



UNIVERSITY OF CALGARY

DEPARTMENT OF BIOLOGICAL SCIENCES COURSE OUTLINE

1. Course: CMMB 443 – MICROBIAL PHYSIOLOGY

Lecture Section(s)	L01	MWF	14:00	EDC 057	Fall 2015
Instructor(s):	Dr. L. Gieg Dr. G. Voordouw		BI 175A BI 486	210-7207 220-6388	lmgieg@ucalgary.ca voordouw@ucalgary.ca

Desire 2 Learn (D2L): CMMB 443 L01 - (Fall 2015) - 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

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 2)	19 %
Midterm Exam 2 (In class October 23)	19 %
Quiz (In class November 16)	10 %
Lab Reports	24 %
* Final Exam	28 %

* There will be a final exam scheduled by the Registrar's office

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.6](#) 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.

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 (FOIP). 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: suypaca@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>

(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). Your responses make a difference - please participate in USRI Surveys.

Department Approval _____ ORIGINAL SIGNED _____ Date _____

UNIVERSITY OF CALGARY
DEPARTMENT OF BIOLOGY
COURSE OUTLINE

CMMB 443
MICROBIAL PHYSIOLOGY

TERM: Fall 2015 SECTION NO.: 01

PREREQUISITE: CMMB 343 and BCEM 393.

Students may not register in a course unless they have a grade of at least C- in each prerequisite course.

COURSE & LAB COORDINATOR: Dr. L. Gieg

LECTURERS: Dr. L. Gieg BI 175A 210-7207 lmgieg@ucalgary.ca
Dr. G. Voordouw BI 486 220-6388 voordouw@ucalgary.ca

LECTURES: MWF 14:00 EDC 057

LABS: T 0900/1200; 1200/1500 BI 132

TEXT: Recommended:
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.

MARK DISTRIBUTION: A. Composition of Final Grade

Midterm Exam 1 (50 min, in class, October 2)	19 %
Midterm Exam 2 (50 min., in class, October 23)	19 %
Quiz 1 (50 min, in class, November 16)	10 %
Lab Reports	24 %
Final Exam*	28 %

B. Final Exam

There will be a 3-hour final exam scheduled by the Registrar's Office.

***Final exam will be on material covered in Lectures 16-33, with an emphasis on Lectures 24-33**

The focus is structure and function of prokaryotic cells. Topics include cell envelope structure, cell division, transport and secretion, signal transduction, differentiation and development, bacterial growth and energetics, and the diversity of metabolic pathways in Bacteria and Archaea. The laboratory introduces analytical techniques commonly used in bacterial physiology, and some useful biochemical assays.

Tentative schedule of topics, CMMB 443

1. Sept 9 LG Cell envelope I: cytoplasmic membrane, cell wall, peptidoglycan
2. Sept 11 LG Cell envelope II: teichoic acids, S-layers, capsules
3. Sept 14 LG Cell envelope III: Gram-ve outer membrane
4. Sept 16 LG Cell envelope IV: archaea, cell shape
5. Sept 18 LG Cell division
6. Sept 21 LG Signal transduction/2-component regulatory systems
7. Sept 23 LG Sporulation I: sporulation and spore structure
8. Sept 25 LG Sporulation II: regulation
9. Sept 28 LG Cell envelope function I: protein secretion
10. Sept 30 LG Cell envelope function II: protein secretion and pili

OCT 2 **MIDTERM 1, IN CLASS, LECTURES 1-8**

11. Oct 5 LG Cell envelope function III: transport
12. Oct 7 LG Chemotaxis: motility, flagella, and regulation
13. Oct 9 LG Quorum sensing & biofilms

Oct 12 Thanksgiving, no classes

14. Oct 14 LG Adaptive responses: stringent response, heat shock
15. Oct 16 LG Adaptive responses: oxidative stress
16. Oct 19 GV Microbial growth, monitoring methods
17. Oct 21 GV Microbial growth: Monod equation, growth yield

OCT 23 **MIDTERM 2, IN CLASS, LECTURES 9-15**

18. Oct 26 GV Microbial Growth: Y_{ATP} , maintenance, chemostat
19. Oct 28 GV Microbial Growth
20. Oct 30 GV Bioenergetics: ΔpH and $\Delta \Psi$ in bacteria
21. Nov 2 GV Bioenergetics: measurement of ΔpH and $\Delta \Psi$ in bacteria
22. Nov 4 GV Bioenergetics: ways to generate Δp in bacteria
23. Nov 6 GV Electron transport: aerobic and anaerobic bacterial chains
24. Nov 9 GV Electron transport: coupling sites and examples

Nov 11, 13 Reading Days, no lecture

NOV 16 **QUIZ 1, IN CLASS, LECTURES 16-22**

25. Nov 18 GV Metabolism: glycolysis, ED pathway
26. Nov 20 GV Metabolism: biosynthetic role of TCA cycle
27. Nov 23 GV Fermentations: cellulose, butanol-acetone, balances
28. Nov 25 GV Fermentations: homo- and heterolactic, syntrophic associations
29. Nov 27 GV Fermentations: conclusion
30. Nov 30 GV Inorganic metabolism: nitrate and sulfate reduction
31. Dec 2 GV Inorganic metabolism: sulfur and sulfide oxidation
32. Dec 4 GV Inorganic metabolism: conclusion
33. Dec 7 GV C1 metabolism: Methanogenesis and methanotrophy

Mark Breakdown

Cut-Off	Letter Grade
> 90.0 %	A +
85.0	A
80.0	A –
77.0	B+
73.0	B
70.0	B –
67.0	C +
63.0	C
60.0	C –
55.0	D +
50.0	D
< 50.0 %	F

Tentative LAB Schedule for CMMB 443, Fall 2015 (subject to change)

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. 15 **Lab 1:** Different methods for estimating protein concentration
Sept. 22 **Lab 1:** Different methods for estimating protein concentration (if needed)

Sept. 29 *No lab (midterm this week)*

Oct. 6 **Lab 2:** Sporulation
Oct. 13 **Lab 2:** Sporulation

Oct. 20 *No lab (midterm this week)*

Oct. 27 **Lab 3:** Catabolite repression of glycerokinase in *E. coli*
Nov. 3 **Lab 4:** Chemotaxis

Nov. 10 *No lab (reading days this week)*

Nov. 17 **Lab 5:** Bacteriocins and quorum sensing
Nov. 24 **Lab 6:** Sulfate reduction