

Environmental Microbiology (I002609)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course size	<i>(nominal values; actual values may depend on programme)</i>		
Credits 3.0	Study time 90 h	Contact hrs	30.0 h

Course offerings and teaching methods in academic year 2020-2021

A (semester 1)	English	Gent	group work	11.25 h
			practicum	6.25 h
			lecture	6.25 h
			seminar: coached exercises	6.25 h

Lecturers in academic year 2020-2021

Boon, Nico	LA25	lecturer-in-charge
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Offered in the following programmes in 2020-2021

	crdts	offering
Master of Science in Environmental Science and Technology	3	A
Exchange Programme in Bioscience Engineering: Environmental Technology (master's level)	3	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

- Why to work sterile? How to work sterile?

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

Initial competences

General biology, general ecology, basic mathematics and chemistry

Final competences

1 Understand basic principles of microbiology

2 Understand and evaluate the principles of environmental hygiene in various environmental compartments

3 Understand and evaluate biodegradation and biodeterioration in various environmental compartments

4 Understand and evaluate microbial responses in various environmental compartments in relation to environmental disturbances

5 Report and perform hands on essential microbiology 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: coached exercises

Learning materials and price

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

References

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

Examination methods in case of permanent evaluation

Participation, assignment, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

EVALUATION

1. Term paper (30 % of the total score)

Select a topic discussed in the course or in the practical exercises. Compare the latter information with 1 or maximum 2 recent publications dealing with the same topic. These publications should come from **good** journals. Also select **research paper** (with experimental section), no reviews. You can find these papers through the "Web of Science": <http://www.webofknowledge.com/wos>

Add your own interpretations, suggestions for further research, possibilities of applications, ... Try to be not only descriptive, but try to incorporate quantitative aspects. Prepare a **max. 5 pages** type written paper and complete this with two addenda i.e. the information in the course and the information found elsewhere (add photocopies of both). An example of a good term paper will be provided.

The term paper is prepared by 2 students. Each pair can consult about their work during the practical exercise or after the lecture (no emails!). During the exam, the lecturer will comment on the content and the quality of the term paper to each student.

This term paper should be delivered at the latest at the end of the lecture period (**deadline last lecture day in week 12**) and it should be **submitted on UFORA and a hard copy at the CMET secretary (Building A, room A0.092)**.

The evaluation criteria will be:

- 1 Is the topic adequate on relation to the course
- 2 Is the text clear, easy to read and well structured
- 3 Have the students understood the part in the course and the experiments of the paper
- 4 Is there an input of the students themselves (own thoughts, remarks, calculations)

2. Your own question (10 % of the total score)

You ask yourself a question which you select yourself from the course. Choose a topic which reflects your capabilities, one listens how you can briefly and clearly present a topic or concept. You will be questioned on details of this particular topic of choice. Try to select a topic different from your colleague.

2. Active knowledge.(25 % of the total score)

You receive 5 short questions which cover the whole of the course. The questions require a short answer and are dealing not with details but with general insight and knowledge.

3. Open book calculation. (25 % of the total score)

The latter relates to the course or for those who have practical exercises, to the course plus the exercises

4. Practical exercises (10%)

Short report and permanent evaluation

Calculation of the examination mark

See evaluation