

ENV-202

Microbiology for engineers

Bernier-Latmani Rizlan

Cursus	Sem.	Type
Biotechnology minor	E	Opt.
Environmental Sciences and Engineering	BA4	Obl.
HES - SIE	E	Obl.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Written
Workload	150h
Weeks	14
Hours	5 weekly
Lecture	3 weekly
Exercises	1 weekly
Project	1 weekly
Number of positions	

Summary

"Microbiology for engineers" covers the main microbial processes that take place in the environment and in treatment systems. It presents elemental cycles that are catalyzed by microorganisms and that have a major impact on planet Earth.

Content

Microbial growth and enzymology: growth theory, influence of environmental parameters, batch and continuous culture, enzymes, enzyme kinetics.

Biogeochemical cycles: Topics covered include (among others): photosynthesis, carbon fixation, fermentation, methanogenesis and methanotrophy, nitrogen and sulfur cycles, degradation of organic pollutants, and biogeochemistry of metals. The degradation pathways and microbial diversity associated with these processes will be considered.

Molecular microbial ecology: characterization of microbial diversity and activity; tools and examples of their application.

Keywords

Enzymatic and bacterial growth kinetics, microbial ecology, microbial metabolism, microbial diversity, biogeochemical cycles.

Learning Prerequisites**Required courses**

ENV-103 Biology
Introduction to chemistry

Important concepts to start the course

Chemistry concepts: acid-base and redox equilibrium; biochemical concepts: the citric acid cycle, glycolysis, respiration

Learning Outcomes

By the end of the course, the student must be able to:

- Identify the type of chemical reaction a given enzyme catalyzes
- Propose an approach to analyze microorganisms in an environmental sample
- Analyze data from a batch or continuous reactor
- Assess / Evaluate enzymatic reaction and microbial growth parameters

- Deduce the role of microorganisms from general information about the system
- Infer chemical processes based on the presence of specific microorganisms
- Propose possible results in a natural or managed environment based on limited information about the microbial community

Transversal skills

- Collect data.
- Write a scientific or technical report.

Teaching methods

Lectures, homework and laboratory practicals.

Expected student activities

- (i) prepare for lecture by reading the chapters indicated on Moodle
- (ii) work on exercises before going to the homework session
- (iii) prepare for laboratory practicals by reading the description and watching the movie

Assessment methods

During the semester:

- Midterm: 30%
- Lab report and poster presentation: 20%

Exam session:

- Written exam: 50%

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

e-book:

https://slsp-epfl.primo.exlibrisgroup.com/permalink/41SLSP_EPF/6bhkks/cdi_askewsholts_vlebooks_9781292235196

e-book (global

edition): https://slsp-epfl.primo.exlibrisgroup.com/permalink/41SLSP_EPF/6bhkks/cdi_proquest_ebookcentral_EBC5203

The two books are equivalent and the reading material will be provided for both.

Ressources en bibliothèque

- [Brock Biology of Microorganisms / Madigan](#)
- [Biology Essentials for Environmental Engineering / Bernier-Latmani](#)

Notes/Handbook

PDF files with course slides available on Moodle

Moodle Link

- <https://go.epfl.ch/ENV-202>

Prerequisite for

ENV-304 Water and wastewater treatment
ENV-504 Soil and groundwater remediation

