



COURSE OUTLINE

1. **Course:** CMMB 563, Microbial Diversity - Fall 2023

Lecture 01 : MWF 11:00 - 11:50 in HNSC 124A

Instructor	Email	Phone	Office	Hours
Dr Peter Dunfield	pdunfie@ucalgary.ca	220-2469	BI 319D	TBA

To account for any necessary transition to remote learning for the current semester, courses with in-person lectures, labs, or tutorials may be shifted to remote delivery for a certain period of time. In addition, adjustments may be made to the modality and format of assessments and deadlines, as well as to other course components and/or requirements, so that all coursework tasks are in line with the necessary and evolving health precautions for all involved (students and staff).

In Person Delivery Details:

It is anticipated that most of the components of this course will be completed IN PERSON.

The regularly scheduled classroom times (MWF 11:00 - 11:50) will be used for lectures, the midterm, student presentations, and bioinformatics exercises.

The exercises and term paper components will be completed outside of class and submitted to the instructor.

If you are unable to attend any in-person events, please contact the instructor at least two days beforehand. Accommodations for missed in-class components will be made on a case-by-case basis.

Course Site:

D2L: CMMB 563 L01-(Fall 2022)-Microbial Diversity

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

Equity Diversity & Inclusion:

The University of Calgary is committed to creating an equitable, diverse and inclusive campus, and condemns harm and discrimination of any form. We value all persons regardless of their race, gender, ethnicity, age, LGBTQIA2S+ identity and expression, disability, religion, spirituality, and socioeconomic status. The Faculty of Science strives to extend these values in every aspect of our courses, research, and teachings to better promote academic excellence and foster belonging for all.

The Biological Sciences Equity Committee acknowledges there are persistent barriers that prevent such accessibility and hinder our progress towards EDI. Our representatives (faculty, staff, postdocs, graduate and undergraduate students) are committed to addressing any concerns and work towards proactive solutions that enact necessary change within the department. To submit anonymous questions, comments or concerns regarding EDI related issues, please reach out to our Chair, Arshad Ayyaz (_arshad.ayyaz@ucalgary.ca), or a committee representative of your choice at <https://science.ucalgary.ca/biological-sciences/about/equity-diversity-and-inclusion>

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 or consent of the Department.

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:

Course Component	Weight	Due Date (duration for exams)	Modality for exams	Location for exams
Student presentation ¹	15%	Ongoing		
Research Grant Letter of Intent	5%	Oct 06 2023		
In Class Midterm	15%	Oct 20 2023 at 11:00 am (50 Minutes)	in-person	HNSC 124A
Bioinformatics Exercise 1	10%	Oct 30 2023		
Bioinformatics Exercise 2	10%	Nov 24 2023		
Research Grant Proposal	25%	Dec 01 2023		
Registrar Scheduled Final Exam	20%	Will be available when the final exam schedule is released by the Registrar	in person	Will be available when the final exam schedule is released by the Registrar

¹ Student presentations will be scheduled (one per class period) at various times throughout the term.

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 %	82 %	78%	74%	70 %	67 %	64%	61%	56 %	50 %

This course will have a Registrar Scheduled Final exam that will be delivered in-person and on campus. [The Final Examination Schedule](#) will be published by the Registrar's Office approximately one month after the start of the term. The final exam for this course will be designed to be completed within 2 hours.

NOTES:

1) The Midterm exam and Final exam will be IN PERSON. The Midterm will be in the regular classroom HNSC 124A.

2) Oral presentations and discussions will be conducted during scheduled class time. Individual students will be scheduled (one per class) at various times throughout the term. This exercise will involve an oral presentation of a recent research paper, which will be provided one week in advance of the presentation. Participation in question periods after each presentation will be marked as a bonus.

3) Details of the Research Grant (Letter of Intent and Proposal components) will be given in the first class. These may be worked on anytime until the due dates.

4) The two exercises are take-home assignments that will be provided 1 week before their due dates. These will require online bioinformatics analyses explained previously in class lectures.

The University of Calgary offers a [flexible grade option](#), Credit Granted (CG) to support student's breadth of learning and student wellness. Faculty units may have additional requirements or restrictions for the use of the CG grade at the faculty, degree or program level. To see the full list of Faculty of Science courses where CG is not eligible, please visit the following website: <https://science.ucalgary.ca/current-students/undergraduate/program-advising/flexible-grading-option-cg-grade>

4. Missed Components Of Term Work:

In the event that a student legitimately fails to submit any online or in-person assessment on time (e.g. due to illness, domestic affliction, 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, or possible exemption and reweighing of components. Absences not reported within 48 hours will not be accommodated. Students may be asked to provide supporting documentation ([Section M.1](#)) for an excused absence, See [FAQ](#).

