



COURSE OUTLINE

1. **Course:** CMMB 545, Petroleum Microbiology - Winter 2021

Lecture 01: MWF 11:00 - 11:50 - Online

Instructor	Email	Phone	Office	Hours
Dr Casey Hubert	chubert@ucalgary.ca	403 220-7794	EEEL 509E	By Appointment
Dr. Lisa Gieg	lmgieg@ucalgary.ca	403 210-7207	BI 228A	By Appointment

Dr. Lisa Gieg is the course coordinator

Online Delivery Details:

This course is being offered online in real-time via scheduled meeting times, you are required to be online at the same time.

To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor's permission.

This course has a registrar scheduled, synchronous final exam. The writing time is 2 hours + 50% buffer time.

Lectures will be given synchronously via Zoom, and will be recorded. Lecture notes and recordings will be available on Zoom. In some cases, lectures may be pre-recorded and posted on D2L; students will be given advanced notice if this should occur.

Online Etiquette: As with in person classes, students are expected to behave in a professional and respectful manner during online teaching and learning sessions, and when using course tools such as discussion boards. The chat function in an online program such as Zoom is reserved to ask questions in a respectful manner or to respond to questions posed in class. The chat function must not be used for posting disrespectful comments towards other students or the course instructor, nor be used for having side-conversations, including private chats. Please note that if the instructor downloads the chat history for the session, ALL chats (including private chats) will be included in the history. Please be sure to not type anything in the chat that you would not be comfortable with viewing by the instructional team.

Course Site:

D2L: CMMB 545 L01-(Winter 2021)-Petroleum Microbiology

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 or consent of the Department.

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:

Component(s)	Weighting %	Date
Midterm 1	22.5%	Feb. 5
Midterm 2	22.5%	Mar. 8
Term Project	25%	
Final Exam*	30%	

*The final exam will be scheduled by the registrar, and will be synchronous and online.

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.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	87 %	82 %	78%	73%	70 %	67 %	63%	60%	55 %	50 %

This course will have a final exam that will be scheduled by the Registrar. [The Final Examination Schedule](#) will be published by the Registrar's Office approximately one month after the start of the term. The final exam for this course will be designed to be completed within 2 hours.

The final exam will be administered using an on-line platform. Per section [G.5](#) of the online Academic Calendar, timed final exams administered using an on-line platform, such as D2L, will be available on the platform. Due to the scheduling of the final exams, the additional time will be added to the end of the registrar scheduled **synchronous** exam to support students. This way, your exam schedule accurately reflects the **start time** of the exam for any **synchronous** exams. E.g. If a **synchronous** exam is designed for 2 hours and the final exam is scheduled from 9-11am in your student centre, the additional time will be added to the **end** time of the **synchronous** exam. This means that if the exam has a 1 hour buffer time, a synchronous exam would start at 9 am and finish at 12pm. - updated April 6, 2021

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:

No textbook is required for this course. However, some useful resources such as the items listed below can be found in the UCalgary library and/or are available online through the UCalgary library system:

- **Petroleum Microbiology**, Eds. B. Ollivier & M. Magot, ASM Press, Washington, DC, 2005. (available in hard copy and online)
- **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, with links provided 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:

Midterm Exams 1 and 2 are synchronous exams that will be written during regular class time. They will be designed to take 33 minutes to write and students will have an additional 17 minutes (for a total exam time of 50 minutes) to account for any technical issues. Time will be adjusted for SAS students if needed and accommodations for students with issues (e.g., caregiving responsibilities, ability to secure an appropriate test-taking environment, different time zones) will be done on a case-by-case basis. Please contact Dr. Gieg at least 14 business days prior to the synchronous assessment to discuss the matter.

Midterm 1 will be held on Feb 5 during your scheduled class time, and the Midterm 2 will be held on March 8 during your scheduled class time.

Unless otherwise stated, the exams are closed book. This means that you may not access your lecture notes or any other resources during exams. No other aids are allowed on tests or examinations, including accessing internet resources such as search engines (Google, etc.), other websites, shared documents (Google docs etc.) or chat servers (Discord, WhatsApp, etc.), etc., and you are specifically prohibited from working with or contacting any other individuals while you complete the exam. Violation of these rules is considered academic misconduct with penalties as described in the University Calendar section K.

