

BIOL 504 / MICROBIOME-HOST INTERACTIONS

1. General Course Information

Course Title: Microbiome-Host Interactions

Course Code: BIOL 504

Course Component(s): Seminar

Year & Term: 2027 Winter

Units: 3.0

Mode of Instruction: In Person

2. Course Description

Calendar Description: Students explore microbiomes and their interactions with plant and animal hosts, emphasizing primary literature, experimental design, and microbiome data analysis.

Course Learning Outcomes (CLOs)

By successful completion of this course, students will be able to:

1. Explain how host-associated microbiomes influence host health, ecology, and evolution to evaluate the functional importance of microbes across biological systems.
2. Critically evaluate primary research literature to identify knowledge gaps, assess scientific evidence, and synthesize current understanding of microbiome-host interactions.
3. Develop testable hypotheses and analytical approaches to investigate questions related to microbiome structure and function.
4. Analyze and interpret microbiome datasets in R to generate reproducible and statistically supported conclusions.
5. Communicate and defend scientific interpretations through written, oral, and collaborative activities to develop transferable skills relevant to research, biotechnology, healthcare, environmental science, and other data-driven professions.

3. Assessment and Evaluation

Assessment	Due Date	Weight	CLOs
Team Charter and Collaboration Plan	Week 2	2%	5

Course Outline

Microbiome System Group Presentation	Weeks 3 – 6 (Assigned individually)	15%	1,2,5
Peer Evaluation and Reflective Assessment	Weeks 3 – 6 (Week of presentation)	3%	5
Research Article Summary	Week 4	10%	2,5
Primary Literature Presentation	Weeks 7 – 10 (Assigned individually)	15%	1,2,5
Peer Review Critique	Week 10	15%	2,3,5
Presentation Quizzes	Weeks 3 - 10	10%	1, 5
Research Question, Hypothesis and Chalk Talk	Week 8	10%	3,4,5
Reproducible Data Analysis in R Markdown	Week 12	10%	3,4,5
Microbiome Analysis Report	Week 12	10%	1,3,4,5

Collaboration (20%), Synthesis (50%), and Analytical Skills (30%) collectively assess scientific knowledge, critical evaluation, quantitative analysis, communication, and professional skills.

Specific due dates for written assessment submissions will be posted on onQ at the beginning of the term.

Late and Missed Assessments

Written assignments include suggested and hard deadlines, followed by a 72-hour grace period. Presentation accommodations require communication with the instructor. The lowest two quiz grades will be dropped.

Assignment Submission Policy

Written assignments are associated with two deadlines:

Course Outline

- a) Soft deadline: Students who submit by this date will receive a 5% bonus on the assignment grade. The bonus applies only to that assignment and cannot increase an assignment grade above 100%.
- b) Hard deadline: This is the official due date for the assignment.

Grace period: Assignments submitted **within 72 hours of the hard deadline** will be accepted without penalty.

After the 72-hour grace period, late submissions will not be accepted unless alternative arrangements have been approved in advance or are supported through university accommodation processes.

Examples:

- Grade = 82%, submitted by soft deadline → recorded grade = 87%.
- Grade = 98%, submitted by soft deadline → recorded grade = 100%.
- Grade = 82%, submitted after soft deadline but before hard deadline → recorded grade = 82%.
- Grade = 82%, submitted within the 72-hour grace period → recorded grade = 82%.

Participation, Presentation Attendance, and Quizzes

Presentation quizzes are completed online, and access is provided during class through a QR code displayed at the presentation. Students are therefore expected to attend the presentation session to complete the associated quiz.

Students who are unable to attend a presentation should contact the instructor as soon as reasonably possible. Where feasible, presentations will be recorded and made available for review. Students who miss a presentation and wish to complete the associated quiz must request access to the recording and quiz **within one week** of the presentation date. Requests received more than one week after the presentation will normally not be accommodated.

- The one-week window is intended to balance flexibility for students experiencing scheduling conflicts or unexpected absences with the need to keep course activities moving forward.

Students with approved academic accommodations should discuss any required arrangements with the instructor as early as possible.

Assessment Descriptions

Collectively, the assessments in this course are designed to mirror the research process, from evaluating scientific literature and developing research questions to analyzing data, participating in peer review, and communicating scientific findings.

Team Charter and Collaboration Plan (2%)

Student teams will develop a collaboration agreement that establishes expectations for communication, participation, responsibilities, conflict resolution, and project management. The goal is to promote effective teamwork and accountability throughout the course.

Microbiome System Group Presentation (15%)

Working in small groups, students will introduce a microbiome-host system and synthesize current scientific understanding of the interactions between hosts and their associated microbial communities. Presentations should highlight important findings from the primary literature, identify knowledge gaps, and stimulate class discussion. This assessment builds on the microbiome presentations used in previous versions of the course.

Peer Evaluation and Reflective Assessment (3%)

Students will provide constructive feedback on team member contributions and reflect on their own participation, communication, and growth as collaborative scientists.

