UNIVERSITY OF CALGARY
FACULTY OF SCIENCE

Department of Biological Sciences
BI 186
403 220-3140
biosci@ucalgary.ca

COURSE OUTLINE

1. **Course:** CMMB 543, Environmental Microbiology - Winter 2021

   Lecture 01: MWF 09:00 - 09:50 - Online

Instructor	Email	Phone	Office	Hours
Dr Casey Hubert	chubert@ucalgary.ca	403 220-7794	EEEL 509E	By Appointment
Dr Michael Hynes	hynes@ucalgary.ca	403 220-8473	BI 429C	By appointment only

   Dr. Michael Hynes is the course coordinator.

   Online Delivery Details:

   This course is being offered online in real-time via scheduled meeting times, you are required to be online at the same time.

   To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor's permission.

   Lectures will be delivered by ZOOM. All students must have access to a computer with reliable internet access, a
   camera, and audio input and output on zoom. Lectures will not be recorded and posted, but Powerpoint presentations will be posted ahead of each class.

   Course Site:

   D2L: CMMB 543 L01-(Winter 2021)-Environmental Microbiology

   Note: Students must use their U of C account for all course correspondence.

2. **Requisites:**

   See section 3.5.C in the Faculty of Science section of the online Calendar.

   Prerequisite(s):
   Cellular, Molecular and Microbial Biology 343.

3. **Grading:**

   The University policy on grading and related matters is described in F.1 and F.2 of the online University Calendar.

   In determining the overall grade in the course the following weights will be used:

Component	Percent	Due Date if Applicable
Take-home Midterm 1	10	February 5th, 2021
Take-home Midterm 2	10	March 12th, 2021
On-line quizzes (6 quizzes, only the highest 3 marks will count)	15	TBA
Grant Proposal -Notification of Intent	10	February 22nd, 2021
Grant Proposal	20	March 29, 2021
Presentation	5	March 31, April 7,9,12, 14
Take-home final examination	30	April 26th, 2021

   Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	92 %	87 %	80 %	77%	73%	70 %	66 %	63%	60%	55 %	50 %

4. **Missed Components Of Term Work:**

   The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

   In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, then the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course.

5. **Scheduled Out-of-Class Activities:**

   There are no scheduled out of class activities for this course.

6. **Course Materials:**

   No Text Required. Most material taught from research articles and reviews. Links will be provided to these through D2L

   The following three books may be useful and are available in the Library:

   - Atlas, R. & R. Bartha. "**Microbial Ecology**", 4th edition.
   - Madigan et al. "**Brock Biology of Microorganisms**", (Brock), 12 th Ed. or higher
   - Lynch & Hobbie. "**Microorganisms in Action**".

   In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

   - A computer with a supported operating system, as well as the latest security, and malware updates;
   - A current and updated web browser;
   - Webcam/Camera (built-in or external);
   - Microphone and speaker (built-in or external), or headset with microphone;
   - Current antivirus and/or firewall software enabled;
   - Stable internet connection.

   For more information please refer to the UofC ELearning online website.

7. **Examination Policy:**

   Quizzes will be administered online through the course D2L site. Due dates will be communicated in advance, and there will be six such quizzes regularly spaced throughout the course. However, only the marks for the top three (3) quizzes will count towards the student's' final mark. Quizzes will be time limited. They will be available for students to complete for a minimum of three days (72 hours).

   Take-home exams will involve long-answer questions that will require more than rote memorization. Students will be asked to synthesize, invent, propose research, and express opinions. There will always be a choice of questions on these exams, and questions will be assigned a minimum of a week in advance.

   Students should also read the Calendar, Section G, on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

   There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

   For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section E.2 of the University Calendar.

   Writing quality WILL be part of the assessment for all course components.

10. **Human & Living Organism Studies Statements:**

Students will not participate as subjects or researchers in human studies.

See also Section E.5 of the University Calendar.

STUDIES IN THE BIOLOGICAL SCIENCES INVOLVE THE USE OF LIVING AND DEAD ORGANISMS. Students taking laboratory and field-based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping.

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

Students are expected to be familiar with Section SC.4.1 of the University Calendar.

11. **Reappraisal Of Grades:**

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See Section I.3 of the University Calendar.

a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections I.1 and I.2 of the University Calendar

b. **Final Exam:**The student shall submit the request to Enrolment Services. See Section I.3 of the University Calendar.

