



UNIVERSITY OF CALGARY

DEPARTMENT OF BIOLOGICAL SCIENCES COURSE OUTLINE

1. Course: **CMMB 549 – MICROBIAL GENETICS**

Lecture Section(s) L01 MWF 9:00-9:50 ST 057 Fall 2017

Course Coordinator: Dr. Hynes

Instructor(s): Dr. M.F. Hynes BI 429C 220-8473 hynes@ucalgary.ca
Dr. J.J. Harrison BI 429B 220-7627 jjharris@ucalgary.ca

Course website or Desire 2 Learn (D2L) course name. CMMB 549 on D2L

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

2. Prerequisites: **CMMB 411**

See section 3.5.C in the Faculty of Science section of the online Calendar
www.ucalgary.ca/pubs/calendar/current/sc-3-5.html

3. Grading: The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Term Paper	15%	(DUE November 20th, 2017)
Assignment	10%	(DUE December 4th, 2017)
Oral Presentation	5%	(Last 3 lecture slots)
Midterm Exam 1	15%	(October 4th 2017, in class)
Midterm Exam 2	15%	(November 6th 2017, in class)
Final Exam	40%	

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

Each piece of work (assignment, term paper, midterm test or final examination) submitted by the student will be assigned a percentage score. The student's percentage score for the various components 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, using the conversion scheme on this outline.

Final Grade Scale :

- A+: 90 or higher ($\geq 90\%$)
- A : 85 and above but under 90 ($\geq 85\%$, $< 90\%$)
- A- : 80 and above but under 85 ($\geq 80\%$, $< 85\%$)
- B+ : 77 and above but under 80 ($\geq 77\%$, $< 80\%$)
- B : 73 and above but under 77 ($\geq 73\%$, $< 77\%$)
- B- : 70 and above but under 73 ($\geq 70\%$, $< 73\%$)
- C+ : 66 and above but under 70 ($\geq 66\%$, $< 70\%$)
- C : 63 and above but under 66 ($\geq 63\%$, $< 66\%$)
- C- : 60 and above but under 63 ($\geq 60\%$, $< 63\%$)
- D+ : 55 and above but under 60 ($\geq 55\%$, $< 60\%$)
- D : 50 and above but under 55 ($\geq 50\%$, $< 55\%$)
- F : below 50 ($< 50\%$)

4. Missed Components of Term Work: 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 himself/herself with these regulations. See also Section E.6 of the University Calendar

5. Scheduled out-of-class activities: NONE

REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY. If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

6. **Course Materials:** Molecular Genetics of Bacteria, by Snyder, L, Peters, JE, Henkin T & Champness, W. ASM Press, Washington, D.C., 2013, 4th Edition

7. **Examination Policy:** Exams will be written without any electronic aids, or notes or books. Non-programmable calculators may be used to answer quantitative questions if required. Clear information on permitted use of calculators will be indicated on the exam paper if any such quantitative questions are a feature of the exam. Some questions for the midterms and final exam **MAY** be provided to students in advance of the exam. Students will be expected to answer those questions without notes or other aids during the exam period. There will always be some choice on exams, and if some questions are provided ahead of time, these questions will not be mandatory (i.e. students can opt to answer alternate questions not provided in advance)

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

8. **Writing across the curriculum statement:** In this course, the quality of the student's writing in **all assignments and exams** will be a factor in the evaluation of those course components. See also Section E.2 of the University Calendar.

9. ETHICS IN THE BIOLOGICAL SCIENCES

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.

10. OTHER IMPORTANT INFORMATION FOR STUDENTS:

(a) **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

(b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points.

(c) **Student Accommodations:** 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 http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.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, preferably in writing, to the Associate Head of Biological Sciences, Dr. H. Addy by email addy@ucalgary.ca or phone 403 220-3140.

(d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

(e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, 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 also: <http://www.ucalgary.ca/secretariat/privacy>.

(f) **Student Union Information:** VP Academic Phone: 403 220-3911 Email: suvpaca@ucalgary.ca

SU Faculty Rep. Phone: 403 220-3913 Email: science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca;

Student Ombuds Office: 403 220-6420 Email: ombuds@ucalgary.ca; <http://ucalgary.ca/provost/students/ombuds>

- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
- (h) At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference - please participate in USRI Surveys.

