GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2022-2023

Environmental Risk Assessment (I002606)

Course size *(nominal values; actual values may depend on programme)*

Credits 5.0 **Study time 150 h** **Contact hrs** 50.0h

Course offerings and teaching methods in academic year 2022-2023

A (semester 1)	English	Gent	lecture	20.0h
			seminar: practical PC room classes	20.0h
			group work	2.5h
			practicum	7.5h

Lecturers in academic year 2022-2023

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 2022-2023	crdts	offering
Bachelor of Science in Environmental Technology	5	A
Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)	5	A
Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)	5	A
Master of Science in Electromechanical Engineering(main subject Maritime Engineering)	5	A
Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	5	A
Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	5	A
International Master of Science in Agro- and Environmental Nematology	5	A
Master of Science in Biology	5	A
Master of Science in Bioscience Engineering: Environmental Technology	5	A
Master of Science in Chemical Engineering	5	A
Master of Science in Chemical Engineering	5	A
Master of Science in Environmental Science and Technology	5	A
Master of Science in Sustainable Materials Engineering	5	A
Exchange Programme in Bioscience Engineering: Environmental Technology (master's level)	5	A

Teaching languages

English

Keywords

risks and safety of chemicals, 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 for ecosystems and humans. 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') and quantitative (real-life) chemicals risk assessment ('PC exercises', 'group work').

Contents

LECTURES
General introduction
• The dawn of (eco)toxicology: the case of DDT
• General scheme of risk assessment: hazard, exposure, effects and risks
• Human versus ecological risk assessment
• Overview of regulatory frameworks for various chemical groups (REACH, CLP, biocides, plant protection products, pharmaceuticals)
• Risk assessment versus Risk management
Environmental Exposure Assessment
• Emission
• Equilibrium partitioning
• Intra- and inter-media transport
• Transformation of chemicals (biotic and abiotic 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
• Design and analysis of ecotoxicity tests
• PNEC derivation using assessment factors
• PNEC derivation using species sensitivity distributions
• Mixture toxicity
Ecotoxicology at Population, Community and Ecosystem Level
• Experimental and modeling approaches
• Extrapolation from lab to field across space and time
Human toxicology and risk assessment
• General framework and aspects of toxicity
• Effects (hazard) assessment
• Exposure assessment
• Risk characterization
• Risk management

PRACTICUM (WETLAB)
• Biodegradation and ecotoxicity test
• Demonstrations of ecotoxicological techniques and data analysis

PC EXERCISES (PCLAB)
• Biodegradation and dose-response analysis
• Environmental exposure, effect and risk assessment
• Human exposure and risk assessment

GROUPWORK
Students need to search environmental fate, exposure and effects data on a certain chemical, critically review and interpret the dataset, perform a risk assessment, and 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 and 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

Practicum, Group work, Lecture, 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 Ufora, at no extra costs

References

van Leeuwen C.J., Vermeire T.G. (2007) Risk Assessment of Chemicals: AnIntroduction. Springer, 2nd edition, 688p; ISBN 978-1-4020-6101-1.

Course content-related study coaching

- A dedicated question and answer session can be organized upon request after all theory lectures
- Lecturers and academic assistants can be consulted (after electronic appointment only) for additional guidance

Assessment moments

end-of-term and continuous assessment

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

Skills test, Written examination with multiple choice questions, Written examination with open questions

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

Skills test, Written examination with multiple choice questions, Written examination with open questions

Examination methods in case of permanent assessment

Participation, Peer assessment, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Extra information on the examination methods

Periodic evaluation:

- Theory: closed book exam with open questions and multiple choice questions focusing on a detailed as well as an integrated understanding of the theoretical foundations of (eco)toxicology and risk assessment.
- Skills test: closed book test; students will need to solve one or more 'integrated problems' for which integrated knowledge obtained during the lectures, practicals and PC exercises classes is required

Permanent evaluation:

- Group Work: Groups of 3-6 students will have to gather environmental fate, exposure, and effects data on a certain chemical, critically review and analyse it and perform a risk assessment. They need to submit a report and present their findings to all other students and need to be able to discuss these with them as well as with the lecturers. in the case that a second chance exam is needed for this part, the work has to be improved, presented to the lecturer and defended individually.
- Participation during practicals, PC exercises, and group work

Calculation of the examination mark

The calculation of the global examination mark will be as follows:
1. Period-aligned evaluation:60% of the total mark (12 points of the 20)
1.1 Theory: 40% of the total mark (8 points of the 20)
1.2 Skills test: 20% of the total mark (4 points of the 20)

2 Permanent evaluation: 40% of the total mark (8 points of the 20)
2.1 Group work: 40% of the total mark (8 points of the
20)
For group work: if there is a clear difference of input between the different group members, the examination mark for this part can be different by up to 5/20 between the different group members.
To pass, the students must score at least half of the points on periodic (6/12) and permanent evaluation (4/8). Students who score less than half of the maximum score for either periodic or permanent evaluation, will only be able to receive a maximum global examination mark of 9/20.
Students who eschew period aligned (periodic) or non-period aligned (permanent) evaluations or who eschew participation in practicum, PC exercises, or groupwork for this course unit may only be able to receive a global examination mark of 6/20.