12. **Other Important Information For Students:**

a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, Mental Health Services Website) and the Campus Mental Health Strategy website (Mental Health).

b. **SU Wellness Services:** For more information, see www.ucalgary.ca/wellnesscentre or call 403-210-9355.

c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (svsa@ucalgary.ca) or phone at 403-220-2208. The complete University of Calgary policy on sexual violence can be viewed at (https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf)

d. **Misconduct:** Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. Research integrity, ethics, and principles of conduct are key to academic integrity. Members of our campus community are required to abide by our institutional Code of Conduct and promote academic integrity in upholding the University of Calgary's reputation of excellence. Some examples of academic misconduct include but are not limited to: posting course material to online platforms or file sharing without the course instructor's consent; submitting or presenting work as if it were the student's own work; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. Please read the following to inform yourself more on academic integrity:

Student Handbook on Academic Integrity

Student Academic Misconduct Policy and Procedure
Research Integrity Policy

Additional information is available on the Student Success Centre Academic Integrity page

e. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at procedure-for-accommodations-for-students-with-disabilities.pdf.

   Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head, Undergraduate of the Department of Biological Sciences, Heather Addy by email addy@ucalgary.ca or phone 403 220-6979. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See Section E.4 of the University Calendar.

f. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see Legal Services website.

g. **Student Union Information:** VP Academic, Phone: 403-220-3911 Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: 403-220-3913 Email: sciencerep@su.ucalgary.ca. Student Ombudsman, Email: ombuds@ucalgary.ca.

h. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction (USRI) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

i. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or non-academic misconduct, in addition to any other remedies available at law.

CMMB 543 Winter 2021

Lectures. Tentative schedule. Subject to change depending on enrolment, changes to Dr. Hubert's schedule, and other factors.

1,2,3, (MH) Introduction. Microbial cells, communities, and populations and

(Jan 11,13,15) their interactions.

4,5,6,7,8,9 (MH) Signalling and sensing in bacteria. Multicellular behaviour.

(Jan 18, 20,22,25,27,29) Biofilms

10 (MH) Nutrient cycling by microorganisms; Carbon, Sulphur,

(Feb 01) Phosphorus, and Iron cycles

11,12,13,14 (MH) Nitrogen cycle, free-living nitrogen fixation

(Feb 03, 05, Feb 08, 10) Plant Microbe Interactions: Nodulation and symbiotic N_2 fixation

15,16,17 (MH) Bacterial plant pathogens; Tumours; Gene for gene theory of

(Feb 12, 22, 24) resistance, effectors, PAMPs and the arms race

NB Reading Week/Term Break Feb 15-19

18,19 (MH) Fungal and viral pathogens of plants

(Feb 26, March 1)

20 (MH) Beneficial microbial interactions with plants:

(March 3) Mycorrhizae and PGPRs, Biocontrol of weeds and disease.

21,22, 23,24 (MH) Microbial interactions with animals. Rumen microbiology.

(March 5, 8, 10,12) Invertebrate microbiology and biocontrol of Insects

25, 26, 27 (MH) Viral Ecology, Predation and "protozoans"**;** bacteriocins

(March 15,17,19)

28, 29, 30, 31 (CH) Extreme environments. Extremophiles and their Biotechnology

(March 22, 24,26, 29)

April 2nd is Good Friday, April 5th is Easter Monday.

Lectures 32,33,34,35,36 Student presentations. Given by ZOOM. Details will be posted on D2L. If

(March 31, April 7,9,12,14) all slots are not required, Dr. Hubert will also lecture on March 31.

Course Outcomes:

- Describe the role of microorganisms in biogeochemical cycling, with specific emphasis on the Nitrogen, Carbon, and Sulfur cycles
- Explain how microbial cells sense their environment and respond to as single cells, and as multicellular aggregates and communities
- Outline fundamental concepts in plant pathology, including the gene-for-gene hypothesis, avirulence genes, and the hypersensitive response
- Describe important mutualistic symbioses between microbes and plants or animals, and how these symbioses have been investigated at the molecular level
- Explain how nutrient availability, predators, and other factors influence and control microbial growth in natural environments
- Generate hypotheses about mechanisms underlying microbial processes in nature, and design experiments that could test those hypotheses
- Formulate a proposal for original research in Microbial Ecology in the form of a mock grant application.

Electronically Approved - Dec 21 2020 09:11

Department Approval

Electronically Approved - Jan 04 2021 10:09

Associate Dean's Approval