

Integrated Assessment of Water and Sediment Quality (I002148)

Course size (nominal values; actual values may depend on programme)
Credits 6.0 Study time 180 h Contact hrs 75.0 h

Course offerings and teaching methods in academic year 2018-2019

Offering	Language	Teaching Method	Hours
A (semester 1)	English	seminar: coached exercises	2.5 h
		seminar: practical PC room classes	15.0 h
		practicum	15.0 h
		guided self-study	2.5 h
		lecture	40.0 h

Lecturers in academic year 2018-2019

Janssen, Colin	LA22	lecturer-in-charge
Blust, Ronny	UA	co-lecturer
Teuchies, Johannes	UA	co-lecturer

Offered in the following programmes in 2018-2019

Programme	crdts	offering
Master of Science in Technology for Integrated Water Management	6	A

Teaching languages

English

Keywords

Water quality, Ecotoxicology, Risk assessment, Pollution, Contaminants, Environmental quality criteria, Assessment methods, Sediments

Position of the course

It is essential for both man and the environment to have abundant water of good quality. Man does not only use huge quantities of water but he is also responsible for the contamination of rivers and other water bodies. Good management of water and sediments requires that we reduce and preferably eliminate the impact on the water quality and use the available water in a sustainable manner. To reach these goals it is imperative to develop and apply instruments and criteria which can assess the quality of water and sediments and which are able to establish the causes of the reduced water quality. This module concerning water and sediment quality assessment will introduce the science of ecotoxicology with special emphasis on the water. An overview will be given of the various physical, chemical and biological aspects of water pollution and the methods which are used to assess water and sediment quality. These aspects will be integrated by learning how the environmental risks of water-borne contaminants are assessed. Practical aspects of exposure and effects assessments, including modeling, will be put into the context of environmental legislation and management.

Contents

LECTURES

- Introduction to ecotoxicology
 - Ecological and toxicological concepts
 - Ecotoxicology versus human toxicology
 - Hazard and risk
 - Overview of pollutants in water and sediments
- Bioavailability of contaminants in water and sediment
 - Metals versus organic chemicals
 - Concentration, Complexation, Competition
 - Biotic and abiotic factors affecting bioavailability

- Bioavailability models
- Relations between environmental contaminants and effects on aquatic organisms
 - Principle and goal of aquatic ecotoxicity tests
 - Factors to consider when setting up an aquatic ecotoxicity test
 - Analysis of toxicity test results
- Effects of aquatic contaminants at different levels of biological organization
 - Uptake, distribution, transformation and effects of chemicals in cells and tissues
 - Molecular responses and biomarkers
 - Toxicogenomics
 - Effects at population level
 - Effects at community and ecosystem level
- Environmental Quality Assessment and Monitoring
 - Chemical analysis of aquatic pollutants
 - Biological status and indicators
 - Biotic indices
- Environmental fate of aquatic contaminants
 - Emission and transport
 - Transformation of chemicals
 - Equilibrium distribution
 - Fate models
- Toxicokinetics and bioaccumulation
 - Uptake and elimination of aquatic contaminants
 - Bioaccumulation modelling and testing
- Principles of risk assessment
 - Data needs
 - Exposure and Effects assessment
 - PEC and PNEC derivation, risk characterization
 - Probabilistic risk assessment
- Sediment Ecotoxicology
 - Typical sediment pollutants
 - Sediment ecotoxicity testing
 - Field contamination in sediments
 - Biotic and abiotic factors to consider in sediment ecotoxicology

PRACTICUM

- Biodegradation test
- Aquatic ecotoxicity test with *Daphnia*
- Environmental Quality assessment with macro-invertebrates

PC EXERCISES

- Analysis of toxicity test results: ECx determination
- Data treatment biodegradation test
- Risk assessment: exposure and effect

PLENARY EXERCISES

- Exposure assessment and fate of aquatic contaminants

Initial competences

A general scientific background (chemistry and ecology) at academic level is required, , as well as basic computer skills (mainly MS Excel).

Final competences

- 1 Understand all key theoretical processes and practical aspects associated with identifying, understanding and assessing the impact of contaminants to water and sediments.
- 2 Being able to perform an initial ecological risk assessment of chemicals in aquatic environments.

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, lecture, practicum, seminar: coached exercises, seminar: practical PC room classes

Learning materials and price

Course notes on the e-learning platform and the following reference book: Van Leeuwen en Vermeire, Risk assessment of chemicals: an introduction, Springer, 2007,

686 p.

References

van Leeuwen C.J., Vermeire T.G. (2007) Risk Assessment of Chemicals: An Introduction. Springer, 2nd edition, 688p; ISBN 978-1-4020-6101-1.
D. Rand, Fundamentals of aquatic toxicology, Taylor & Francis, 1995, 1125 p.
P. Calow, Handbook of ecotoxicology, Blackwell Scientific Publications, 1994, 478p.
Michael C. Newman, Michael A. Unger, Fundamentals of Ecotoxicology, Lewis Publishers, 2008, 458 p.

Course content-related study coaching

For each of the parts in this module, a tutor will be available to assist the student when needed.

Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination

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

Written examination

Examination methods in case of permanent evaluation

Report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

Written examination. Evaluation of the lab/PC exercise reports.

Calculation of the examination mark

Part Prof. Janssen - Period aligned evaluation (50%)

Part Prof. Blust - Periodic aligned evaluation (40%) and non-period aligned evaluation (10%)