

The Microbiome – Spring 2024

MCB 4320C and MCB 6670C

3 credit hours

Brief Background: Environmental microbiologists began the study of uncultured microbial life in the early 1990s. The idea was to start to understand the breadth of microbial diversity across a wide variety of habitats using methods that do not require culturing of the organisms. During this period, the technology and data analysis explosion also began in genomics. Environmental microbiologists took full advantage of these new tools and found diverse life in many places. By about 2005, those outside of microbiology began to take notice of these new tools and became interested in discovering microbes associated with their environments of interest. That included biomedical scientists, ecologists, agriculturalists, taxonomists, entomologists, and others. This has led to a sea of papers investigating the collection of microbes associated with eukaryotes.

The collection of microorganisms that inhabit a specific environment, their genomes (i.e., genes), and the surrounding environmental conditions are referred to as the microbiome. The microbiome includes all microbial life: bacterial, archaeal, fungal, and viral. Microbiomes exist on and within plants, animals, insects, amphibians, birds, etc. They also live in niches to themselves in a wide variety of terrestrial, marine, and aquatic environments. Many of these environments are extreme, including hot springs, deep ocean thermal vents, and subsurface rock formations. Given the many environments in which microbiomes thrive, no single course or group of courses can hope to cover them adequately. However, this course intends to teach students how microbes are associated with different niches, including humans, animals/insects, plants, soils, water, and polluted environments. Modern tools available to analyze the microbiome will also be taught. Guest speakers may be invited for a Q&A on certain topics. Since there are no proctored exams in this course, the weekly content will be assessed in quizzes and other assignments, with a diversity of assessment-type (e.g., multiple-choice, multiple-answer, short response).

In this course, active learning will be encouraged. The course will include an ongoing capstone project, with a specific microbial niche in mind. This question and its importance will be addressed early in the course. In succeeding weeks, students will learn approaches, methods, and technologies to address the topic. Consistent with collaboration in any research project, students will be introduced early in the semester and work in small teams. Throughout the project, students will apply concepts from course lectures, exploring how theoretical knowledge translates into practical scenarios. This exploration will contribute to the advancement of their chosen microbiome topic. Milestones and scaffolding assignments throughout the course will be presented, to ensure that you make consistent and significant progress on the project throughout the semester. Guided by instructors, students will receive feedback and support at various checkpoints, ensuring their progress aligns with project objectives. The culmination of this project is a Showcase structured around student team presentations on their topic, in a TEDx style. During this phase, students will share their projects with classmates, fostering interaction and knowledge exchange. This exchange will not only showcase their discoveries but also provide an opportunity for reflection on the skills and insights gained.

The course will be entirely web-based, and all lectures will be delivered online. The reading assignments, course lecture materials, and hands-on individual or team activities will be posted weekly.

Instructors:

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The best way to contact us is via E-learning mail, or we can set up a time for individual phone calls and zoom sessions.

Pre-requisites: This course has introductory microbiology (MCB 3020 or MCB 3023 or equivalent) as a prerequisite with a minimum grade of C and is intended for majors in the Life Sciences. It will be taught at the senior level, and its primary objective is to increase microbiome knowledge and appreciation.

Course Objectives:

- 1. Students will be able to understand what the microbiome is and the principles that drive microbial life in different niches.**
- 2. Students will be introduced to how microbial omics data is used to understand the human microbiome and its role in human health.**
- 3. Students will be introduced to the modern technologies used in microbiome research. By understanding the technologies, the students can learn which biological questions can be asked and answered given today's tools.**
- 4. Students will learn how to analyze and interpret primary scientific literature in the microbiome. They will lead presentations (“journal clubs”) on these topics and engage in ongoing and meaningful discussion.**
- 5. Students will collaborate in analysis and interpretation of the state of research in an area of interest in the microbiome. They will present their findings to the class as part of a showcase at the end of the term.**

e-Learning system: The course will be managed entirely through the e-Learning in the Canvas system (one of two big orange buttons at <https://elearning.ufl.edu/>). If you are not familiar with this system, you need to become acquainted with it for this course. The LSS homepage contains tips and tutorials for students as well as [computer requirements](#). It is your responsibility to become familiar with e-Learning in Canvas and to ensure that you have the appropriate browsers, settings, internet speed, etc. For any technical questions regarding Canvas, please visit the elearning site (https://elearning.ufl.edu/help/Student_Faq) and/or the UF Help desk (<http://helpdesk.ufl.edu/>). They can address technical issues such as being unable to view course materials, not being able to access the quizzes, not being able to send mail, etc. **All technical issues/questions/comments should go to the Help Desk first (352-392-HELP)**. They are the experts. The Help Desk suggests that if you encounter any problem (error messages, etc.), you take a screenshot of the problem and save it. This will help the Help Desk in fixing your problem.

