

OCES 4201 ENVIRONMENTAL MICROBIOLOGY (3 CREDITS)

Instructor: Stanley Lau, Department of Ocean Science, HKUST

Class schedule: 10:30 am to 11:55 pm, Tuesdays and Thursdays; **Venue:** Room 5506

Office hours: by appointment

Course description

The objective of this course is to acquaint students with (i) the essential characteristics of microorganisms in the environment, (ii) how microorganisms contribute to ecological processes that shape our ecosystem, and (iii) how microorganisms are employed in environmental biotechnology. By examining real-world examples and case studies, students will develop a comprehensive grasp of crucial ideas and their real-world uses.

Course intended learning outcomes

By the end of this course, you will be able to:

1. **Appreciate** the vast diversity of microorganisms in the natural environment;
2. **Understand** the relationship between environmental conditions and the genetic, functional, and morphological diversity of microorganisms;
3. **Explain** the key ecological processes that are driven by environmental microorganisms;
4. **Apply** microbiological principles to explain the underlying mechanisms of various environmental technologies.

Learning materials and activities

Major reference:

- Environmental microbiology: fundamentals and applications
https://lbdiscover.hkust.edu.hk/bib/cdi_scopus_primary_606308137
- Microbial ecology
<https://lbdiscover.hkust.edu.hk/bib/991012623430303412>

Before lecture:

- PowerPoint slides and reference readings will be uploaded to Canvas

During lecture:

- The slides will be explained and they may be supplemented using video clips

After lecture:

- Self-reviewing of learning materials
- Prepare for assessment tasks

Site visit:

- Hong Kong Museum of Medical Sciences
- Guided tour on Public Health, Conquest and Prevention of Infectious Diseases
- **8 November 2024 (Friday)**
- **Compulsory; in substitution of the lecture on 17 October 2024**

Assessment tasks

- End of lecture MC questions through iPRS (20 %)
- Structured questions on Canvas (4 x 20 % each)

Structured questions assessment schedule

- 19 September 2024 (20 %)
- 15 October 2024 (20 %)
- 7 November 2024 (20 %)
- 28 November 2024 (20 %)

Mapping of course ILOs to assessment tasks

Assessed task	ILOs	Explanation
End of lecture MC Qs through iPRS	1,2,3	The multiple-choice questions administered at the end of each lecture will assess students' immediate understanding of the materials taught during lectures.
Structured questions on Canvas	1,2,3,4	The structured questions will assess students' deep understanding of the lecture material, their ability to synthesize and integrate knowledge to tackle complex scenarios, and their ability to apply microbiological principles in explaining the underlying mechanisms of various environmental technologies.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Students who have questions about the marks should consult the instructor within five working days after the feedback is received.

Course AI Policy

The use of Generative AI in assessment tasks is permitted. However, you must declare its use. Using generative AI without declaration will be considered as academic misconduct.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy ([URL]). All submissions will be scanned using anti-plagiarism software. Suspected and confirmed cases of plagiarism will be handled in accordance with university policy.

Final grade descriptor

Grades	Short description	Elaborate on subject grading description
A	Excellent performance	Exhibits an exceptional grasp of the vast diversity of microorganisms in natural environments and their genetic, functional, and morphological variations in response to environmental conditions. Demonstrates an outstanding ability to explain complex ecological processes driven by microbes and apply microbiological principles to elucidate the mechanisms underlying various environmental technologies. Exemplary critical thinking and problem-solving skills.
B	Good performance	Demonstrates a strong understanding of microbial diversity in nature and the relationship between environmental factors and microbial characteristics. Proficiently explains key ecological processes mediated by microbes and applies microbiological concepts to environmental technologies. Good critical thinking and analytical abilities.
C	Satisfactory performance	Displays a satisfactory level of comprehension of microbial diversity, the interplay between environmental conditions and microbial traits, microbially-driven ecological processes, and microbiological principles in environmental technologies. Reasonable critical thinking and problem-solving skills.
D	Marginal Pass	Exhibits a basic grasp of microbial diversity, the influence of environmental conditions on microbes, and ecological processes involving microbes. Limited ability to apply microbiological concepts to environmental technologies. Marginal critical thinking and problem-solving proficiency.
F	Fail	Lacks fundamental understanding of the course concepts regarding microbial diversity, the role of environmental factors, key ecological processes, and the application of microbiological principles to environmental technologies. Insufficient critical thinking and problem-solving abilities.

COURSE SCHEDULE:

Week	Topic
1 - 2	- Course Introduction - Introduction to Environmental Microbiology - Evolution of life
3 - 4	- Classification of prokaryotes
5 - 7	- Biogeography of microbes
8 - 9	- Functions of prokaryotic cell structure in relation to survival in the environment
10 – 11	- Bacterial growth and physiology - Bacterial metabolism and biogeochemical cycling
12 – 13	- Socioeconomic importance of biogeochemical cycles