1. **Course:** CMMB 443, Microbial Physiology - Fall 2020

Lecture 01: MWF 14:00 - 14:50 - Online

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Email</th>
<th>Phone</th>
<th>Office</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Dr Casey Hubert</td>
<td><a href="mailto:chubert@ucalgary.ca">chubert@ucalgary.ca</a></td>
<td>403 220-7794</td>
<td>EEEL 509E</td>
<td>By Appointment</td>
</tr>
<tr>
<td>Dr Lisa Gieg</td>
<td><a href="mailto:lmgieg@ucalgary.ca">lmgieg@ucalgary.ca</a></td>
<td>403 210-7207</td>
<td>BI 228A</td>
<td>By Appointment</td>
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**In Person Delivery Details:**

The lab component of this course will be in person. Three labs will be offered during the semester, and students are enrolled in either the morning (B01) or afternoon (B02) sections. Students enrolled in either the morning or afternoon sections will be each divided into 2 groups to maintain social distancing while conducting labs (10 students maximum per group; divided based on alphabetical order of surname) and will come in person to perform the labs on different dates. These student cohort groups (groups A, B, C, D) will be communicated at the start of the semester. The lab dates will be as follows:

**Lab 1:**

Sept. 15 (group A, morning section; group B, afternoon section)

Sept. 22 (group C, morning section; group D, afternoon section)

**Lab 2:**

Sept. 29, Part 1 (group A, morning section; group B, afternoon section)

Oct. 13, Part 2 (group A, morning section; group B, afternoon section)

Oct. 20, Part 1 (group C, morning section; group D, afternoon section)

Nov. 3, Part 2 (group C, morning section; group D, afternoon section)

**Lab 3:**

Nov. 17 (group A, morning section; group B, afternoon section)

Nov. 24 (group C, morning section; group D, afternoon section)

Information about safety protocols and other relevant information for in-person labs will be provided to the students prior to the start of the labs.

Students are expected to attend and perform labs in person. A case-by-case evaluation will be made should a student not be able to attend and perform the labs in person.

**Online Delivery Details:**

Some aspects of this course are being offered in real-time via scheduled meeting times. For those aspects you are required to be online at the same time.

The lecture component of this course will be offered online via Zoom or by pre-recorded lectures. Online lectures will be a combination of synchronous (students must attend during normally scheduled lecture time) or asynchronous (recorded and posted to D2L). Recording of synchronous lectures will be at the discretion of each instructor. Students will be notified by each instructor of the course as to which lectures will be synchronous or pre-recorded.

For the online lecture component, students will need to have reliable access to a computer and internet technology, as indicated by the Provost. These include: a computer with a supported operating system, as well as the latest security, and malware updates; a current and updated web browser; stable internet connection; current antivirus and/or firewall software enabled; a microphone and speaker (built-in or external) may also be useful for any interactive activities.

**Course Site:**

2020-08-28
D2L: CMMB 443 L01-(Fall 2020)-Microbial Physiology

**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; and Biochemistry 341 or 393.

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:

<table>
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<tr>
<th>Component(s)</th>
<th>Weighting %</th>
<th>Date</th>
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<tbody>
<tr>
<td>Midterm 1</td>
<td>20</td>
<td>Oct. 6</td>
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<tr>
<td>Midterm 2</td>
<td>20</td>
<td>Oct. 27</td>
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<tr>
<td>Labs</td>
<td>20</td>
<td>various due dates, TBD</td>
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<tr>
<td>*Final exam</td>
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   * The final exam, scheduled by the registrar, will focus on the second half of the course (Lectures 19-36).

   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.

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<th>A+</th>
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<th>A-</th>
<th>B+</th>
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<th>B-</th>
<th>C+</th>
<th>C</th>
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<th>D+</th>
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<tr>
<td>Minimum %</td>
<td>92</td>
<td>85</td>
<td>80</td>
<td>77</td>
<td>73</td>
<td>70</td>
<td>67</td>
<td>63</td>
<td>60</td>
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<td>Required</td>
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</table>

   This course has a registrar scheduled final exam.

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:**

   **Recommended Textbook(s):**
   

   The recommended book is optional. Any additional suggested resources will be provided as links on D2L or in lecture notes.

   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:

Unless otherwise indicated, no aids are allowed on examinations - these include lecture notes, or other written resources, accessing the internet for information (e.g., looking up information on Google or other search engines), accessing shared documents (such as Google docs, OneDrive, etc.), or using chat or messaging servers/apps (Discord, WhatsApp, Instagram, FaceTime, SnapChat, etc.). You are also prohibited from working with or contacting others during exams through the above or any other means. Violation of these rules is considered academic misconduct and penalties will be applied as described in University Calendar Section K.

Midterm exams will be scheduled to be completed synchronously online (e.g., through D2L) during regularly scheduled lab times (Tuesday Oct. 6 and 27), and will be designed to be completed in 60 min. Students will be given an extra 50% time for the online exam (for a total of 90 min) to account for any potential technical or disruption issues.

The registrar scheduled timed final exam will also be synchronously offered online and designed to be completed in 120 min. Students will be given an extra 50% time for the online exam (for a total of 180 min) to account for any potential technical or disruption issues.

Accommodations will be given to SAS students.

