

# MICROBIOME SCIENCES

<b>Graduate Program Head</b>	Carolee Bull
<b>Program Code</b>	MBIOM
<b>Campus(es)</b>	University Park
<b>Degrees Conferred</b>	Dual-Title
<b>The Graduate Faculty</b>	View ( <a href="https://secure.gradsch.psu.edu/gpms/?searchType=fac&amp;prog=MBIOM">https://secure.gradsch.psu.edu/gpms/?searchType=fac&amp;prog=MBIOM</a> )

Students electing this degree program through participating programs earn a degree with a Dual Title in the Ph.D., e.g., Ph.D. in (graduate program name) and Microbiome Sciences.

The following graduate program offers a dual-title in Microbiome Sciences: Plant Pathology.

The Microbiome Sciences Dual-Title Degree Program will be administered by the Department of Plant Pathology and Environmental Microbiology for the participating graduate programs. An executive committee with representatives from participating departments will maintain program definition, identify courses appropriate to the program, and recommend policy and procedures for the program's operation to the dean of the Graduate School and to the deans of the participating colleges.

## Admission Requirements

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-208-dual-titles/>).

For admission to pursue a dual-title degree under this program, a student must apply to (1) the Graduate School and (2) one of the participating major graduate programs; and then subsequently to (3) the Microbiome Sciences program through the program head. Students may only apply to the dual-title program once they have been enrolled in a major program. Once a student has been enrolled in a major program, application to the dual-title degree program can occur immediately or at any time before the end of the fourth semester, not counting summer terms. The application for the dual-title degree program may be completed after the qualifying examination in the major program, as long as the application takes place before the end of the fourth semester. Graduate students with research and educational interests in Microbiome Sciences may apply to the Microbiome Sciences Dual-Title Degree Program. Candidates must submit to the program head transcripts of their undergraduate and graduate coursework, a written personal statement indicating their interests in the interdisciplinary arena of Microbiome Sciences and the career goals they hope to work toward by attaining a Microbiome Sciences dual-title. Their dissertation adviser, if assigned, must also be provided. A strong undergraduate preparation in the basic sciences is expected, with evidence of an interest in multiple disciplines.

## Degree Requirements

To qualify for a dual-title degree, students must satisfy the requirements of the major graduate program in which they are enrolled, in addition to the minimum requirements of the Microbiome Sciences program. Students are required to have two advisers from separate disciplines: one individual serving as a primary adviser in their major degree program and a secondary adviser in an area within a field covered by the Dual-Title program and a member of the Microbiome Sciences faculty.

The major program adviser normally will also be a member of the Microbiome Sciences faculty. The two faculty advisers can represent different academic programs, but this is not required, as faculty from a scientifically diverse department could represent very different areas of expertise.

To fulfill the course requirements for the dual-title in Microbiome Sciences, students must complete a total of 15 credits including 2 credits of ECLGY 550 and at least 13 credits chosen in consultation with the adviser from an approved list of courses, with at least 3 credits in each of the following areas: microbial sciences, ecology and evolution, and bioinformatics and research tools. All students must pass a qualifying examination in their major field of study. The qualifying examination for the student's graduate major program will satisfy the qualifying examination for the dual-title degree program in Microbiome Sciences. The qualifying examination for the major program must take place before the end of the fourth semester to enable enrollment in the dual-title Microbiome Sciences program by that time. The qualifying examination committee will be composed of Graduate Faculty from the major program and may include, but is not required to include, a faculty member who holds appointments in both programs' Graduate Faculty.

In addition to the general Graduate Council requirements for Ph.D. committees, the student's Ph.D. committee must include Graduate Faculty from the major program and must also include at least one member of the Microbiome Sciences Graduate Faculty. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. If the chair of the Ph.D. committee is not also a member of the Graduate Faculty in Microbiome Sciences, the member of the committee representing Microbiome Sciences must be appointed as a co-chair. The Microbiome Sciences representative on the student's Ph.D. committee will develop questions for and participate in the evaluation of the comprehensive examination.

A Ph.D. dissertation that contributes fundamentally to the field of Microbiome Sciences is required. A public oral presentation of the dissertation is required, which may be part of the final defense within the major degree program. The dissertation must be accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School.

## Minor

A graduate minor is available in any approved graduate major or dual-title program. The default requirements for a graduate minor are stated in Graduate Council policies listed under GCAC-600 Research Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>) and GCAC-700 Professional Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>), depending on the type of degree the student is pursuing:

- GCAC-611 Minor - Research Doctorate (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-611-minor-research-doctorate/>)
- GCAC-641 Minor - Research Master's (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-641-minor-research-masters/>)
- GCAC-709 Minor - Professional Doctorate (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-709-professional-doctoral-minor/>)
- GCAC-741 Minor - Professional Master's (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-741-masters-minor-professional/>)

## Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding (<https://gradschool.psu.edu/graduate-funding/>) section of The Graduate School's website. Students on graduate assistantships must adhere to the course load limits (<https://gradschool.psu.edu/graduate-education-policies/gsad/gsad-900/gsad-901-graduate-assistants/>) set by The Graduate School.

## Courses

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

## Learning Outcomes

1. Dual-title graduates will have an understanding of microbiome diversity, dynamics, and measurement methods which will qualify them for positions in academia, government agencies, or industry.
2. Dual-title graduates will have laboratory and computer skills for characterizing the composition and function of microbiomes and be able to relate microbiome characteristics to relevant information from associated hosts and ecosystems (metadata).
3. Dual-title graduates will generate meaningful hypotheses and interpret data in ways that lead to solution of novel problems in microbiome sciences.
4. Dual-title graduates will recognize the means for pursuing diverse career opportunities and articulate professional and ethical issues in the field of microbiome sciences.