If you encounter a problem that the HELP DESK cannot fix, please send a help request to the Technical Support Center of the Microbiology & Cell Science Department. Please fill out your request at <http://microcell.ufl.edu/support/index.php>. The form will ask for your name, number, email, and location. In the location field, please indicate “online course.”

Office Hours: Since this is a web-based course, office hours will be online. The office hours will be conducted via zoom. Office hours are difficult to schedule since our students have such varied schedules. We will always be available to answer questions by email or to set up an individual phone or zoom conversation. Just contact us to arrange it.

Email and Announcements: All email communication regarding this course will be done through the mail function of E-learning in Canvas. This mail system is private and secure. You are responsible for checking your E-learning Mail and Announcements **frequently** to stay updated on the course. **Please check the course a minimum of two times per week** to ensure you are not missing any critical communications. As instructors, we will respond to your questions and emails promptly. Maintaining all email communication through Canvas instead of other email domains reduces the chance that discussions will get lost among outside accounts. When sending an email through e-Learning in Canvas, you can also forward the email to the recipient’s ufl account. Please use this option if you have an urgent message. If you receive a course email (from Canvas) to your ufl account, please note that you cannot simply hit “reply” to the email. You must login to Canvas to respond through the mail function.

Topical outline of weekly modules (all times Eastern):

Wk.	Dates	Topics for the week:
1	Jan 9-15	Course Orientation History of the study of the microbiome
2	Jan 16-22	The great plate anomaly: Why count microbes using high throughput sequencing of marker genes? Quiz 1
3	Jan 23-29	Overview of 16S rRNA data analysis and interpretation
4	Jan 30 – Feb 5	Around the world in eight microbiomes – Work week #1 Quiz 2
5	Feb 6-12	Selected topics in the human microbiome in health and disease – Part 1 Journal Club #1 – Guided questions and discussion about scientific papers
6	Feb 13-19	Selected topics in the human microbiome in health and disease – Part 2 Quiz 3
7	Feb 20-26	Selected topics in the animal/insect microbiome Journal Club #2 – Guided questions and discussion about scientific papers
8	Feb 27 – Mar 4	Guest Lecture Journal Club #3 – Guided questions and discussion about scientific papers
9	Mar 5-8, 18	Selected topics in the soil microbiome
	Mar 9-16	Spring Break
10	Mar 19-25	Selected topics in the plant microbiome Quiz 4
11	Mar 26-Apr 1	Around the world in eight microbiomes – Work week #2
12	Apr 2-Apr 8	Selected topics in the water microbiome

13	Apr 9-15	The microbiome in polluted environments and bioremediation Quiz 5
14	Apr 16-24	Showcase on the course's "Around the world in eight microbiomes" project Quiz 6 (optional)

The scaffolding Capstone assignments will be distributed across the semester schedule.

Grading Scale:

Percentage

A	90 or above
A-	87-89
B+	84-86
B	80-83
B-	77-79
C+	74-76
C	70-73
C-	67-69
D+	64-66
D	60-63
D-	57-59
E	56 or below

For more information on grade points and UF grading policies, see

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Assessments

Students will be introduced to smaller groups early in the semester, after the drop-add period. Any team-structured assignments will be executed by the students collectively within these groups. For the Journal Club and Around the World in Eight Microbiomes project assignments, both individual and team assignments will be built in. Quizzes are meant to be completed only by the individual.

