M.S. in Microbiology

The M.S. in Microbiology combines a dynamic curriculum in a broad range of areas with interdisciplinary research opportunities at the frontiers of microbiology, host-microbe interactions, and environmental microbiology. Graduates of the program are equipped for successful careers in biotechnology and pharmaceutical companies, academic and government research laboratories, and as preparation for doctoral programs, medical school, and health-related professional programs.

Distinctive Features of the Program

- Research opportunities are available in many cutting edge microbiology research areas
- Emphasis on interdisciplinary research training
- Well-equipped research laboratories and core facilities on the UNH campus
- Laboratory rotations upon entry to the program to become familiar with different research laboratories
- Weekly graduate student seminar presentations, as well as a departmental seminar series of invited speakers
- Opportunities to gain teaching experience as a Graduate Teaching Assistant

Research Opportunities

- Host-microbe interactions, parasitology, and immunology
- Environmental microbiology
- Signal transduction pathways
- Molecular microbiology
- Genomics and bioinformatics
- Microbial ecology and evolution
- Biotechnology

Financial Support

- Students admitted to the M.S. Program are typically supported by Research Assistantships or Teaching Assistantships
- Intramural summer and academic year fellowships are available to students on a competitive basis.

Career Prospects

- Research scientists in biotechnology and pharmaceutical industries
- Lab managers in academic research labs and research institutes, state and federal government agencies
- Academic preparation for doctoral programs and professional health programs (e.g., medical school)

Admission Requirements

- Completion of foundational courses in biology, chemistry (including organic chemistry), physics, and mathematics

- Otherwise well-qualified applicants can correct academic deficiencies with enrollment in appropriate courses or independent study during the first year of graduate studies
- International applicants living outside the U.S.A. should first complete a free online application
- Applicants from non-English speaking countries must provide Test of English as a Foreign Language (TOEFL) scores
- Three letters of recommendation
- Personal statement, including research interests and names of two or three potential Microbiology faculty thesis advisors.

Requirements

M.S. Degree Requirements

The Department of Molecular, Cellular, and Biomedical Science (MCBS) offers a Master of Science in Microbiology. Students admitted to the M.S. program are required to conduct an independent research project in conjunction with a faculty adviser and must submit a thesis based on this research to a graduate committee, which determines its acceptability. Specific coursework is determined in conjunction with the graduate committee.

A minimum of 30 credits, including 6-10 thesis credits (MCBS 899 Master’s Thesis), and a minimum of two other graduate level courses at the 800 or 900-level in the area of microbiology, are required. All M.S. students are required to enroll in and attend seminar (MCBS 997) every semester and present one seminar each year. A thesis and a formal defense are also required. In addition, the student must submit at least one manuscript for publication to a peer-reviewed journal.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tr>
<td>BIOL 804</td>
<td>Plant-Microbe Interactions</td>
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<td>MICR 805</td>
<td>Immunology</td>
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<td>Immunology Laboratory</td>
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<td>GEN 804</td>
<td>Genetics of Prokaryotic Microbes</td>
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<td>GEN 813</td>
<td>Microbial Ecology and Evolution</td>
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<td>GEN 817</td>
<td>Molecular Microbiology</td>
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<td>NR 806</td>
<td>Soil Ecology</td>
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<td>ANFS 933</td>
<td>Design, Analysis, and Interpretation of Experiments</td>
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<td>BCHM 825</td>
<td>Cell Phenotyping and Tissue Engineering Laboratory</td>
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<td>BCHM 853</td>
<td>Cell Culture</td>
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<td>BCHM 854</td>
<td>Molecular Biology Research Methods</td>
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<td>BIOL 811</td>
<td>Experimental Design &amp; Analysis</td>
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<td>BIOL 902</td>
<td>Writing and Publishing Science</td>
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<td>BIOL 950</td>
<td>Scientific Communication</td>
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<td>GEN 812</td>
<td>Programming for Bioinformatics</td>
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<td>GRAD 891</td>
<td>National Science Foundation Graduate Research Fellowship Preparation</td>
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<td>GRAD 890</td>
<td>Ethics in Research and Scholarship</td>
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<td>LSA 900</td>
<td>College Teaching</td>
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<td>MATH 835</td>
<td>Statistical Methods for Research</td>
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<td>MCBS 901</td>
<td>Introduction to Research in the Life Sciences</td>
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<td>MCBS 913</td>
<td>Applied Bioinformatics</td>
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<td>MCBS 910</td>
<td>Cell Signaling Networks Across the Kingdoms</td>
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<td>MCBS 997</td>
<td>Seminar</td>
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<td>NR 905</td>
<td>Grant Writing</td>
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<tr>
<td>NR 900</td>
<td>Analysis of Ecological Communities and Complex Data</td>
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Approved courses for the Microbiology Ph.D. and M.S. programs:

Biological Sciences

- BIOL 804 Plant-Microbe Interactions
- MICR 805 Immunology
- MICR 815 Immunology Laboratory
- GEN 804 Genetics of Prokaryotic Microbes
- GEN 813 Microbial Ecology and Evolution
- GEN 817 Molecular Microbiology
- NR 806 Soil Ecology

Additional non-disciplinary courses to consider:

- ANFS 933 Design, Analysis, and Interpretation of Experiments
- BCHM 825 Cell Phenotyping and Tissue Engineering Laboratory
- BCHM 853 Cell Culture
- BCHM 854 Molecular Biology Research Methods
- BIOL 811 Experimental Design & Analysis
- BIOL 902 Writing and Publishing Science
- BIOL 950 Scientific Communication
- GEN 812 Programming for Bioinformatics
- GRAD 891 National Science Foundation Graduate Research Fellowship Preparation
- GRAD 890 Ethics in Research and Scholarship
- LSA 900 College Teaching
- MATH 835 Statistical Methods for Research
- MCBS 901 Introduction to Research in the Life Sciences
- MCBS 913 Applied Bioinformatics
- MCBS 910 Cell Signaling Networks Across the Kingdoms
- MCBS 997 Seminar
- NR 905 Grant Writing
- NR 900 Analysis of Ecological Communities and Complex Data
Student Learning Outcomes

All MCBS graduates will be able to:

• Critically apply theories, methodologies, and knowledge to address fundamental questions in their primary area of study.
• Pursue research of significance in the discipline or an interdisciplinary or creative project. Students plan and conduct this research or implement this project under the guidance of an advisor while developing the intellectual independence that typifies true scholarship.
• Demonstrate skills in oral and written communication sufficient to publish and present work in their field and to prepare grant proposals.
• Follow the principles of ethics in their field and in academia.
• Demonstrate, through service, the value of their discipline to the academy and community at large.
• Demonstrate a mastery of skills and knowledge at a level required for college and university undergraduate teaching in their discipline and assessment of student learning.
• Interact productively with people from diverse backgrounds as both leaders/mentors and team members with integrity and professionalism.

Graduates of the Microbiology M.S. degree program will be able to:

• Demonstrate strong foundational knowledge in microbiology theory and practice, and sub-disciplinary and cross-disciplinary knowledge specific to the student’s research area.
• Critically analyze and interpretate the primary literature.
• Integrate knowledge by 1) synthesizing research questions and/or hypotheses, 2) designing, executing, and interpreting research and 3) contextualizing their contributions to the field of study.
• Demonstrate competency in laboratory safety, and specialized microbiological methods.
• Promote the importance of science, the discipline of microbiology, and microbes themselves to society by communicating the meaning and value of your scholarship across formal and informal forums.