

Microbial Ecological Processes (1000579)

Course size (nominal values; actual values may depend on programme)
Credits 5.0 Study time 135 h Contact hrs 60.0 h

Course offerings and teaching methods in academic year 2018-2019

Offering	Language	Teaching Method	Hours
A (semester 1)	Dutch	seminar: practical PC	7.5 h
		room classes	
		practicum	15.0 h
		guided self-study	2.5 h
		lecture	30.0 h
		group work	5.0 h

Lecturers in academic year 2018-2019

Boon, Nico	LA25	lecturer-in-charge
De Vrieze, Jo	LA25	co-lecturer

Offered in the following programmes in 2018-2019

Programme	crdts	offering
Bachelor of Science in Bioscience Engineering (main subject Cell and Gene Biotechnology)	5	A
Master of Science in Bioscience Engineering: Forest and Nature Management	5	A
Master of Science in Bioscience Engineering: Land and Water Management	5	A

Teaching languages

Dutch

Keywords

Microbial ecology, microbial diversity, soil microbiology, microbiology of the higher organisms, nutrient cycles

Position of the course

The centre of this course is the interrelation between microbial associations with water, soil, air, plant and human/animal. These relations are discussed from an engineering point of view.

In part A characteristics of the microbial communities are discussed. Basic phenomena such as the dispersion of propagules and the importance of surface structures in attachment and biofilm formation of micro-organisms are addressed.

Part B discusses the main processes occurring in the soil and in the plant-rhizosphere.

Attention is also directed towards methods for the stimulation of micro-organisms towards conversion of minerals and organic compounds in nature. Part C addresses the microbial associations that stand in a direct relation with humans and animals, specific attention goes to the colonisation of the host.

Practical exercises are directed towards the use of computer models describing microbial associations and their mode of operation.

Contents

Theory

Part A : Characteristics of microbial communities

I. Microbiota : functional overview

II. Basic phenomena in relation to microbial ecology

Part B : Soil and plant microbial processes

I. Aerobic mineralisation in sediment soils

- II. Soil as an ecosystem
- III. Interrelations plant - microbiota
- IV. Energy balance of the ecosystem
- V. The carbon cycle
- VI. The nitrogen cycle
- VII. Soil sterilization and hygienization
- VIII. Soil treatment for organic pollutants

Part C : Colonisation of higher organisms

- I. Microbial associations
- II. Function of the intestinal microbiota

Practical exercises

Computer practicum: simulation of microbial transport phenomena and degradation processes

Lab practicum: checking basic phenomena such as respiration and nitrification on the basis of practical experimentation

Initial competences

Microbial Ecological Processes builds on certain learning outcomes of course units Microbiology, Biochemistry and Molecular Biology, Ecology, Organic Chemistry and Inorganic Chemistry; or the learning outcomes have been achieved differently.

Final competences

- 1 Applying modern techniques for the analysis and control of microbial communities and their activities in open systems.
- 2 Calculating efficiencies of microbial processes.
- 3 Estimating the impact of micro-organisms on the nitrogen and carbon cycle.
- 4 Determining and quantifying interactions between plants and micro-organisms.
- 5 Explaining and applying basic phenomena in the field of microbial ecology in microbial processes.
- 6 Understanding and applying of interactions between micro-organisms and the host (the human body).

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

Guided self-study, group work, lecture, practicum, seminar: practical PC room classes

Learning materials and price

Course notes will be provided by the VLK

References

Microbial ecology - Fundamentals and applications. 4th Edition. (R.M. Atlas & R. Bartha, Eds.) Addison Wesley Longman, Inc. 694 p. ISBN 0-8053-0655-2.
Environmental Microbiology. (Maier et al., Eds.). Academic Press. 585 p. ISBN 0-12-497570-4.

Course content-related study coaching

Study coaching is being offered during the exercises and after theory colleges.

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, written examination, open book examination, oral examination

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

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

Examination methods in case of permanent evaluation

Assignment, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

Extra information on the examination methods

The oral exam comprises questions related to the theoretical and practical knowledge in the course notes. The written exam contains exercises in which the theoretical principles in the course notes will be applied. The workpiece comprises a critical evaluation of a research paper. The report should be written in the framework of the practical exercises.

Calculation of the examination mark

Oral + written exam : ca. 50%

Workpiece : ca. 25%

Practicals: ca. 25%

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.