Journal Club

At three points in the semester, students will engage in their group in what is called a Journal Club. This is a regular gathering of scientists to discuss a scientific paper or papers. Typically, one student will present a paper more in-depth, and the whole group will discuss it. Such platforms provide a few benefits: 1) staying abreast of new knowledge and research, 2) improvement of scientific reading skills, 3) practice presenting, both orally and visually, 4)

networking and improving dialogue and interpersonal relationships with others, 5) practice interpretation of data. Such discussions encourage improvement of outcomes in research.

Here, three journal clubs will be held virtually. Each student will be assigned to pick and present a paper at one of the journal clubs. They will provide the citation for the paper, their take-away, and a short, recorded 10-15-minute presentation for their peers to watch. Because the groups will be smaller, it is expected that only 2-3 students per group will present their papers at each Journal Club. Students will be expected to review the presentations, ask questions and discuss the papers with one another throughout the span of the journal club, with active dialogue assessed on the Perusall app. **Presentations will not be accepted late.** They must be posted in Canvas by the due date to allow instructors ample time to integrate the presentations into Perusall and open the student portals for active discussion. Discussion will be open for a full week. Specifics will be provided with the release of the assignment.

-Journal Club Presentation (1 per student– 8% of the grade)

-Journal Club Discussions (3 per student– 9% of the grade)

Quizzes

All quizzes are open book and unproctored. These quizzes are a *learning tool* so you may take each quiz up to **three times each** and only your last score of quiz will be recorded. A quiz will not be re-opened or reset if it is interrupted by technical difficulties. (NOTE: A slow internet connection may affect timed quizzes, but it is your responsibility to use a connection at the speed suggested in the e-learning homepage.) The last quiz of the semester may be more difficult than the previous ones, as it will be cumulative. If you have done well on the previous five quizzes and are satisfied with your score, you do not need to take this assessment. **We will drop the lowest grade of any of the six quizzes.**

Following the close of each quiz window, you have 10 calendar days to contest your quiz/exam grade in an email to us (i.e., a student cannot request a grade correction on quiz 2 during the last week of the course). Please note that you can ask a question about or discuss any quiz question at any time during the semester for the purposes of understanding and education. **Any requests for points must include a clear justification of your response.** For example, please do not send an email saying, “tell me why I am wrong”, but rather send an email saying, “this is why I think my response is a better answer or is as complete or appropriate....”

Quizzes will open on Fridays and remain open for a full week, closing the following Friday, to allow flexibility for taking the quiz according to your schedule.

“Around the World in 8 microbiomes” Capstone: Scaffolding Assignments and Showcase

In this course, active learning will be encouraged. The course will include an ongoing capstone project, with a specific microbial niche in mind. This question and its importance will be addressed early in the course. In succeeding weeks, students will learn approaches, methods, and technologies to address the topic. Consistent with collaboration in any research project, students will be introduced early in the semester and work in small teams.

Throughout the project, students will apply concepts from course lectures, exploring how theoretical knowledge translates into practical scenarios. This exploration will contribute to the advancement of their chosen microbiome topic. Milestones and scaffolding assignments throughout the course will be presented, to ensure that you make consistent and significant

progress on the project throughout the semester. This includes a variety of smaller projects, including 1) critical analysis and synthesis of the scientific literature, 2) an interview with a scientist in your topic area, 3) an original 2-page proposal for future work regarding a scientific question relevant to their microbial niche, and other 4) visual, written, and oral representations of the topic. Guided by instructors, students will receive feedback and support at various checkpoints, ensuring their progress aligns with project objectives.

The culmination of this project is a Showcase structured around student team presentations on their topic, in a TEDx style. For this Showcase, your team will integrate your scaffolding assignments into a short, engaging, 10-15-minute video presentation, structured as if you were giving a TEDx talk on the topic. We will share the graphics and videos with the class as the Showcase Module (Module 14). During this phase, students will share their projects with classmates, fostering interaction and knowledge exchange. This exchange will not only showcase their discoveries but also provide an opportunity for reflection on the skills and insights gained.

Assignments for MCB6670C – graduate students only

As requested by UF CALS Curriculum Committee, assignments must account for at least a 15% difference in graded material between the undergraduate and graduate levels. To account for these differences, requirements will be posted to graduate students during the quizzes and other, related assessments. Separate MCB6670C-specific quizzes will be posted, accordingly. Graduate students may also expect to have some additional tasks to complete in order to elevate their contributions to team assignments. Additional requirements for MCB6670C students will be made available within the instructions for those individual and team assignments.

