Course Specifications
Valid in the academic year 2019-2020

Metals and Metalloids in Environment and Technology (I002411)

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 2019-2020
A (semester 1) English
- Group work: 6.25 h
- Practicum: 20.0 h
- Microteaching: 3.75 h
- Lecture: 30.0 h

Lecturers in academic year 2019-2020
- Tack, Filip LA24 lecturer-in-charge
- Du Laing, Gijs LA24 co-lecturer
- Meers, Erik LA24 co-lecturer

Offered in the following programmes in 2019-2020
- Master of Science in Bioscience Engineering: Chemistry and Bioprocess Technology: 5 crdts A
- Master of Science in Bioscience Engineering: Environmental Technology: 5 crdts A
- International Master of Science in Sustainable and Innovative Natural Resource Management: 5 crdts A
- Exchange Programme in Bioscience Engineering: Chemistry and Bioprocess Technology (master's level): 5 crdts A

Teaching languages
- English

Keywords
- Metals, trace elements, metalloids, environmental chemistry, soil, water, remediation, bioavailability

Position of the course
This course focuses on heavy metals and metalloids in the environment. Presence, fate, and management of heavy metals and metalloids in the environment is discussed. This includes their properties, origin, behaviour and dynamics in the soil-water-plant continuum. Emphasis is put on factors affecting the transfer of metals from soils or water to biota and the biomagnification in the food chain. Remediation and management options for metal contaminated water, soil, and sediments are explored. Analytical aspects are also highlighted. Practical work focuses on conducting chemical analysis of heavy metals and metalloids in water, soils and plants and interpreting the data obtained. Environmental technologies to remediate soil, sediments and water polluted by heavy metals and metalloids are discussed, as well as related legislation (soil and water quality standards), and management techniques to reduce the bioavailability and mobility of metals and metalloids in situ.

Contents
1. Heavy metals and metalloids: environmental chemistry, general principles and processes
2. Assessment of baseline concentrations in soils - legislation
3. Uptake by plants
4. Physicochemical remediation techniques for metal-polluted water, sediments and soil
5. In situ management of heavy metals and metalloids in floodplains and river sediments

(Approved)
6. Phytomanagement
7. Environmental effects of mining activities and sustainable management of metal resources
8. Arsenic in the environment
9. Mercury in the environment
10. Cadmium in the environment

Initial competences
General knowledge of chemistry and soil science.

Final competences
1. Have thorough insight in the nature and importance of metal sand metalloids in environment and society
2. Have thorough insight in the chemical forms of occurrence and the physico-chemical behaviour of metals and metalloids in the environment
3. Understand the meaning of background concentrations and the reasoning behind derivation of legal environmental standards
4. Have a conceptual insight in the interactions between metals and plants
5. Be capable of selecting and applying suitable remediation and containment approaches for metal contaminated soils, sediments and water
6. Have insight in the potential negative effects of high concentrations of metals and metalloids on the environment and on humans
7. Have knowledge about specific properties and behaviour of individual elements

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, microteaching, practicum

Learning materials and price
Elaborated slides and selected scientific publications as background reading, made available through the electronic learning platform.

References
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Course content-related study coaching
Professors and staff members of the department are available (upon appointment).

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

Examination methods in case of periodic evaluation during the second examination period
Written examination with open questions

Examination methods in case of permanent evaluation
Assignment

Possibilities of retake in case of permanent evaluation
examination during the second examination period is possible in modified form

Calculation of the examination mark
period aligned evaluation (75%)
non-period aligned evaluation (25%)
Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.

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