

MBIO 4480: Microbes in our Environment

Instructor: Dr. Matthew Bakker Matthew.Bakker@umanitoba.ca
Office: 414B Buller Building 204-474-7297
Use your U of M e-mail address to correspond with professors!

Course Description: This course offers a survey of microbial activities and microbiomes of importance, largely in human-associated environments such as microbiomes of people, plants and animals, microbial communities involved in waste treatment and in bioremediation, and plant pathogens. Strategies for bioprospecting for novel microorganisms with relevant properties will also be discussed.

Course dates: 6th of January - 7th of April, 2020
Class times: *Lecture:* MWF 10:30 am - 11:20 am
Location TBD
Instructor available for questions & discussion: 414B Buller,
MWF 11:30-12:00, or by appointment (to be arranged by e-mail)
Lab: see lab manual. *Lab instructor:* Dr. Damien Rivers
Prerequisites: A minimum grade of 'C' in each of MBIO 3030 (Microbiology III) and MBIO/CHEM 2370/2371 (Biochemistry II).
Course credits: 3.00

Background expected: This is a 4000 level course, which means that some assumptions are made with respect to background knowledge of biochemistry, microbial metabolism and molecular biology, as would have been taught in the prerequisite courses. Referring to general Biochemistry and Microbiology textbooks should provide the necessary background refreshers as needed.

Course Content Objectives: With respect to selected microbial communities that surround us, we will attempt to understand *who* is doing *what*, *where* these processes happen, and *why* these activities matter! We will also discuss methods & strategies for such inquiry (i.e., *how* do researchers gain these understandings?).

Learning objectives: Students will...

- gain an appreciation of microbial diversity and its importance, from an ecological and human perspective
- become familiar with several of the strategies used to study and observe the microbial communities around us
- gain insight into how microbiomes interact with larger host organisms, including humans
- practice reading primary scientific literature
- think critically about microbiological research, including experimental design, metadata, data interpretation, how conclusions are drawn from scientific observations, and the impact of these conclusions on every day life

Student responsibilities: Students are expected to attend class and participate in class discussions, take informal notes in class, provide feedback on the learning process, investigate

required topics from the bibliography provided during class, hand in their assignment on time, and comply with the evaluation requirements. *Expectations and responsibilities with respect to the laboratory component of this course will be provided by Dr. Damien Rivers during your first laboratory period.*

Reading list: There is no text book for this course. Rather, we will be drawing information from recent reviews and research publications. These references are available through the University of Manitoba e-library, and will be assigned as the course progresses. Every student is expected to know how to search for research articles and retrieve them through the university e-library system, when provided with a reference.

Evaluations: A *midterm exam (25%)* will be held in class on the 14th of February, and will include material covered through the 12th of February. This exam will be a mix of short and longer questions. Some questions will measure recall of materials, while some will require critical thinking about the material presented and integration of various elements from different lectures. The midterm exam cannot be deferred. If you choose not to write the midterm (i.e., if you are not in class on that day), the final exam shall count for 65% of your final grade.

Assignments (3 @ 5% each = 15%) will be used to provide guided experience reading primary scientific literature, evaluating claims drawn from experimental data, and to contrast alternative methods for addressing a similar experimental objective. Instructions specific to each assignment will be posted on UMLearn a minimum of 2 weeks prior to the due date. Assignments received up to 2 calendar days after the due date will be accepted with a 50% penalty. Assignments not submitted, or submitted more than 2 calendar days after the due date will receive a score of 0%.

Laboratory (20%); please check the lab syllabus for a specific breakdown of this score. A passing grade is required in the laboratory component to pass the course.

A *final cumulative exam (40%)* will be scheduled by the Student Records Office. The examination will consist of a mix of short and longer questions. Some questions will measure recall of material, some will require critical thinking about the material presented, and some questions will test integration of various elements from different lectures.

Feedback from the midterm exam and the first assignment will be provided prior to the voluntary withdrawal date, which is 18 March 2020. Both the lecture and the laboratory section of the course must receive a passing grade (50%) for the course to be passed.

Letter grades will only be assigned at the end of the term. Letter grades are assigned taking into consideration the grade distribution in the class and the University of Manitoba's descriptors (see <http://umanitoba.ca/student/records/grades/686.html>): A+ (Outstanding), A (Excellent), B+ (Very Good), B (Good), C+ (Satisfactory), C (Adequate), D (Marginal), F (Failure). The tentative grading scheme is: A+ (>90%), A (80-89.9%), B+ (75-79.9%), B (70-74.9%), C+ (65-69.9%), C (55-64.9%), D (50-54.9%), F (<50%, or <45% in final exam).

Reasonable Accommodation: Students with disabilities are directed to Student Accessibility Services to facilitate the implementation of accommodations.

Academic Dishonesty: Academic dishonesty will be met with disciplinary action. Read statements on academic integrity, including plagiarism, cheating and examination impersonation found in the University General Calendar and the Faculty of Science website (<https://www.sci.umanitoba.ca/undergraduate-students/academic-resources/academic-integrity-2/>).

Proposed course outline: *The following outline is subject to change based on timeliness of progress and other current events.*

Lectures 1-17: Introduction to microbial communities; the microbiome concept; profiling the structure of microbial communities; understanding functions performed by microbial communities; Assignment 1.

Lecture 18: midterm exam, in class

Lectures 19-36: Case studies of microbes and microbiomes in our environment, including human/animal microbiomes, microbial involvement in waste water treatment, plant diseases and disease suppression; bioprospecting for useful microorganisms; Assignments 2 & 3.

Lecture 37: review for cumulative final exam