Important note: It is the responsibility of students to ensure that they have adequate internet and computer access on the exam dates. Students will be required to begin their exams at the start of the scheduled class time on the exam date. If technical issues are encountered at the beginning of the exam or any time throughout (such as lost internet connection), the students must document the problem by taking a photo/video, or taking a screenshot, and must contact the instructor immediately so that the issue can be resolved and/or alternate arrangements can be made. Students claiming to have such difficulties at the start of the exam must contact the instructor with evidence of the technical issue within 15 min of the start time, else the student will not be able to write the exam and will receive a zero on the exam. Similarly, if a technical issue arises during the exam, the instructor must be notified immediately and evidence (as above) must be provided. In this case, students will be granted reentry to the exam.

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.
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 Center:** 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](https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf).

   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. **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](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](https://www.ucalgary.ca/legal-services) website.

g. **Student Union Information:** VP Academic, Phone: [403-220-3911](tel:403-220-3911), Email: suvpa@ucalgary.ca. SU Faculty Rep., Phone: [403-220-3913](tel: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.

**Tentative schedule of topics, CMMB 443**

1. Sept 9 CH (JR) Cell envelope I
2. Sept 11 CH (JR) Cell envelope II
3. Sept 14 CH (JR) Cell envelope III
4. Sept 16 CH (JR) Cell envelope IV
5. Sept 18 CH (JR) Cell division I
6. Sept 21 CH (JR) Cell division II
7. Sept 23 CH Microbial growth I
8. Sept 25 CH Microbial growth II
9. Sept 28 CH Microbial growth III
10. Sept 30 CH Microbial growth IV/Dormancy & sporulation I
11. Oct 2 CH Dormancy & sporulation II
12. Oct 5 CH Dormancy & sporulation III

**OCT 6 MIDTERM I - Cell envelope, cell division, growth**

13. Oct 7 CH Dormancy & sporulation IV
14. Oct 9 CH Bioenergetics I

**Oct 12 Thanksgiving, no classes**

15. Oct 14 CH Bioenergetics II
16. Oct 16 CH Bioenergetics III/Electron transport I
17. Oct 19 CH Electron transport II
18. Oct 21 CH Electron transport III
19. Oct 23 LG Solute transport
20. Oct 26 LG Protein secretion I

**OCT 27 MIDTERM II - Dormancy & sporulation, Bioenergetics, Electron transport**
21. Oct 28 LG Protein secretion II
22. Oct 30 LG Signal transduction/2-component regulatory systems
23. Nov 2 LG Biofilms and quorum sensing I
24. Nov 4 LG Quorum sensing II
25. Nov 6 LG Motility and chemotaxis

**Nov 9-13 Fall break, no lectures**

27. Nov 18 LG Adaptive responses II
29. Nov 23 LG Inorganic metabolism: N and S metabolism II
30. Nov 25 LG Metabolism: central pathways I
31. Nov 27 LG Metabolism: central pathways II
32. Nov 30 LG Fermentations I
33. Dec 2 LG Fermentations II
34. Dec 4 LG Fermentation and syntrophy
35. Dec 7 LG C1 metabolism: Methanogenesis and methanotrophy
36. Dec 9 LG C1 metabolism and review

**Final exam will be scheduled by the registrar, and will focus on topics covered in Lectures 19-36.**

**LAB Schedule for CMMB 443, Fall 2020 (subject to change)**

Lab BI 132 Lab Section B01 9:00 - 12:00
Lab Section B02 12:00 - 15:00

There is no published lab manual to buy. Individual lab protocols and associated material will be posted to D2L. THERE IS NO LAB IN THE FIRST WEEK OF CLASSES.

**Lab 1: Estimating Protein Concentration**
Sept. 15 (group A, morning section; group B, afternoon section)
Sept. 22 (group C, morning section; group D, afternoon section)

**Lab 2: Sporulation**
Sept. 29, Part 1 (group A, morning section; group B, afternoon section)
Oct. 13, Part 2 (group A, morning section; group B, afternoon section)
Oct. 20, Part 1 (group C, morning section; group D, afternoon section)
Nov. 3, Part 2 (group C, morning section; group D, afternoon section)
Lab 3: Catabolic repression of glycerokinase

Nov. 17 (group A, morning section; group B, afternoon section)

Nov. 24 (group C, morning section; group D, afternoon section)

Course Outcomes:

- Describe cell envelope features and their functions for different kinds of microorganisms (Gram positive and Gram negative bacteria and archaea), including functions related to protein secretion and transport processes across membranes
- Describe in detail how microbial cells divide, sporulate, and move
- Explain and calculate microbial growth yields, ATP production yields, and maintenance energy
- Explain the central metabolic pathways in microbial cells and how these relate to energy production and cellular biosynthesis
- Describe pathways of fermentation and anaerobic electron-accepting processes including nitrate reduction, sulfate reduction, and methanogenesis
- Through the laboratory component, visualize various aspects of microbial physiology (such as sporulation, enzyme measurements, chemotaxis) through performing experiments related to topics covered in the lecture portion of the course
- Perform various laboratory techniques used to understand principles of microbial physiology (such as protein assays, microscopy, agar plate assays, spectrophotometric assays, mass balance calculations) and communicate scientific results in detailed laboratory reports