If an excused absence is approved, options for how the missed assessment is dealt with is at the discretion of the coordinator or course instructor. Some options such as an exemption and pro-rating among the components of the course may not be a viable option based on the design of this course.

Most marking components can be completed at home (Research Grant Letter of Intent, Research Grant Proposal,

Exercise 1, Exercise 2), or can be scheduled flexibly (Student Presentation) and are therefore obligatory. Accommodation for missed components (e.g. extended deadlines or make-up exams) will be assessed on a case-by-case basis.

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

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

6. **Course Materials:**

Recommended support readings will be provided. These are usually review papers and will be available via the U of C library resources.

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:**

No aids are allowed on tests or examinations.

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.

The course includes written work for grading. Quality of writing will affect the grade.

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 their [website](#) 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 [here](#).
- d. **Student Ombuds Office:** A safe place for all students of the University of Calgary to discuss student related issues, interpersonal conflict, academic and non-academic concerns, and many other problems.
- e. **Student Union Information:** [SU contact](#), Email your SU Science Reps: science1@su.ucalgary.ca, science2@su.ucalgary.ca, science3@su.ucalgary.ca,
- f. **Academic Accommodation Policy:**

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The student accommodation policy can be found at: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf>

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf>.

Students needing an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, by filling out the [Request for Academic Accommodation Form](#) and sending it to Lisa Gieg by email imgieg@ucalgary.ca preferably 10 business days before the due date of an assessment or scheduled absence.

- g. **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](#)
[Faculty of Science Academic Misconduct Process](#)
[Research Integrity Policy](#)

Additional information is available on the [Student Success Centre Academic Integrity page](#)

- h. **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.
- i. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIP). 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.
- j. **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.

Lecture Topics will include:

(NOTE: Outline is tentative, some content and/or dates may change).

1 (Sept 6) Course outline, course business

2-3 (Sept 8, 11) The history of life; Geological evidence of the dawn of microbial life; Microfossils

4-5 (Sept 13, 15) The many trees of life

6-7 (Sept 18, 20) Microbial taxonomy

8 (Sept 22) Genotyping and strain delineation

9-10 (Sept 25, 27) Cultivation-independent analyses of diversity: Next-gen sequencing of 16S rRNA genes

11 (Sept 29) Cultivation-independent quantitative analyses: FISH, qPCR

12-13 (Oct 2, 4) Cultivation-independent methods for linking community structure and function.

14 (Oct 6) Metagenomics

Oct 6, Letters of intent for grant proposal due

Oct 9, Thanksgiving, no class

15 (Oct 11) Metagenomics

16 (Oct 13) Example, anaerobic methane oxidation

17-18 (Oct 16, 18) Microbial genomics

Oct 20, In Class Midterm

19-20 (Oct 23, 25) Analysis of microbial genomes using IMG/MER (in class bioinformatics exercise)

21-22 (Oct 27, 30) SAGs and MAGs (Single cell genomes and metagenome-assembled genomes)

23-24 (Nov 1, 3) Microbial Dark Matter

25-26 (Nov 6, 8) The uncultured majority

Nov 12-18, Reading Week no classes

27-28 (Nov 10, 20) Cultivation bias

29-30 (Nov 22, 24) New cultivation technologies

31-32 (Nov 27, 29) Microbial ecology

Dec 1, Research Grant Proposal Due

33-34 (Dec 1, 4) How many species of microbes are there?

35 (Dec 6) Wrap up

Course Outcomes:

- Contrast species concepts used for prokaryotes versus those used for multicellular organisms
- List the major taxonomic groups of prokaryotes and assess their relative importance in nature
- Design experiments to assess microbial community composition (who is there) and microbial function (who is doing what) in an environment
- Describe how evolutionary processes in prokaryotes differ from those in multicellular eukaryotes
- Apply online bioinformatics tools to describe microbial community composition and diversity
- Predict metabolic functions of a microbe or microbial community based on its genomic/metagenomic content
- Perform routine genomic analyses of a bacterium using the online Integrated Microbial Genomes (IMG) platform
- Compare different DNA sequencing technologies
- Interpret and summarize scientific literature in the field of microbial ecology.
- Demonstrate improved speaking/presentation skills

Electronically Approved - Sep 01 2023 10:05

Department Approval