

BACTERIOLOGY, M.S.

The primary goal of the master of science (M.S.) degree program is to give students a solid understanding of the scientific process and to provide the opportunity to obtain advanced training in microbiology. The master's degree is the terminal degree in this program, and completion of this degree does not allow automatic admission to a Ph.D. program.

This program provides the opportunity to tailor a curriculum of advanced coursework and research to fit the needs of each student, with two different tracks (coursework or research tracks, see below). Students may acquire a general overview of microbiology or may focus on a specialized subject area in microbiology such as bacterial physiology, molecular microbiology, food microbiology, environmental microbiology, biotechnology or medical microbiology. The self-tailored program must meet the requirements of the Department of Bacteriology and the Graduate School for the M.S. degree. Full-time students can expect to complete the M.S. degree in about two years. The M.S. program also can accommodate part-time students with consequent increased time to degree.

The coursework track serves students who want to acquire knowledge about current topics in microbiology primarily in a classwork setting. Examples of students who benefit from this track are those currently employed in research, clinical, or biotechnology labs seeking an advanced degree; lawyers and law students who wish to specialize in biotechnology or environmental law; and students preparing for health professions.

The research track serves students who seek to improve scientific research skills. This track is chosen by laboratory technicians who want advanced technical training; students seeking laboratory skills for employment; and students who desire laboratory experience and advanced coursework before applying to Ph.D. programs.

ADMISSIONS

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.

Graduate admissions is a two-step process between academic programs and the Graduate School. **Applicants must meet** the minimum requirements (<https://grad.wisc.edu/apply/requirements/>) **of the Graduate School as well as the program(s)**. Once you have researched the graduate program(s) you are interested in, apply online (<https://grad.wisc.edu/apply/>).

Requirements	Detail
Fall Deadline	June 1*
Spring Deadline	October 15
Summer Deadline	January 10
GRE (Graduate Record Examinations)	Not required but may be considered if available.

English Proficiency Test Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements (<https://grad.wisc.edu/apply/requirements/#english-proficiency>).

Other Test(s) (e.g., GMAT, MCAT) n/a

Letters of Recommendation Required 3

*

Early review of Fall applications begins January 10.

APPLICATION DEADLINES

Although students may apply to begin the program in any semester, summer application is not encouraged. Students pursuing the research option who have found a lab in which to carry out their research may apply for summer admission. Students who plan to pursue the coursework option will be considered for summer admission only if they need to take a prerequisite or general requirement course that is offered in the summer.

MINIMUM COURSEWORK FOR ADMISSIONS

Students applying to the program should have taken some or all of these courses prior to admission to the program for either coursework or research tracks. Students may correct deficiencies (up to 6 credits) after admission, but these credits do not apply toward the credits of coursework required for the degree, and all deficiencies must be absolved before completion of the master's degree.

- Biology: two semesters (such as the following UW-Madison courses: BIOLOGY/BOTANY/ZOOLOGY 151 and BIOLOGY/BOTANY/ZOOLOGY 152 or BIOLOGY/ZOOLOGY 101 and BIOLOGY/ZOOLOGY 102)
- Chemistry: four semesters of chemistry including two semesters of organic chemistry (such as the following UW-Madison courses: CHEM 103, CHEM 104, CHEM 343, and CHEM 345)
- Math: one course in math beyond algebra/trigonometry such as calculus, statistics, or computer science (such as the following UW-Madison courses: MATH 171, MATH 221, STAT 301, or STAT 371)
- Physics: one semester (such as the following UW-Madison courses: PHYSICS 103, PHYSICS 201, or PHYSICS 207)

The Graduate Record Examination (GRE) is not required for admission to the M.S. program, but scores may be submitted. International students whose undergraduate instruction was not in English must provide evidence of English proficiency by taking the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS).

FUNDING

GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (<https://grad.wisc.edu/funding/>) is available from the Graduate School. Be sure to check with your program for individual policies and restrictions related to funding.

PROGRAM RESOURCES

The M.S. in Bacteriology program does not provide funding for any student in the program and financial support for master's students is limited. Because the program is flexible, students are able to work part or full-time at jobs on or off campus while enrolled. Students in the research option may be paid as research assistants by their research mentor if funds are available.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (<http://guide.wisc.edu/graduate/#policiesandrequirements>), in addition to the program requirements listed below.

MAJOR REQUIREMENTS

MODE OF INSTRUCTION

Face to Face	Evening/ Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	No

Mode of Instruction Definitions

Accelerated: Accelerated programs are offered at a fast pace that condenses the time to completion. Students typically take enough credits aimed at completing the program in a year or two.

Evening/Weekend: Courses meet on the UW-Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

Face-to-Face: Courses typically meet during weekdays on the UW-Madison Campus.

Hybrid: These programs combine face-to-face and online learning formats. Contact the program for more specific information.

