



## COURSE OUTLINE

### 1. **Course:** CMMB 549, Microbial Genetics and Genomics - Fall 2021

#### **Coordinator(s)**

<b>Name</b>	<b>Email</b>	<b>Phone</b>	<b>Office</b>	<b>Hours</b>
Michael Hynes	TBA	TBA	TBA	TBA

#### **Section(s)**

Lecture 01: MWF 09:00 - 09:50 in SA 235

<b>Instructor</b>	<b>Email</b>	<b>Phone</b>	<b>Office</b>	<b>Hours</b>
Michael Hynes	TBA	TBA	TBA	TBA
Dr Joe Harrison	jjharris@ucalgary.ca	403 220-7627	BI 429B	TBA

#### **In Person Delivery Details:**

Course will be delivered in person through lectures and assignments.

#### **Re-Entry Protocol for Labs and Classrooms:**

To limit the spread of COVID-19 on campus, the University of Calgary has implemented safety measures to ensure the campus is a safe and welcoming space for students, faculty and staff. The most current safety information for campus can be found [here](#).

#### **Course Site:**

D2L: CMMB 549 L01-(Fall 2021)-Microbial Genetics and Genomics

**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 411.

### 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	Due date if applicable	% Value (Weighting)
Midterm 1	October 6 (in class)	12.5
Midterm 2	November 3 (in class)	12.5
D2L Quizzes (5-7 where best 3 will count)	TBA for each quiz. Dates will be posted in D2L and are dependent on progress through course material. The date of each quiz will be posted well before the due date.	5
Term paper (Grant)	November 17	15
Presentation	in class Nov 28-Dec 9	10
Bioinformatics Assign	December 9	10
Final Exam (CUMULATIVE)	Registrar Scheduled	35

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
<b>Minimum % Required</b>	90 %	85 %	80 %	77%	73%	70 %	66 %	63%	60%	55 %	50 %

This course will have a final exam that will be scheduled by the Registrar. [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 3 hours.

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:**

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, one possible arrangement is that the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course. This option is at the discretion of the coordinator and may not be a viable option based on the design of this course.

Attendance at lectures is encouraged, but not mandatory. Students who miss lectures due to illness or other exigency will have access to powerpoint slides and reading lists pertaining to those lectures on D2L. Students in lecture may record lectures in an unobtrusive way, provided they sign the standard waiver provided in class, and may record lectures, or make notes, on behalf of students unable to attend through illness. Students who miss a midterm exam due to illness will be offered the option of transferring the value of the test proportionately to the other examination components of the course, or of writing a makeup exam that will be different in content, and slightly different in format, than the one that the other students wrote. Students who miss their assigned presentation slot through illness will be able to make this up in extra slots reserved on the last presentation day. Students in prolonged quarantine will be allowed to do presentations by ZOOM.

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

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

## 6. Course Materials:

Recommended Textbook(s):

Snyder, Peters, Henkin, and Champness, , *Molecular Genetics of Bacteria*: ASM Press.

D2L will be used to post Powerpoint presentations from lectures, and links to other course materials (Journal Articles etc.).

The above textbook has been available to students through the U of C library (online) the last few years.

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 electronic aids, notes, or books are allowed on tests or examinations. On the final examination, some questions (not mandatory, and with a large amount of choice) will be pre-assigned so that students can research their answers. This will also apply to a small number of questions on at least one midterm. Students will have to write their answers without aids or notes during the exam period.

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.

Quality of students' writing **WILL** be an important determinant of a student's mark on all examinations, assignments and term papers.

## 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](http://www.ucalgary.ca/wellnesscentre) or call [403-210-9355](tel: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 ([syva@ucalgary.ca](mailto:syva@ucalgary.ca)) or phone at [403-220-2208](tel:403-220-2208). The complete University of Calgary policy on sexual violence can be viewed at (<https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Sexual-and-Gender-Based-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:**

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](mailto:imgieg@ucalgary.ca) preferably 10 business days before the due date of an assessment or scheduled absence.

- 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](mailto:suvpaca@ucalgary.ca). SU Faculty Rep., Phone: [403-220-3913](#) Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca). [Student Ombudsman](#), Email: [ombuds@ucalgary.ca](mailto: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 549 - Fall 2021

The aim of this course is to provide a detailed exposure to concepts in microbial genetics (almost exclusively bacterial genetics) as well as an introduction to modern Bacterial and Archaeal genomics. The first part of the course (up to about lecture 23, with a few exceptions) will make use of the textbook, as well as occasional review articles and articles from the primary literature. The last part of the course will be taught using current research papers and reviews.