Late submissions

If we accept a late submission on a particular assignment, this will be made known to students in advance, i.e., when the assignment is released. Under this policy, such an assignment can be submitted up to two days late, with a 10% late deduction each day. We will not accept late submissions on journal club presentations, quizzes, or assignments structured around teamwork.

Assessment Breakdown

Assignment	% Weight
Journal Club (3 total) <ul style="list-style-type: none"> Includes 1 presentation (8%) and 3 discussions per student (9% total) 	17%
Quizzes (6 total – drop the lowest quiz) <ul style="list-style-type: none"> 5 of 6 quizzes will count towards the final grade 	45%
“Around the World in 8 microbiomes” Project <ul style="list-style-type: none"> Includes final submission, as well as related, scaffolding assignments scattered throughout the semester 	26%
Virtual Symposium Engagement	4%
Reflection Assignments	8%
TOTAL	100%

Make up and attendance policy: This is an online course that gives students enormous scheduling flexibility. Every assignment will be given at least double the adequate time needed to complete the assessment based on past experiences. Hence, accommodation for up to double the time needed to take an exam is already included in the assessment periods. As a result, there will be no makeup quizzes for reasons not accepted by the University. There are no make-ups or non-penalized extensions without proper documentation of excused events and prior notification (in the case of excused, planned absences that fall under the categories of the UF policy). Unexpected illnesses documented by a physician (not a physician's assistant) are grounds for a makeup quiz. Otherwise, the deadlines are real and strict. **As a student, it is your choice to complete all quizzes and assignments.** If you choose not to take a quiz or assignment because of another activity (work, social engagement, etc.), you will get a zero for the grade.

There are no make-ups or extensions for module quizzes as the lowest quiz score will be dropped. Quizzes not taken by their due date for any reason will count as a zero. Up to one of the lowest quiz grades can be dropped. **Missed assignments count as a zero. There are no late submissions for team-based assignments.**

Excused absences are consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation.

Textbook: There is no required or recommended textbook.

Course structure: The course is structured as 14 lessons or modules – one each week of the semester. Each week will cover a different topic. The topics are built on each other, so in order to understand a topic in week 6, for example, it is necessary that you understand the material from week 1. The first 4 weeks of the course lay the foundation for the remaining weeks.

Each week begins on Tuesday morning, which is the day by which a new week's worth of material will be posted. Every effort on our part will be made to post material prior to Tuesdays, but that may not always happen. For each week's lesson, there may be several items to complete. Keep the learning objectives in mind as you learn the week's material. After reading the learning objectives, please go through the week's material in the order presented. After you go through the material in the order presented, you are always free to return and visit any of the content.

Academic Honesty: As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your

individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dsoufl.ed/SCCR/honorcodes/honorcode.php>.

Additional comments regarding academic integrity:

Students are encouraged to discuss material with each other from the course, help each other understand concepts, study together, and even discuss assessment questions with each other once the quiz window is closed. However, the following is considered academic dishonesty, and I expect that no student will ever do any of the following:

- Have another person complete a quiz in this course
- Copy another student's quiz in this course
- Collaborate with anyone during a quiz in this course
- Discuss the questions and answers of a quiz with other students while the quiz window is still open
- Manipulate and/or distribute any materials provided in this course for any purpose (including course lecture slides).
- Use any materials provided by a previous student in the course

Software Use: All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

Campus Helping Resources: Students experiencing crisis or personal problems that interfere with their general wellbeing are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/*
 - Counseling Services
 - Groups and Workshops
 - Outreach and Consultation
 - Self-Help Library
 - Training Programs
 - Community Provider Database
- *U Matter, We Care:* If you or a friend is in distress, please contact umatter@ufl.edu or 352-392-1575 so that a team member can reach out to the student.
- *Career Resource Center, First Floor JWRU, 392-1601, www.crc.ufl.edu/*

Students Requiring Accommodations: Students requesting class accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructors when requesting accommodation.

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

Statement on Distance Education Courses

Should you have any complaints with your experience in this course, please visit <http://www.distance.ufl.edu/student-complaints>.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.