Online: These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

CURRICULAR REQUIREMENTS

Requirement Detail

Minimum
Credit
Requirement

Minimum
Residence
Credit
Requirement

Minimum
Graduate
Coursework
Requirement

30 credits

21 credits

15 credits must be graduate-level coursework. Details can be found in the Graduate School's Minimum Graduate Coursework (50%) policy (<https://policy.wisc.edu/library/UW-1244>).

Overall
Graduate
GPA
Requirement

3.00 GPA required.
This program follows the Graduate School's policy: <https://policy.wisc.edu/library/UW-1203> (<https://policy.wisc.edu/library/UW-1203/>).

Other Grade
Requirements

n/a

Assessments
and
Examinations

Research path: thesis is required; coursework path: writing and assessment is required.

Language
Requirements

n/a

REQUIRED COURSES

The following courses (or equivalent) are required for completion of the M.S. degree for both the coursework and research pathways, and may be fulfilled by courses taken prior to entrance to the M.S. program or as part of the M.S. program.

Code	Title	Credits
General Microbiology		
MICROBIO 303	Biology of Microorganisms	3
Microbial Physiology		
MICROBIO 526	Physiology of Microorganisms	3
Microbial Genetics		
MICROBIO 470	Microbial Genetics & Molecular Machines	3
General Biochemistry		
		3-6
BIOCHEM 501	Introduction to Biochemistry	
BIOCHEM 507 & BIOCHEM 508	General Biochemistry I and General Biochemistry II	
Masters Seminar		
MICROBIO 875	Special Topics (Masters Degree Seminar)	1
Ethics Workshop ¹		

1

The Ethics Workshop has the goal of fostering ethical and professional conduct. This workshop will be organized by the M.S. program director, and will occur every year in the fall semester. This is a requirement for both path options.

There are two pathways for the M.S. degree: one involving primarily formal coursework with no research requirement (coursework option (<https://masters.bact.wisc.edu/coursework-track/>)), and the other requiring significant laboratory research with a formal written component describing and analyzing the work performed (research option (<https://masters.bact.wisc.edu/research-track/>)).

Coursework Pathway ²

- Coursework should either be on the approved list below or be approved by the program advisor.
- Research (990), Special Problems (699, 999), and Independent Study (899) credits may constitute up to nine credits of the required 30. If a student enrolls in any of these courses, they will be required to complete 15 credits of additional graduate-level coursework.
- Seminar credits and one-credit courses must be approved by the program advisor.

2

Note: These pathways are internal to the program and represent different curricular paths a student can follow to earn this degree. Pathway names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

The following commonly taken courses are pre-approved electives for the Coursework Pathway:

Code	Title	Credits
MICROBIO/ SOIL SCI 523	Soil Microbiology and Biochemistry	3
MICROBIO 607	Advanced Microbial Genetics	3
MICROBIO/ BIOCHEM/ GENETICS 612	Prokaryotic Molecular Biology	3
MICROBIO 632	Industrial Microbiology/ Biotechnology	2
MICROBIO 657	Bioinformatics for Microbiologists	3
MICROBIO/ BMOLCHEM 668	Microbiology at Atomic Resolution	3
MICROBIO 710	Microbial Symbiosis	3
M M & I/PATH- BIO 528	Immunology	3
M M & I 554	Emerging Infectious Diseases and Bioterrorism	2
M M & I/ BIOCHEM 575	Biology of Viruses	2
M M & I/ POP HLTH 603	Clinical and Public Health Microbiology	5
M M & I 704	Infectious Diseases of Human Beings	3
M M & I 740	Mechanisms of Microbial Pathogenesis	3
M M & I/PATH- BIO 750	Host-Parasite Relationships in Vertebrate Viral Disease	3
GENETICS 525	Epigenetics	3
GENETICS/ CHEM 626	Genomic Science	2
GENETICS 633	Population Genetics	3
GENETICS/ BOTANY/M M & I/ PL PATH 655	Biology and Genetics of Fungi	3
GENETICS 885	Advanced Genomic and Proteomic Analysis	3
ONCOLOGY 675	Advanced or Special Topics in Cancer Research	1-3
BIOCHEM 601	Protein and Enzyme Structure and Function	2
BIOCHEM/ GENETICS/ MD GENET 620	Eukaryotic Molecular Biology	3
STAT/F&W ECOL/ HORT 571	Statistical Methods for Bioscience I	4

Research Pathway²

- At least ten credits of formal coursework is required. This coursework must meet one of the following requirements:
 - On the pre-approved list below
 - Approval of M.S. program advisor or the student's research advisor
 - A student may count up to 5 credits from the Required Courses towards the ten credits of formal coursework if taken while in the program
- A minimum of 12 credits of independent research (Research (990), Special Problems (699, 999), and Independent Study (899)) is required, although more are strongly encouraged.
- Seminar credits and one-credit courses must be approved by the program advisor.

