GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2018-2019

Ecological Risk Assessment (I001293)

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

A (semester 1)	English	seminar: practical PC room classes	15.0 h
		lecture	40.0 h
		practicum	6.25 h
		guided self-study	7.5 h
		group work	6.25 h

Lecturers in academic year 2018-2019

De Schamphelaere, Karel	LA22	lecturer-in-charge
Asselman, Jana	LA22	co-lecturer
Janssen, Colin	LA22	co-lecturer
Verougstraete, Violaine	LA22	co-lecturer

Offered in the following programmes in 2018-2019	crdts	offering
Bachelor of Science in Bioscience Engineering (main subject Environmental Technology)	6	A

Teaching languages

English

Keywords

Environmental toxicology, toxicology, ecotoxicology, (eco)toxicity tests, risk assessment of chemicals, dose-response evaluation, environmental pollution, human health, effects analysis, exposure analysis

Position of the course

The aim of this course is to introduce the students in the theoretical foundations of (eco)toxicology of chemicals and in the principles of exposure, effects and risk assessment of chemicals to man and the environment. A strong focus is on understanding how different physical, chemical, biological and ecological processes contribute to chemicals exposure, effects and, ultimately, risk. Finally, the various aspects of the theory will be brought into practice by means of hands-on training into exposure and effects testing in the laboratory (‘practicum’), quantitative (real-life) chemicals risk assessment (‘PC exercises’), and a critical review of a scientific paper (‘group work’).

Contents

LECTURES

General introduction

- What this course is about
- Chemicals are everywhere… but risks?
- Awakening to environmental problems
- (Eco)toxicology and Risk Assessment
- The Risk management process
- Risk Assessment: Risk Characterization through Exposure Assessment and Effects Assessment
- Course overview

Environmental Exposure Assessment

- Emission
- Equilibrium partitioning

- Intra- and inter-media transport
- Transformation (degradation)
- (External) Exposure assessment (concentrations in water, air, soil & sediment)
- (Internal Exposure assessment (bioconcentration, bioaccumulation & biomagnification)

Ecotoxicology at sub-organism level
- Uptake, biotransformation, detoxification and elimination
- Molecular and cellular effects
- Adverse outcome pathways

Ecotoxicology at organism level
- Factors to consider in ecotoxicity tests
- Standardization and guidelines
- Analysis of toxicity test results
- PNEC derivation
- Secondary poisoning
- Effect QSARs

Ecotoxicology at Population, Community and Ecosystem Level
- Populations: endpoints
- Populations: determinants
- Populations: models
- Communities: experimental setups
- Communities: endpoints
- Communities: determinants
- Communities: models

Ecological risk assessment and legislation
- REACH
- Global Harmonized System (GHS) and Classification, Labelling and Packaging (CLP)
- EU pesticide regulation
- OECD Chemicals programme

Human toxicology and risk assessment
- General framework and aspects of toxicity
- Effects (hazard) assessment
- Exposure assessment
- Risk characterization
- Risk management

Bioavailability of metals
- The three C's: Complexation, Concentration and Competition
- Modeling metal interactions with fish gills and toxicity
- The Biotic Ligand Model (Development and Validation)
- Applications of the Biotic Ligand Model: three case studies

Marine ecotoxicology
- Ecotoxicology and risk assessment in a marine context
- Oil pollution
- Endocrine disrupting chemicals in the marine environment
- INRAM: micropollutants in the Belgian coastal zone
- Salinity and metal ecotoxicology
- Marine debris and plastics

PRACTICUM (WETLAB)
- Biodegradation test
- Acute ecotoxicity test with *Daphnia magna*

PC EXERCISES (PCLAB)
- Biodegradation and dose-response analysis
- Environmental exposure, effect and risk assessment
- Human exposure and risk assessment
- Bioconcentration
- Species sensitivity distributions (SSDs)
- Bioavailability and effects assesment of metals

GROUPWORK

Students need to review and critically interpret a scientific paper on (eco)toxicology or risk assessment and need to present this to the entire group.

Initial competences

Basic knowledge of biology, ecology, physics and chemistry

Final competences

1 Understand physical, chemical, biological and ecological processes that determine exposure, effects and risks of chemical to man and the environment
2 Know how theoretical foundations of risk assessment are brought into practice in legislation
3 Apply quantitative techniques for dose-response, exposure, effect and risk evaluation
4 Interpret, critically analyze and report on scientific literature on (eco)toxicology or risk assessment

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

- Selected chapters from the Van Leeuwen and Vermeire (2007) book - online version available via Springer
- Lecture notes: slides presented during the theory lectures, practicum and PC exercises
- Course notes for the practicum and PC exercises
- Video recordings of theory lectures
- Lecture and course notes are made available via MINERVA

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.

Course content-related study coaching

- A dedicated question and answer session will be organized at the end of every theory lecture
- Lecturers and academic assistants can be consulted (after electronic appointment only) for additional feed-back

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 with multiple choice questions

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

Written examination with open questions, written examination with multiple choice questions

Examination methods in case of permanent evaluation

Participation, assignment, skills test

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

- Periodic evaluation: closed book exam with open questions and multiple choise questions focusing on a detailed as well as an integrated understanding of the theoretical foundations of (eco)toxicology and risk assessment
- Permanent evaluation:
  - Skill test: closed book test will take place at the end of all theory, practicum and exercises classes; will be closed book; students will need to solve one or more ‘integrated problems’ for which integrated knowledge obtained during the practicals and PC exercises classes is required
  - Group Work: Groups of 3-6 students will have to critically review a scientific paper about (eco)toxicology or risk assessment; they need to present their findings to all other students and need to be able to discuss these with them as well as with the lecturers
  - Participation during practicals and PC exercises

Calculation of the examination mark

The calculation of the global examination mark will be as follows:
1 Periodic evaluation: 60% of the total mark (12 points of the 20)
2 Permanent evaluation: 40% of the toal mark (8 points of the 20)
This permanent evaluation consists of:
- A skills test: 30% of the total mark (6 points of the 20)
- A group work: 10% of the total mark (2 points of the 20)

To pass, the students must score at least half of the points on both the periodic and the permanent evaluation. Students who score less then half of the maximum score for the periodic (i.e. <6/12) or the permanent evaluation (i.e.< 4/8), will only be able to receive a maximum global examination mark of 9/20.

For group work: if there is a clear difference in the input between the different group members, the examination mark for this part can be different between the different group members.