

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
<b>Hours</b>	<b>6 weekly</b>
Lecture	3 weekly
Exercises	2 weekly
Practical work	1 weekly
<b>Number of positions</b>	

**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

- prepare for lecture by reading the chapters indicated on Moodle
- work on exercises before going to the homework session
- 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](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](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  
Specialization MS: Biological and chemical processes in environmental engineering