Research Article Summary (10%)

Students will learn how to critically read and summarize a primary research article. The goal is to identify the research question, experimental approach, major findings, and broader significance of the study while communicating scientific information clearly and concisely.

Primary Literature Presentation (15%)

Students will present and lead a discussion of a primary research article related to microbiome-host interactions. Presentations should evaluate the study's hypotheses, methods, results, and limitations while facilitating scientific discussion among peers. This expands upon the article presentation component from the previous course offering.

Peer Review Critique (15%)

Students will examine a microbiome-related journal article for which both the manuscript and peer-review history are publicly available. Students will evaluate reviewer comments, author responses, and manuscript revisions to better understand the scientific publishing and peer-review process.

Presentation Quizzes (10%)

Short quizzes associated with student presentations are designed to encourage engagement with course material, reinforce key concepts, and promote active participation in discussions. The lowest two quiz grades will be dropped.

Research Question, Hypothesis, and Chalk Talk (10%)

Students will develop a novel microbiome-related research question and formulate testable hypotheses. Using a brief chalk-talk format, students will communicate the rationale, predictions, and proposed experimental approach while receiving feedback from peers and the instructor.

Reproducible Data Analysis in R Markdown (10%)

Students will learn to analyze microbiome sequence data using R and reproducible workflows. Students will explore data, conduct statistical analyses, and present their methods, code, and results in an R Markdown document. This assessment builds upon the microbiome analysis assignment from the previous course offering.

Microbiome Analysis Report (10%)

Students will analyze a microbiome dataset to evaluate a biological hypothesis and communicate their findings in a scientific report. The report should integrate statistical analyses, visualizations, interpretation of results, and discussion of biological significance.

4. Course Schedule (Tentative)

Weeks 1-2: Introduction to microbiomes and primary literature

Weeks 3-5: Microbiome system presentations

Weeks 6-8: Omics approaches, QIIME2 overview, and R tutorials

Weeks 9-11: Peer review, hypothesis development, and data analysis

Weeks 12-13: Project presentations and course reflection

Detailed weekly schedule to be finalized.

5. Required Materials and Costs

No required textbook. Course materials consist of peer-reviewed research articles and instructor-provided resources. Estimated cost: \$0.

6. Use of Generative AI Tools

Students may use generative AI tools for brainstorming, language editing, and improving clarity of written work unless otherwise specified. AI-generated analyses, interpretations, citations, code, or scientific content may not be submitted without explicit permission. Any use of generative AI must be disclosed in an acknowledgements statement describing the tool used and how it contributed to the work.

7. Institutional Policies and Resources

Students are responsible for familiarizing themselves with Queen's University policies and resources related to academic integrity, accessibility and accommodations, technology use, and mental health and wellness. The official Queen's Institutional Course Policies and Resources can be found at:

[Course Policies](#)

8. Additional Elements

Approach to Instruction

This course is designed around the principle that students learn most effectively when they actively engage with course material and reflect on their own learning. Course activities will emphasize application, discussion, problem-solving, and engagement with scientific evidence rather than passive memorization. Students will be encouraged to develop metacognitive skills by reflecting on their learning strategies, evaluating their understanding of key concepts, and using feedback to improve over time.

The course also recognizes that learning is a shared responsibility. My role is to provide a structured, supportive, and inclusive learning environment; students are expected to actively participate in learning activities, seek feedback, and engage thoughtfully with course materials.

Integration of Student Feedback

Student feedback plays an important role in the ongoing development of this course. Feedback collected through course evaluations, informal discussions, and anonymous surveys is used to identify aspects of the course that support learning and areas that could be improved. Previous student feedback has informed revisions to course activities, assessment structure, and learning resources to better support student engagement and success.

Inclusive and Respectful Classroom Expectations

This course is committed to fostering a learning environment that is respectful, inclusive, and supportive of diverse perspectives, experiences, and backgrounds. Students are expected to engage respectfully with classmates and instructors, contribute constructively to discussions, and approach differences in viewpoints with curiosity and professionalism.

Questions, mistakes, and intellectual risk-taking are valued as important components of the learning process. All members of the course share responsibility for creating a welcoming and supportive learning community.

Communication Policy

Clear communication is essential for success in this course. Course announcements and updates will be posted on OnQ. Students are encouraged to seek assistance when needed and to communicate proactively regarding course-related concerns.

Email is the preferred method of communication for course-related matters.

Emails will typically receive a response within 2 business days during the work week. Communications received on weekends or holidays may receive a response on the next business day.

Learning Resources and Support

Success in university involves more than mastering course content. Students are encouraged to develop skills in time management, study strategies, critical thinking, and professional communication. Throughout the course, resources and guidance will be provided to help students develop these skills alongside disciplinary knowledge.

Students are also encouraged to make use of Queen's academic support services, library resources, and student wellness programs when appropriate.

Opportunities for Student Choice

Where possible, students will have opportunities to exercise choice in their learning, such as selecting topics for assignments, choosing examples relevant to their interests, or pursuing independent exploration of course-related questions. Providing opportunities for choice helps students connect course concepts to their own interests and promotes ownership of the learning process.