICROBIO 551 (Spring only)           | 2            |
| Set A elective courses for the major | 3 Set B elective courses for the major | 3            |
| Research (optional)                  | 1-4 Research                           | 1-4          |
| Elective courses                     | 3 Elective courses                     | 3            |
| <b>12-15</b>                         |  | <b>12-15</b> |

**Total Credits 102-124**

## ADVISING AND CAREERS

### ADVISING AND CAREERS HOW TO DECLARE

If you are interested in exploring or declaring the Microbiology major, schedule an appointment with a Microbiology academic advisor using Starfish. Current UW-Madison students should use Starfish to schedule an appointment with an advisor in the Biochemistry & Microbiology Undergraduate Advising Hub (<https://biochemmicrobio.wisc.edu/>).

### ACADEMIC ADVISING

Each student is assigned a professional academic advisor who works to understand student goals and helps to craft a path that best suits their needs. Students can learn more about the major and advising support in Microbiology on the Biochemistry & Microbiology Undergraduate Advising Hub website.

- Schedule an Appointment: Current UW-Madison students can schedule an appointment with a Microbiology academic advisor using Starfish.
- Send an Email: Reach out to us with brief questions at [atbiochemmicrobio-advisor@wisc.edu](mailto:atbiochemmicrobio-advisor@wisc.edu).

- Drop-in Hours: Drop-in advising hours for quick (10–15 minute) questions, on a first-come, first-served basis, are posted on the Biochemistry / Microbiology Undergraduate Advising Hub website#each semester.

## CAREERS IN MICROBIOLOGY

Microbiology, the study of microorganisms, helps us understand our world and solve major problems. The field of microbiology is constantly expanding as we learn more about the role of microbes in infectious disease, environmental remediation, bioenergy, food safety, antibiotic resistance, biotechnology, and much more.

Graduates of this program are recognized for their skills in laboratory research and scientific communication, skills that are valued by potential employers and professional schools.

Our Microbiology alumni have found rewarding, exciting, and professional work across all fields, such as public health, healthcare, food science, research, graduate school, infectious disease, quality control, and more.

## CALS CAREER SERVICES

CALS Career Services (<https://cals.wisc.edu/academics/undergraduate-students/career-services/>) provides expertise to support students and alumni of the college as they explore, experience, and achieve their career goals. In short, CALS Career Services helps students in the College of Agriculture and Life Sciences discover themselves, find opportunities, and develop the skills they need for success after graduation.

CALS Career Services can also assist students in career advising, résumé and cover letter writing, networking opportunities, and interview skills, as well as assisting undergraduates to begin their career exploration early in their undergraduate career.

Students should set up their profiles in Handshake (<https://wisc.joinhandshake.com/login/>) to take care of everything they need to explore career events, manage their campus interviews, and apply to jobs and internships from 200,000+ employers around the country.

## WISCONSIN EXPERIENCE

### WISCONSIN EXPERIENCE A RICH HISTORY OF MICROBIOLOGY

UW–Madison is recognized as one of the birthplaces of Microbiology, as recognized by the American Society for Microbiology’s *Milestones in Microbiology*. UW–Madison is the first school to teach microbiology in the U.S., and it is consistently ranked as one of the top public schools in the field.

## COMMUNITY ENGAGEMENT

Our students engage in various activities outside of the classroom:

### Microbiology Student Club

The Microbiology Club aims to immerse students into the diverse world of microbiology, regardless of major. Microbiology Club provides information about careers and job opportunities, how to get involved in research, and volunteer and outreach opportunities.

## Microbiology Peer Mentor Program

The Microbiology Peer Mentor Program is a program that connects first-year and second-year students (mentees) with non-first year students (mentors) in their same major, and works to match mentees and mentors who have like interests and involvements on campus. This program runs each Fall and Spring semester, so students declared in the major should watch their wisc.edu email for invitations.

## Microbiology Engagement Program

The Microbiology Engagement Program encourages, celebrates, and recognizes the importance of students’ involvement within the department. The goal of this program is to engage and integrate undergraduate Microbiology students into the Bacteriology Department through structured, pre-determined activities that you complete outside of the classroom and in research.

## RESEARCH EXPERIENCE

The majority of Microbiology majors conduct research in a faculty-led research lab where they receive direct mentorship from professors, scientists, and graduate students. Because UW–Madison has the highest concentration of microbiologists on any U.S. campus, students have many research options.

The Microbiology Major Program website#and the advisors can provide more information on finding research opportunities. Summer funding awards for research are available through the department.

## GLOBAL ENGAGEMENT

Microbiology majors can participate in several international academic experiences including short-term field experiences, summer research opportunities, and semester-long exchange programs at top universities around the world. You can see more information about planning for a Study Abroad program as a Microbiology major on the Microbiology MAP website.

## RESOURCES AND SCHOLARSHIPS

### RESOURCES AND SCHOLARSHIPS

Students in the College of Agricultural and Life Sciences receive more than \$1.25 million in scholarships annually. Learn more about college scholarships at <https://cals.wisc.edu/academics/undergraduate-students/financing-your-education/cals-scholarships/>.

The Department of Bacteriology offers several scholarships to students in the microbiology major. Awards are given annually and fund undergraduate research, provide travel stipends to microbiology students attending professional scientific conferences, or recognize outstanding graduating seniors. Learn more at <https://bs.microbiology.wisc.edu/awards-and-scholarships/>.