2

Note: These paths are internal to the program and represent different pathways a student can follow to earn this degree. Path names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

The following commonly taken courses are pre-approved electives for the Research Path:

Code	Title	Credits
MICROBIO/ SOIL SCI 523	Soil Microbiology and Biochemistry	3
MICROBIO 607	Advanced Microbial Genetics	3
MICROBIO/ BIOCHEM/ GENETICS 612	Prokaryotic Molecular Biology	3
MICROBIO 632	Industrial Microbiology/ Biotechnology	2
MICROBIO 657	Bioinformatics for Microbiologists	3
MICROBIO/ BMOLCHEM 668	Microbiology at Atomic Resolution	3
MICROBIO 710	Microbial Symbiosis	3
M M & I/PATH- BIO 528	Immunology	3
M M & I 554	Emerging Infectious Diseases and Bioterrorism	2
M M & I/ BIOCHEM 575	Biology of Viruses	2
M M & I/ POP HLTH 603	Clinical and Public Health Microbiology	5
M M & I 704	Infectious Diseases of Human Beings	3
M M & I 740	Mechanisms of Microbial Pathogenesis	3
M M & I/PATH- BIO 750	Host-Parasite Relationships in Vertebrate Viral Disease	3
GENETICS 525	Epigenetics	3
GENETICS/ CHEM 626	Genomic Science	2
GENETICS 633	Population Genetics	3
GENETICS/ BOTANY/M M & I/ PL PATH 655	Biology and Genetics of Fungi	3

GENETICS 885	Advanced Genomic and Proteomic Analysis	3
ONCOLOGY 675	Advanced or Special Topics in Cancer Research	1-3
BIOCHEM 601	Protein and Enzyme Structure and Function	2
BIOCHEM/ GENETICS/ MD GENET 620	Eukaryotic Molecular Biology	3
STAT/F&W ECOL/ HORT 571	Statistical Methods for Bioscience I	4
ZOOLOGY 430	Comparative Anatomy of Vertebrates	5

POLICIES

GRADUATE SCHOOL POLICIES

The Graduate School's Academic Policies and Procedures (<https://grad.wisc.edu/acadpolicy/>) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

MAJOR-SPECIFIC POLICIES

PRIOR COURSEWORK

Graduate Work from Other Institutions

With permission of the program advisor, up to seven graduate course credits from another university may be applied toward the credit requirements for the Coursework Pathway. Students in the Research Pathway may request to have up to three graduate course credits apply toward the ten credit formal coursework minimum.

The student must provide verification that those credits were not used to satisfy any degree, major, or University requirements from any prior degree they have earned. Decisions are made by the M.S. program advisor.

UW–Madison Undergraduate

With permission of the program advisor, up to seven course credits numbered 300 or above may be applied toward the credit requirements for the Coursework Pathway. Students in the Research Pathway may request to have up to three course credits numbered 300 or above apply toward the ten-credit formal coursework minimum.

The student must provide verification that those credits were earned in excess of the requirements for the prior degree or major. Decisions are made by the M.S. program advisor.

UW–Madison University Special

With permission of the program advisor, up to nine course credits numbered 300 or above may be applied toward the credit requirements for the Coursework Pathway. Students in the Research Pathway may request to have up to three course credits numbered 300 or above apply toward the ten-credit formal coursework minimum.

The student must provide verification that those credits were not used to satisfy any degree, major, or University requirements from any prior degree they have earned. Decisions are made by the M.S. program advisor.

PROBATION

This program follows the Graduate School Probation policy.

ADVISOR / COMMITTEE

This program follows the Graduate School Advisor and Committees policies.

CREDITS PER TERM ALLOWED

15 credits (recommended: only 8–10 credits per semester, or 4–5 credits per summer term)

TIME LIMITS

This program follows the Graduate School's Time Limits policy.

GRIEVANCES AND APPEALS

These resources may be helpful in addressing your concerns:

- Bias or Hate Reporting (<https://doso.students.wisc.edu/bias-or-hate-reporting/>)
- Graduate Assistantship Policies and Procedures (<https://hr.wisc.edu/policies/gapp/#grievance-procedure>)
- Hostile and Intimidating Behavior Policies and Procedures (<https://hr.wisc.edu/hib/>)
 - Office of the Provost for Faculty and Staff Affairs (<https://facstaff.provost.wisc.edu/>)
- Dean of Students Office (<https://doso.students.wisc.edu/>) (for all students to seek grievance assistance and support)
- Employee Assistance (<http://www.eao.wisc.edu/>) (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
- Employee Disability Resource Office (<https://employee disabilities.wisc.edu/>) (for qualified employees or applicants with disabilities to have equal employment opportunities)
- Graduate School (<https://grad.wisc.edu/>) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
- Office of Compliance (<https://compliance.wisc.edu/>) (for class harassment and discrimination, including sexual harassment and sexual violence)
- Office of Student Conduct and Community Standards (<https://conduct.students.wisc.edu/>) (for conflicts involving students)
- Ombuds Office for Faculty and Staff (<http://www.ombuds.wisc.edu/>) (for employed graduate students and post-docs, as well as faculty and staff)
- Title IX (<https://compliance.wisc.edu/titleix/>) (for concerns about discrimination)

