

## Environmental Microbiology (I001762)

Course size (nominal values; actual values may depend on programme)

Credits 4.0 Study time 120 h Contact hrs 45.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	English	group work	5.0 h
		practicum	6.25 h
		lecture	23.75 h
		seminar: practical PC room classes	10.0 h

Lecturers in academic year 2018-2019

Boon, Nico	LA25	lecturer-in-charge
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Offered in the following programmes in 2018-2019

	crdts	offering
<a href="#">Master of Science in Environmental Sanitation</a>	4	A
<a href="#">Exchange Programme in Bioscience Engineering: Environmental Technology (master's level)</a>	4	A

Teaching languages

English

Keywords

Biological assessment methods, biomonitoring, bio-indicator systems, biotic indices, sampling, pollution, fecal pollution, eutrophication, ecotoxicology, surface water, dynamics of microbial processes, hygienic indicator organisms, biodegradation, microbial eco-toxicology and disinfection

Position of the course

This course aims at acquiring in-depth knowledge of microbiological methods which can be used to monitor the effects of (fecal) pollution, eutrophication and manipulation of (mainly aquatic) environments. Emphasis is given on the microbial processes which are of special importance in polluted waters and soils. The dynamics of the various bioconversions is schematized. The most important hygienic indicator organisms, the principles of biodegradation and biodeterioration, the fundamentals of microbial ecotoxicology and the means to combat and control micro-organisms are discussed. The practical exercises allow the student to apprehend some essential lab skills.

Contents

- 1 PRINCIPLES OF MICROBIOLOGY
  - 1.1 Microbial diversity
  - 1.2 Metabolism
  - 1.3 Growth
  - 1.4 Cell structure & motility
  - 1.5 Microbial ecology
- 2 ENVIRONMENTAL HYGIENE
  - 2.1 Microbial detection techniques
  - 2.2 Pathogenicity
  - 2.3 Indicator organisms
  - 2.4 Water norms
  - 2.5 Growth control
  - 2.6 Microbial die-off
  - 2.7 Quantitative microbial risk assessment (QMRA)
- 3 BIODEGRADATION AND BIODETERIORATION

- 3.1 Auto-epuration (self-purification)
- 3.2 Biodegradation pathways
- 3.3 Estimating biodegradability
- 3.4 Biodegradation techniques
- 3.5 Biodeterioration
  
- 4 MICROBIAL ECO-TOXICOLOGY
- 4.1 Micro-organisms as test objects
- 4.2 Tests to detect toxicants
- 4.3 Tests to detect disturbances of soil microbial communities

During the **laboratory exercises**, students will learn the following skills:

I. Hygiene and sterility

- Introduction to growth curve
- Why to work sterile? How to work sterile?
- What is a bacteria growth curve? How to enumerate bacteria?

II. Environmental hygiene

- Use of indicator microorganisms to characterize the quality of different biotopes

III. Quantitative parameters for the determination of organic compounds present in wastewater

- How to describe metabolic process that occur in wastewater treatment plant

Initial competences

General biology, general ecology

Final competences

- 1 Capacity to evaluate the microbiological quality of various environmental compartments
- 2 The students will be able to perform hands on essential microbial skills.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Group work, lecture, practicum, seminar: practical PC room classes

Learning materials and price

Syllabus and reader available; for recommended handbooks see references below and in syllabus.

References

Manual of environmental microbiology. C.J. Hurst et al. American Society for Microbiology. ASM Press, Washington D.C. ISBN 1-55581-087-X

Environmental microbiology. R.M. Maier et al. Academic Press

Environmental health engineering in the tropics. S. Cairncross & R. Feachem. Wiley. ISBN 0471 93 885 8

Course content-related study coaching

- Rehearsal sessions + extra explanation upon request
- Discussions in groups, guided exercises

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Written examination with open questions, open book examination, oral examination

Examination methods in case of periodic evaluation during the second examination period

Written examination with open questions, open book examination, oral examination, assignment

Examination methods in case of permanent evaluation

Report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Calculation of the examination mark

Students who eschew periodic and/or permanent evaluations for this course unit may be failed by the examiner.