



UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF BIOLOGICAL SCIENCES
COURSE OUTLINE

1. **Course: CMMB 549, Microbial Genetics – Fall 2019**

Lecture 01: MWF 09:00 – 09:50 in ST 061

Instructor(s)	Email	Phone	Office	Hours
Dr. Michael Hynes	hynes@ucalgary.ca	220-8473	BI 429C	By appt. only
Dr. Joe Harrison	jharris@ucalgary.ca	220-7627	BI 429B	TBA

Course Site: D2L: CMMB 549 L01-(Fall)-Microbial Genetics

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

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

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(s)	Weighting %	Date
Term Paper	15%	November 18, 2019
Assignment	10%	December 6, 2019
Oral Presentation	5%	Nov 29, Dec 2,4,6
Midterm 1	15%	October 4, 2019 In-Class
Midterm 2	15%	November 4, 2019 In-Class
Final Exam	40%	Registrar Scheduled.

There will be a **cumulative, 3 hour final exam** scheduled by the Registrar's Office

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a numerical grade (usually also expressed as a %). 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.

Letter Grade	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Min. Percent Required	90%	85%	80%	77%	73%	70%	66%	63%	60%	55%	50%

Department Approval: ORIGINAL SIGNED
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Date: _____

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

In the event that a student misses the midterm or any course work due to illness, supporting documentation, such as a medical note or a statutory declaration will be required (see [Section M.1](#); for more information regarding the use of statutory declaration/medical notes, see [FAQ](#)). Absences must be reported within 48 hours.

The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in Section 3.6. It is the student's responsibility to familiarize themselves with these regulations. See also Section E.3 of the University Calendar.

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

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

6. **Course Materials:**

Recommended text book: Molecular Genetics of Bacteria by Snyder, Peters, Henkin, and Champness, ASM Press, 2013, ISBN 978-1-55581-627-8. May be available in digital form through library.

Course D2L site will be used heavily.

7. **Examination Policy:**

No notes or electronic aids are allowed on tests or examinations. Non-programmable calculators may be used to answer mathematical questions, should any occur. The presence of such questions will be communicated in advance to students.

Some questions for midterms and the final exam may be pre-assigned as much as two weeks in advance, (possibly even longer for the final). These will never be mandatory questions, and students electing not to do these questions will still have a choice on the exam. For these pre-assigned questions, students can do as much research and preparation as they like, but will have to answer the question during the exam period with no notes or other aides.

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, style etc.) **will be a factor** in the evaluation of the work. See also Section E.2 of the University Calendar.

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 the 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 concerns 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 15 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 immediately submit the Reappraisal of Graded Term work form to the department in which the course is offered. The department will arrange for a re-assessment of the work if, and only if, the student has sufficient academic grounds. See sections I.1 and I.2 of the University Calendar.
- b. **Final Exams:** 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 resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 30, MacEwan Student Centre, Mental Health Services Website) and the Campus Mental Health Strategy website (Mental Health).
- b. **SU Wellness Center:** The Students Union Wellness Centre provides health and wellness support for students including information and counselling on physical health, mental health and nutrition. For more information, see www.ucalgary.ca/wellnesscentre or call 403-210-9355.
- c. **Sexual Violence:** The University of Calgary is committed to fostering a safe, productive learning environment. The Sexual Violence Policy (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>) is a fundamental element in creating and sustaining a safer campus environment for all community members. We understand that sexual violence can undermine students' academic success and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. 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 .
- d. **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K. Student Misconduct to inform yourself of definitions, processes and penalties. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/ fabrication of experimental values in a report. **These are only examples.**
- e. **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points.
- f. **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.

- g. **Safewalk:** Campus Security will escort individuals day or night (See the Campus Safewalk website). Call 403-220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- h. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPPA). 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.
- i. Student Union Information:
- j. **Internet and Electronic Device Information:** Unless instructed otherwise, cell phones should be turned off during class. All communication with other individuals via laptop, tablet, smart phone or other device is prohibited during class unless specifically permitted by the instructor. Students that violate this policy may be asked to leave the classroom. Repeated violations may result in a charge of misconduct.
- k. **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.
- l. **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.

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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 18th. This will take the form of a **critical mini review** article or **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 6th. The assignment will focus on genomics literacy. Details of the assignment will be posted on Desire 2 Learn by November 5th. The assignment will require the use of web-based bioinformatics tools. 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 2019 - 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 06	MH	Introduction to course and topics, basic concepts	Ch 1	
2	Sept 09	MH	Introduction to bacterial genetics	Ch 1,2,3	
3	Sept 11	MH	Introduction to bacterial genetics	Ch 1,2,3	
4	Sept 13	MH	Review of recombination (not in depth)	Ch 10	
5	Sept 16	MH	Mutations and mutagenesis	Ch 11 (1,2,3)	
6	Sept 18	MH	Plasmids	Ch 4	
7	Sept 20	MH	Plasmids	Ch 4	
8	Sept 23	MH	Plasmids	Ch 4	
9	Sept 25	MH	Plasmids, Conjugation	Ch 4, Ch 5	
10	Sept 27	MH	Conjugation	Ch 5	
11	Sept 30	MH	Conjugation,	Ch 5	
12	Oct 02	MH	Conjugation - conclusions. Midterm questions answered.		
Oct 04	MH	Midterm Exam 1 (IN CLASS) Friday October 4th		Ch 5	
13	Oct 07	MH	Transformation	Ch 6	
14	Oct 09	MH	Transformation	Ch 6	
15	Oct 11	MH	Transduction and phage biology and genetics	Ch. 7,8	
October 14		THANKSGIVING MONDAY			
16	Oct 16	MH	Transduction	Ch 7,8	
17	Oct 18	MH	Transduction + GTAS	Ch 7,8	
18	Oct 21	MH	Antiphage mechanisms, Abi, Restriction and others		
19	Oct 23	MH	CRISPRs		
20	Oct 25	MH	Anti-CRISPR and other novelties		
21	Oct 28	MH	Transposition and transposon mutagenesis	Ch 9	
22	Oct 30	MH	Transposition and transposon mutagenesis	Ch 9	
23	Nov 01	MH	Transposition and transposon mutagenesis	Ch 9	
	Nov 04	MH	Midterm Exam 2 (IN CLASS) Monday November 4th.		
25	Nov 06	JH	Bacterial Genomics: Massively parallel sequencing technology		
26	Nov 08	JH	Bacterial Genomics: Library construction, assemblers and annotation		
	Nov 11 to 15th		READING DAYS, NO CLASSES		
27	Nov 18	JH	Laptop bioinformatics for molecular (micro)biologists – Part I		
28	Nov 20	JH	Bacterial Gene Expression: RNA-sequencing, ChIP-seq		
29	Nov 22	JH	Microbial diversity, metagenomics and 16S amplicon sequencing		
30	Nov 25	JH	Laptop bioinformatics for molecular (micro)biologists – Part II		
31	Nov 27	JH	Laptop bioinformatics - Part III		
32	Nov 29	MH/JH	Student presentations		
33	Dec 2	MH/JH	Student presentations		
34	Dec 4	MH/JH	Student presentations		
35	Dec 6	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