College of Agricultural and Life Sciences: Grievance Policy

In the College of Agricultural and Life Sciences (CALs), any student who feels unfairly treated by a member of the CALs faculty or staff has the right to complain about the treatment and to receive a prompt hearing. Some complaints may arise from misunderstandings or communication breakdowns and be easily resolved; others may require formal action. Complaints may concern any matter of perceived unfairness.

To ensure a prompt and fair hearing of any complaint, and to protect the rights of both the person complaining and the person at whom the

complaint is directed, the following procedures are used in the College of Agricultural and Life Sciences. Any student, undergraduate or graduate, may use these procedures, except employees whose complaints are covered under other campus policies.

1. The student should first talk with the person at whom the complaint is directed. Most issues can be settled at this level. Others may be resolved by established departmental procedures.
2. If the student is unsatisfied, and the complaint involves any unit outside CALS, the student should seek the advice of the dean or director of that unit to determine how to proceed.
 - a. If the complaint involves an academic department in CALS the student should proceed in accordance with item 3 below.
 - b. If the grievance involves a unit in CALS that is not an academic department, the student should proceed in accordance with item 4 below.
3. The student should contact the department's grievance advisor within 120 calendar days of the alleged unfair treatment. The departmental administrator can provide this person's name. The grievance advisor will attempt to resolve the problem informally within 10 working days of receiving the complaint, in discussions with the student and the person at whom the complaint is directed.
 - a. If informal mediation fails, the student can submit the grievance in writing to the grievance advisor within 10 working days of the date the student is informed of the failure of the mediation attempt by the grievance advisor. The grievance advisor will provide a copy to the person at whom the grievance is directed.
 - b. The grievance advisor will refer the complaint to a department committee that will obtain a written response from the person at whom the complaint is directed, providing a copy to the student. Either party may request a hearing before the committee. The grievance advisor will provide both parties a written decision within 20 working days from the date of receipt of the written complaint.
 - c. If the grievance involves the department chairperson, the grievance advisor or a member of the grievance committee, these persons may not participate in the review.
 - d. If not satisfied with departmental action, either party has 10 working days from the date of notification of the departmental committee action to file a written appeal to the CALS Equity and Diversity Committee. A subcommittee of this committee will make a preliminary judgement as to whether the case merits further investigation and review. If the subcommittee unanimously determines that the case does not merit further investigation and review, its decision is final. If one or more members of the subcommittee determine that the case does merit further investigation and review, the subcommittee will investigate and seek to resolve the dispute through mediation. If this mediation attempt fails, the subcommittee will bring the case to the full committee. The committee may seek additional information from the parties or hold a hearing. The committee will present a written recommendation to the dean who will provide a final decision within 20 working days of receipt of the committee recommendation.
4. If the alleged unfair treatment occurs in a CALS unit that is not an academic department, the student should, within 120 calendar days of the alleged incident, take his/her grievance directly to the Associate Dean of Academic Affairs. The dean will attempt to resolve the problem informally within 10 working days of receiving the complaint. If this mediation attempt does not succeed the student may file a written complaint with the dean who will refer it to the CALS Equity and Diversity Committee. The committee will seek a written response

from the person at whom the complaint is directed, subsequently following other steps delineated in item 3d above.

OTHER

n/a

PROFESSIONAL DEVELOPMENT

GRADUATE SCHOOL RESOURCES

Take advantage of the Graduate School's professional development resources (<https://grad.wisc.edu/pd/>) to build skills, thrive academically, and launch your career.

LEARNING OUTCOMES

1. The department's goal is to ensure that every student demonstrates understanding of the central principles of microbiology and the necessary skills for a professional career in microbiology.
2. The department's goal is to ensure that every student demonstrates the ability to articulate and critique the approaches and findings in the microbiology literature.
3. The department's goal is to ensure that every student demonstrates capability to identify sources, generate, and assemble data or evidence pertaining to questions in microbiology.
4. The department's goal is to ensure that every student demonstrates effective writing and speaking skills.
5. The department's goal is to ensure that every student demonstrates personal and professional ethics.

PEOPLE

Faculty: The program is led by directors Dr. Charles Kaspar, Dr. Tim Paustian, and Dr. Michelle Rondon. The program's faculty trainers can be found on the program website (<https://masters.bact.wisc.edu/faculty-trainers/>) or by contacting the program office.