Students will be required to submit one term paper, due November 17th. This will take the form of **grant proposal**. Details on the scope of this assignment, and suggested topics, will be posted on Desire2Learn. Students will also be required to make a brief (maximum 12-15 minutes (enrolment dependent), including questions) presentation based on a recent research article (their choice, but some suggestions will be provided). The lecture schedule may be altered slightly to accommodate these, depending on enrolment.

Finally, students will be required to complete one assignment, due December 9th. The assignment will focus on genomics literacy. Details of the assignment will be posted on Desire 2 Learn by November 15th. The assignment will probably require the use of web-based bioinformatics tools and the analysis of real data. A topic will be chosen to highlight course material and may integrate with current community driven genome annotation efforts. The aim will be to apply computational approaches to investigate the structure of bacterial genomes and predict gene function and regulation.

### CMMB 549, Fall 2021 - Lecture Schedule (tentative! precise topics and order may change)

Textbook: Snyder et al. , Molecular Genetics of Bacteria, ASM Press, Washington, D. C., 4rd edition, 2013.

#### Lecture Date Lecturer Topic Location/Chapter

- 1 Sept 08 MH Introduction to course and topics, basic concepts Ch 1
- 2 Sept 10 MH Introduction to bacterial genetics Ch 1,2,3
- 3 Sept 13 MH Introduction to bacterial genetics Ch 1,2,3
- 4 Sept 15 MH Review of recombination (not in depth) Ch 10
- 5 Sept 17 MH Mutations and mutagenesis Ch 11 (1,2,3)
- 6 Sept 20 MH Plasmids Ch 4
- 7 Sept 22 MH Plasmids Ch 4
- 8 Sept 24 MH Plasmids Ch 4
- 9 Sept 27 MH Plasmids, Conjugation Ch 4, Ch 5

10 Sept 29 MH Conjugation Ch 5

11 Oct 01 MH Conjugation, Ch 5

12 Oct 04 MH Conjugation - conclusions. Midterm questions answered.

Oct 06 MH **Midterm Exam 1 (IN CLASS) Weds October 6th** Ch 5

13 Oct 08 MH Transformation Ch 6

October 11 **THANKSGIVING** MONDAY

14 Oct 13 MH Transformation Ch 6

15 Oct 15 MH Transduction and phage biology and genetics Ch. 7,8

16 Oct 18 MH Transduction Ch 7,8

17 Oct 20 MH Transduction + GTAS Ch 7,8

18 Oct 22 MH Antiphage mechanisms, Abi, Restriction and others

19 Oct 25 MH CRISPRs

20 Oct 27 MH Anti-CRISPR and other novelties

21 Oct 29 MH Transposition and transposon mutagenesis Ch 9

22 Nov 01 MH Transposition and transposon mutagenesis Ch 9

Nov 03 MH **Midterm Exam 2 (IN CLASS) Weds November 3rd.**

23 Nov 05 JH Bacterial Genomics: Massively parallel sequencing technology

Nov 08 to 12th **READING DAYS, NO CLASSES**

24 Nov 15 JH Bacterial Genomics: Library construction, assemblers and annotation

25 Nov 17 JH Laptop bioinformatics for molecular (micro)biologists – Part I

26 Nov 19 JH Bacterial Gene Expression: RNA-sequencing, ChiP-seq

27 Nov 22 JH Microbial diversity, metagenomics and 16S amplicon sequencing

28 Nov 24 JH Laptop bioinformatics for molecular (micro)biologists – Part II

29 Nov 26 JH Laptop bioinformatics - Part III

30 Nov 29 MH/JH Student presentations

31 Dec 01 MH/JH Student presentations

32 Dec 03 MH/JH Student presentations

33 Dec 06 MH/JH Student presentations

34 Dec 08 MH/JH Student presentations

**Course Outcomes:**

- Explain the concepts and tools required to do experimental work in bacterial genetics
- Describe in detail the mechanisms by which genes are exchanged between microorganisms
- Explain methods used to generate mutants in bacteria, and the application of these methods
- Describe advances in DNA sequencing technology and their application to sequencing genomes and studying gene expression
- Use computer-based tools to carry out bioinformatic analysis of genes and genomes
- Read primary research articles in the field of Molecular Microbiology, and explain them in oral presentations and in written assignments that require a critical analysis of the literature
- Generate hypotheses about mechanisms underlying genetic processes in bacteria, and design experiments that could test those hypotheses

Electronically Approved - Sep 01 2021 20:14

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**Department Approval**

Electronically Approved - Sep 02 2021 11:59

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**Associate Dean's Approval**