



# UNIVERSITY OF CALGARY

## DEPARTMENT OF BIOLOGICAL SCIENCES COURSE OUTLINE

### 1. Course: CMMB 443 – MICROBIAL PHYSIOLOGY

Lecture Section: L01 MWF 14:00 ST 130 Fall 2016

Lab: B01 T 09:00- 11:50 BI 132  
B02 T 12:00-2:50 BI 132  
B03 T 3:00-5:50 BI 132 Tentative

Course Coordinator: Dr. Voordouw

Instructor(s): Dr. C. Hubert EEEL 509E 220-7794 chubert@ucalgary.ca  
Dr. G. Voordouw BI 486 220-6388 voordouw@ucalgary.ca  
Dr. S.L. Wong BI 178A 220-5721 slwong@ucalgary.ca

Technician: K. Teal Dunwald BI 238D 210-7808 kteal@ucalgary.ca

**Desire 2 Learn (D2L):** CMMB 443 L01 - (Fall 2016) - Microbial Physiology

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

### 2. Prerequisites: CMMB 343 and BCEM 393 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](http://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:

Midterm Exam 1 (In class October 7)	19 %
Midterm Exam 2 (In class October 24)	19 %
Quiz (In class November 14)	10 %
Lab Reports	24 %
* Final Exam	28 %

\* There will be a 3-hour final exam scheduled by the Registrar's office

**\*Final exam will be on material covered in Lectures 17-34, with an emphasis on Lectures 24-34**

Each piece of work (assignment, laboratory report, midterm test or final examination) submitted by the student will be assigned a percentage score. The student's average 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, bearing in mind that an F grade will result if the student does not pass the overall lab OR the overall lecture component.

### 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.3 of the University Calendar

### 5. 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: Recommended text: White, D.; Drummond, J.; Fuqua, C. 2012. The Physiology and Biochemistry of Prokaryotes, Oxford University Press – New York, 4th Edition. - Any other suggested readings will be available on-line through Desire to Learn (D2L) or through given links.

7. **Examination Policy:** No electronic or written aids (eg. cell phones, tablets, computers, PDAs, notes, textbooks) will be allowed during writing of any exams. Non-programmable calculators will be permitted to answer quantitative questions on exams, if applicable, and permission to do this will be clearly indicated on the examination paper. Students should also read the Calendar, [Section G](#), on Examinations.
8. **Writing across the curriculum statement:** e.g. "In this course, the quality of the student's writing in laboratory reports will be a factor in the evaluation of those reports. 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](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](mailto: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 (FOI/PPA). 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

(f) <http://www.ucalgary.ca/secretariat/privacy>.

(g) **Student Union Information:** VP Academic Phone: 403 220-3911 Email: [suvc@ucalgary.ca](mailto:suvc@ucalgary.ca)  
SU Faculty Rep. Phone: 403 220-3913 Email: [science1@su.ucalgary.ca](mailto:science1@su.ucalgary.ca), [science2@su.ucalgary.ca](mailto:science2@su.ucalgary.ca) and [science3@su.ucalgary.ca](mailto:science3@su.ucalgary.ca);  
Student Ombuds Office: 403 220-6420 Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca); <http://ucalgary.ca/provost/students/ombuds>

(h) **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.

(i) 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](http://www.ucalgary.ca/usri)). Your responses make a difference - please participate in USRI Surveys.

## Tentative schedule of topics, CMMB 443

1. Sept 12 CH Cell envelope function I: protein secretion
2. Sept 14 CH Cell envelope function II: protein secretion and pili
3. Sept 16 SLW Cell envelope III
4. Sept 19 SLW Cell envelope IV
5. Sept 21 SLW Cell envelope V
6. Sept 23 SLW Cell envelope VI
7. Sept 26 SLW Sporulation I: sporulation and its regulation
8. Sept 28 SLW Sporulation II: spore structure and function
9. Sept 30 CH Sporulation III
10. Oct 3 CH Sporulation IV
11. Oct 5 CH Cell division

### **OCT 7 MIDTERM 1, IN CLASS, LECTURES 1-8**

*Oct 10 Thanksgiving, no classes*

12. Oct 12 CH Signal transduction/2-component regulatory systems
13. Oct 14 CH Chemotaxis: motility, flagella, and regulation
14. Oct 17 CH Quorum sensing & biofilms
15. Oct 19 CH Quorum sensing & biofilms
16. Oct 21 CH Adaptive responses

### **OCT 24 MIDTERM 2, IN CLASS, LECTURES 9-16**

17. Oct 26 GV Microbial growth, monitoring methods
18. Oct 28 GV Microbial growth: Monod equation, growth yield
19. Oct 31 GV Microbial Growth:  $Y_{ATP}$ , maintenance, chemostat
20. Nov 2 GV Microbial Growth: Conclusion
21. Nov 4 GV Bioenergetics:  $\Delta pH$  and  $\Delta \Psi$  in bacteria
22. Nov 7 GV Bioenergetics: measurement of  $\Delta pH$  and  $\Delta \Psi$  in bacteria
23. Nov 9 GV Bioenergetics: ways to generate  $\Delta p$  in bacteria

*Nov 11 Reading Days, no lecture*

### **NOV 14 QUIZ 1, IN CLASS, LECTURES 17-23**

24. Nov 16 GV Electron transport: coupling sites and examples
25. Nov 18 GV Electron transport: coupling sites and examples
26. Nov 21 GV Metabolism: glycolysis, ED pathway
27. Nov 23 GV Metabolism: biosynthetic role of TCA cycle
28. Nov 25 GV Fermentations: cellulose, butanol-acetone, balances
29. Nov 28 GV Fermentations: homo- and heterolactic, syntrophic associations
30. Nov 30 GV Fermentations: conclusion
31. Dec 2 GV Inorganic metabolism: nitrate and sulfate reduction
32. Dec 5 GV Inorganic metabolism: sulfur and sulfide oxidation
33. Dec 7 GV Inorganic metabolism: conclusion
34. Dec 9 GV C1 metabolism: Methanogenesis and methanotrophy

## Mark Breakdown

Cut-Off	Letter Grade
> 85.0 %	A +
80.0	A
75.0	A –
70.0	B+
65.0	B
62.0	B –
59.0	C +
56.0	C
53.0	C –
50.0	D +
47.0	D
< 47.0 %	F

## Tentative LAB Schedule for CMMB 443, Fall 2016 (subject to change, if needed)

Lab BI 132                      Lab Section 01 9:00 -12:00  
    Lab Section 02 12:00 - 15:00

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

**Sept. 20**            **Lab 1:** Different methods for estimating protein concentration  
**Sept. 27**            **Lab 1:** Different methods for estimating protein concentration (if needed)

*Oct. 4*                *No lab (midterm this week)*

**Oct. 11**            **Lab 2:** Sporulation  
**Oct. 18**            **Lab 2:** Sporulation

*Oct. 25*                *No lab (midterm this week)*

**Nov. 1**             **Lab 3:** Catabolite repression of glycerokinase in *E. coli*  
**Nov. 8**             **Lab 4:** Chemotaxis

*Nov. 15*                *No lab*

**Nov. 22**            **Lab 5:** Bacteriocins and quorum sensing  
**Nov. 29**            **Lab 6:** Sulfate reduction