Course Specifications
Valid as from the academic year 2017-2018

Environmental Microbiology (1001762)

Course offer specifications

Lecturers in academic year 2017-2018
Boon, Nico LA25 lecturer-in-charge

Course offerings and teaching methods in academic year 2017-2018

A (semester 1) English

- seminar: practical 10.0 h
- practicum 6.25 h
- lecture 23.75 h
- group work 5.0 h

Offered in the following programmes in 2017-2018

- Master of Science in Environmental Sanitation crdts offering
  - 4 A
- Exchange Programme in Bioscience Engineering: Environmental Technology (master's level)
  - 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

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


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

(Approved)
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.

(Approved)