Department Approval _____ ORIGINAL SIGNED _____ Date _____

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UNIVERSITY OF CALGARY

CMMB 549 - Fall 2017

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 20th. 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 10-12 minutes (enrolment dependent), plus 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 4th. The assignment will focus on genomics literacy. Details of the assignment will be posted on Desire 2 Learn by November 3rd. 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 2017 - Lecture Schedule (tentative! precise topics and order may change)Textbook: Snyder et al. , Molecular Genetics of Bacteria, ASM Press, Washington, D. C., 4th edition, 2013.

<u>Lecture</u>	<u>Date</u>	<u>Lecturer</u>	<u>Topic</u>	<u>Location/Chapter</u>
1	Sept 11	MH	Introduction to course and topics, basic concepts	Ch 1
2	Sept 13	MH	Introduction to bacterial genetics	Ch 1,2,3
3	Sept 15	MH	Introduction to bacterial genetics	Ch 1,2,3
4	Sept 18	MH	Review of recombination (not in depth)	Ch 10
5	Sept 20	MH	Mutations and mutagenesis	Ch 11 (1,2,3)
6	Sept 22	MH	Plasmids	Ch 4
7	Sept 25	MH	Plasmids	Ch 4
8	Sept 27	MH	Plasmids	Ch 4
9	Sept 29	MH	Plasmids, Conjugation	Ch 4, Ch 5
10	Oct 02	MH	Conjugation	Ch 5
	Oct 04	MH	Midterm Exam 1 (IN CLASS)	
11	Oct 06	MH	Conjugation, Review Midterm	Ch 5
	Oct 09		THANKSGIVING MONDAY	
12	Oct 11	MH	Conjugation	Ch 5
13	Oct 13	MH	Transformation	Ch 6
14	Oct 16	MH	Transformation	Ch 6
15	Oct 18	MH	Transduction	Ch 7,8
16	Oct 20	MH	Transduction	Ch 7,8
17	Oct 23	MH	GTAs	
18	Oct 25	MH	Antiphage mechanisms, Abi, Restriction and others	
19	Oct 27	MH	CRISPRs	
20	Oct 30	MH	Transposition and transposon mutagenesis	Ch 9
21	Nov 01	MH	Transposition and transposon mutagenesis	Ch 9
22	Nov 03	MH	Transposition and transposon mutagenesis	Ch 9
	Nov 06	MH	Midterm Exam 2 (IN CLASS)	
23	Nov 08	MH	Midterm review. Hot new topic(s) in the literature	
Nov 10 to 13th			READING DAYS, NO CLASSES	
24	Nov 15	JH	Bacterial Genomics: Massively parallel sequencing technology	
25	Nov 17	JH	Bacterial Genomics: Massively parallel sequencing technology	
26	Nov 20	JH	Bacterial Genomics: Library construction, assemblers and annotation	
27	Nov 22	JH	Laptop bioinformatics for molecular (micro)biologists – Part I	
28	Nov 24	JH	Bacterial Gene Expression: RNA-sequencing, ChiP-seq	
29	Nov 27	JH	Microbial diversity, metagenomics and 16S amplicon sequencing	
30	Nov 29	JH	Laptop bioinformatics for molecular (micro)biologists – Part II	
31	Dec 01	JH	Laptop bioinformatics - Part III	
32	Dec 04	MH/JH	Student presentations	
33	Dec 06	MH/JH	Student presentations	
34	Dec 08	MH/JH	Student presentations	

CMMB 549 Learning outcomes

After successful completion of the course, students will be able to:

1. Explain the concepts and tools required to do experimental work in bacterial genetics.
2. Describe in detail the mechanisms by which genes are exchanged between microorganisms
3. Explain methods used to generate mutants in bacteria, and the application of these methods
4. Describe advances in DNA sequencing technology and their application to sequencing genomes and studying gene expression
5. Use computer-based tools to carry out bioinformatic analysis of genes and genomes
6. 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.
7. Generate hypotheses about mechanisms underlying genetic processes in bacteria, and design experiments that could test those hypotheses