The registrar-scheduled Final Exam will be offered synchronously online and will be designed to be completed in 2 hours (120 min). Students will be given an extra 50% time for the online exam (for a total of 3 hours, 180 min) to account for any potential technical issues or disruptions. Accommodations will be given to SAS students.

IMPORTANT: It is the student's responsibility to ensure that they have adequate computer and internet access to write the exams. Students will be required to begin their exams promptly at the start of their scheduled class on the day of the exam. If a student encounters any technical issues in starting an exam, they **MUST** document the issue by taking a photo, screenshot, or video, and they must contact the instructor immediately so that either additional time can be provided to access the exam or alternative arrangements made. **Students claiming such difficulties who do not contact their instructor providing evidence of technical difficulties within 15 minutes of the scheduled start of the exam will not be allowed to write the exam and will receive a grade of zero (0) on the exam.** If a student's exam is suspended during the exam (lost internet connection, internet browser crashes etc.), they **MUST** provide evidence as outlined above and contact the instructor immediately. Students will then be granted re-entry to suspended exams if they began the exam on time, provided evidence of the suspension, and still have time remaining to complete their 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 Services:** For more information, see www.ucalgary.ca/wellnesscentre or call [403-210-9355](tel: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 (syssa@ucalgary.ca) or phone at [403-220-2208](tel: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>)
- d. **Misconduct:** Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. Research integrity, ethics, and principles of conduct are key to academic integrity. Members of our campus community are required to abide by our institutional [Code of Conduct](#) and promote academic integrity in upholding the University of Calgary's reputation of excellence. Some examples of academic misconduct include but are not limited to: posting course material to online platforms or file sharing without the course instructor's consent; submitting or presenting work as if it were the student's own work; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. Please read the following to inform yourself more on academic integrity:

[Student Handbook on Academic Integrity](#)
Student Academic Misconduct [Policy](#) and [Procedure](#)
[Research Integrity Policy](#)

Additional information is available on the [Student Success Centre Academic Integrity page](#)

- 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](#).

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 (FOIPPA). 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](#) website.

- g. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](#) Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: [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 lecture topics (*subject to change*)

1. Jan. 11 LG Introduction to the oil industry and petroleum microbiology
 2. Jan. 13 LG What is petroleum? How is oil classified? Hydrocarbon classes & structures
 3. Jan. 15 LG How is oil formed? Diagenesis and biomarkers
 4. Jan. 18 LG Oil reservoirs, oil recovery & refining
 5. Jan. 20 LG Generation of heavy oil/Biodegradation in oil reservoirs
 6. Jan. 22 LG General microbial principles – anaerobes I
 7. Jan. 25 LG General microbial principles – anaerobes II + mass balances
 8. Jan. 27 LG Hydrocarbon biodegradation pathways, aerobic
 9. Jan. 29 LG Hydrocarbon biodegradation pathways, aerobic/anaerobic
10. **Course Outcomes:**
- Explain the composition of crude oil, how crude oil is classified, how crude oil reservoirs are formed over geological time, and how oil recovery and refining works
 - Describe the kinds of microorganisms (and their basic physiologies) that can be found in petroliferous reservoirs, the various ways by which they can be identified, and how their activities can lead to the formation of heavy oil.
 - Describe the main metabolic pathways for the aerobic and anaerobic biodegradation of hydrocarbons
 - Explain bioremediation, the various approaches that can be used (natural versus engineered) to clean up hydrocarbon-contaminated environments, and the numerous tools that can be used to monitor for evidence of bioremediation
 - Describe how microorganisms can be used to enhance oil recovery (microbial enhanced oil recovery, MEOR)
 - Explain oilfield souring, and the various microbial-based approaches that can be used to control souring
 - Understand the microbial processes that can lead to the corrosion of steel surfaces within petroleum industry infrastructure (microbial influenced corrosion, MIC)
 - Explain how Alberta's oil sands are recovered, the environmental issues associated with the oil sands industry, and how microorganisms play a role in the management of oil sands tailings ponds
 - Through a group project, communicate a topic or seminal scientific paper related to petroleum microbiology through either an oral presentation or a poster presentation
 - Be able to read and comprehend media reports and literature associated with the petroleum industry as presented in the media

Electronically Approved - Apr 06 2021 16:49

Department Approval

