



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

1. **Course: CMMB 545 – PETROLEUM MICROBIOLOGY**

Lecture Sections: L01 MWF 11:00-11:50 ST 127 WINTER 2015

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

D2L: CMMB 545 L01 (Winter 2014) Petroleum Microbiology
Biological Sciences Department BI 186; (403) 220-3140; biosci@ucalgary.ca

2. **PREREQUISITE(S):** CMMB 343 or Consent of the Department
See section 3.5.C in the Faculty of Science section of the online Calendar
(<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 1	20%	(February 11, in class, lectures 1-11)
Midterm 2	20%	(March 18, in class, lectures 12- 22)
Special Project	25%	
Final Examination	35%	(To be scheduled by the Registrar)

“Each piece of work (assignment, 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.”

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:** There are no out-of-class activities scheduled for this class.

6. **Course Materials:** No text required

Useful Resources – In library and/or available on-line through U of C library system:

- [Petroleum Microbiology](#), Eds. B. Ollivier & M. Magot, ASM Press, Washington, DC, 2005.
- [Handbook of Hydrocarbon and Lipid Microbiology](#), Eds. K.N. Timmis, T.J. McGenity, J.R. Van der Meer & V. De Lorenzo, Springer, 2010. (online only)

Any other recommended readings will be available online linked through lecture notes.

7. **Examination Policy:** Calculators are allowed for examinations (programmable calculators or portable computers are not allowed). The use of wireless devices, such as cell phones, PDAs (Palm OS or pocket PC devices etc.), and camera devices during the examination will not be allowed. Students should also read the Calendar, [Section G](#), on Examinations.

8. **Human studies statement:** indicating whether students in the course may be expected to participate as subjects or researchers. See also [Section E.5](#) of the University Calendar.

STUDIES IN THE BIOLOGICAL SCIENCES INVOLVE THE USE OF LIVING AND DEAD ORGANISMS. Students are expected to be familiar with <http://www.ucalgary.ca/pubs/calendar/current/sc-5-1.html> of the on-line calendar.

See also <http://www.ucalgary.ca/pubs/calendar/current/e-5.html>.

9. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **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.
- (b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- (c) **Academic Accommodation Policy:** Students with documentable disabilities are referred to the following links: Students with Disabilities: <http://www.ucalgary.ca/pubs/calendar/current/b-1.html> **B.1** and Student Accessibility Services: <http://www.ucalgary.ca/access/>.
- (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: 220-3911 Email: suvpaca@ucalgary.ca.
SU Faculty Rep. Phone: 220-3913 Email: sciencerep@su.ucalgary.ca; [Student Ombudsman](#)
- (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) **U.S.R.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 _____

CMMB 545
PETROLEUM MICROBIOLOGY

TERM: Winter 2015 SECTION NO.: L01

PREREQUISITE: CMMB 343 or consent of the department

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

COURSE COORDINATOR: Dr. L. Gieg

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

LECTURES: MWF 11:00-11:50 am Location: ST 127

TEXT: No text required

Useful Resources – In library and/or available on-line through U of C library system:

- Petroleum Microbiology, Eds. B. Ollivier & M. Magot, ASM Press, Washington, DC, 2005.
- Handbook of Hydrocarbon and Lipid Microbiology, Eds. K.N. Timmis, T.J. McGenity, J.R. Van der Meer & V. De Lorenzo, Springer, 2010. (online only)

Any other recommended readings will be available online linked through lecture notes.

MARK DISTRIBUTION:

A. Composition of Final Grade

Midterm 1 (February 11, in class, lectures 1-11)	20%
Midterm 2 (March 18, in class, lectures 12- 22)	20%
*Special Project	25%
Final Exam (To be scheduled by the Registrar)	35%

*Special Project will be carried out in groups and will include an oral component, a written component, and a peer participation evaluation.

B. Final Exam

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

Microbial communities have been known to thrive in oil fields for several decades, harboring metabolic capabilities that may be detrimental or beneficial in energy recovery. Further, recent advances in the understanding of how hydrocarbons can be biodegraded show that microorganisms have enormous potential to help restore petroleum-contaminated environments. This course will provide a comprehensive overview of microbial communities found in petroleum-associated environments, their metabolic capabilities under aerobic and anaerobic conditions, and their beneficial and detrimental impacts on the petroleum industry. Topics will include oilfield souring and treatment, biocorrosion, biodegradation in petroleum reservoirs, microbially-enhanced oil recovery, bioremediation of hydrocarbon-contaminated sites, genomics of petroleum systems, biotechnological upgrading of petroleum, and oil sands tailings pond microbiology.

Tentative schedule of lecture topics

1. Jan. 12	LG	Introduction to the oil industry and petroleum microbiology
2. Jan. 14	LG	What is petroleum? How is oil classified? Hydrocarbon classes & structures
3. Jan. 16	LG	How is oil formed? Diagenesis and biomarkers
4. Jan. 19	LG	Oil reservoirs, oil recovery & refining
5. Jan. 21	LG	Generation of heavy oil/Biodegradation in oil reservoirs
6. Jan. 23	GV	General microbial principles
7. Jan. 26	GV	Determining/enumerating microbes in oilfields - who's there?
8. Jan. 28	GV	Metagenomics in hydrocarbon resource environments
9. Jan. 30	LG	Metal and sulfate reduction (<i>possible grad student lecture</i>)
10. Feb. 2	LG	Syntrophy and methanogenesis
11. Feb. 4	LG	Syntrophy and methanogenesis cont'd/mass balances
12. Feb. 6	LG	Hydrocarbon biodegradation pathways, aerobic
13. Feb. 9	LG	Hydrocarbon biodegradation pathways, aerobic/anaerobic

Feb. 11 Midterm 1, in class, Lectures 1-11

14. Feb. 13	LG	Bioremediation
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Feb. 16-20 Reading Week, no classes

15. Feb. 23	LG	Bioremediation
16. Feb. 25	LG	Bioremediation
17. Feb. 27	LG	Bioremediation
18. Mar. 2	LG	Bioremediation
19. Mar. 4	LG	Bioremediation
20. Mar. 6	LG	Microbial enhanced oil recovery
21. Mar. 9	LG	Microbial enhanced oil recovery
22. Mar. 11	LG	Microbial enhanced oil recovery
23. Mar. 13	GV	Oilfield souring and treatment
24. Mar. 16	GV	Oilfield souring and treatment

Mar. 18 Midterm 2, in class, Lectures 12-22

25. Mar. 20	GV	Oilfield souring and treatment
26. Mar. 23	GV	Oilfield souring and treatment
27. Mar. 25	GV	Microbially influenced corrosion
28. Mar. 27	GV	Microbially influenced corrosion
29. Mar. 30	GV	Microbially influenced corrosion
30. Apr. 1	GV	Microbially influenced corrosion

Apr. 3 Good Friday, no classes

31. Apr. 6	Project Presentations	
32. Apr. 8	Project Presentations	
33. Apr. 10	Project Presentations	
34. Apr. 13	LG	Microbiology of oil sands and tailings ponds
35. Apr. 15	LG	Microbiology of oil sands and tailings ponds

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