GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2024-2025

Pharmaceuticals in the Environment (J000529)

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

Credits 6.0 **Study time 150 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)	English	Gent	practical	0.0h
			independent work	0.0h
			group work	0.0h
			excursion	0.0h
			seminar	0.0h
			lecture	0.0h

Lecturers in academic year 2024-2025

Hertleer, Carla	FWO2	staff member
Wynendaele, Evelien	FWO2	lecturer-in-charge
De Spiegeleer, Bart	FWO2	co-lecturer

Offered in the following programmes in 2024-2025	**crdts**	**offering**
International Master of Science in Sustainable Drug Discovery	6	A

Teaching languages

English

Keywords

Environment; pharmaceuticals; eco-toxicity; risk assessment

Position of the course

In this course, students are introduced into the environment-pharmaceuticals axis. Different concepts and principles of environmental sustainability related to pharmaceuticals and related health products are elucidated. Moreover, students are provided with extensive knowledge about environmental risk assessment (ERA) of pharmaceuticals. Theoretical principles are illustrated by case studies worked-out by the students as well as practical laboratory sessions and visits: concepts of animal and plant eco-toxicity of medicines, pharmaceutical environmental analyses and pharmaceutical waste treatment will be turned into practice.

Contents

1) Concepts: hazards and risks, efficacy and safety, environmental and eco-toxicology, biodiversity, one health, cradle-to-cradle, circular economy, pollution/contaminants, green chemistry, compartments, systems thinking
2) Environmental consequences of pharmaceuticals: levels (order of magnitude), different medicine classes, different elements of a medicine (active pharmaceutical ingredient, excipients, packaging)
3) Eco-toxicity tests: experimental design, experiments with *C. elegans* (icw prof. Braeckman), plants (icw prof. Werbrouck) and lab-analyses, dose-response/effect analysis
4) Exposure analysis: approaches, uncertainties
5) Environmental Risk Assessment (ERA) of medicines: models, EU-guidelines (human, veterinary)
6) Mitigation/reduction, incl. waste treatments (incl. plant visit)
Benign-by-Design (BbD) in drug discovery

Initial competences

Basic knowledge of fundamental physical, chemical and biological principles and processes.

Final competences

1 Understand semantics
2 Explain systems thinking and the place of pharmaceuticals in the earth's ecosystem
3 Perform a conceptual ERA analysis of a pharmaceutical
4 Discuss balance of efficacy, safety, quality versus ecotoxicity of medicines
5 Have insights in the used techniques and methods in the ERA of pharmaceuticals
6 Understand the applied modelling & probabilistic approaches
7 Discuss different approaches to reduce the environmental impact of pharmaceuticals
8 Demonstrate the ability to understand, summarize and evaluate relevant scientific literature
9 Communicate scientific rationales and critical reflections leading to concise conclusions

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, Seminar, Excursion, Lecture, Practical, Independent work

Extra information on the teaching methods

Eight (8) lectures of each 1.25 hours will be given.
Four (4) coached seminars of 1.25 hours each, plus two (2) guided self-study sessions (each 1.25 hours) for the oral presentation.
1 study visit (1 day) on the waste treatment, mitigations and adaptations of a pharmaceutical company.
Eighteen (18) practical sessions (each 1.25 hours) are given, divided in different topics (incl. eco-toxicity, pharmaceutical analyses and plant-toxicity/bioremediation).
Three (3) additional coached seminar sessions (each 1.25 hours) are organised with exercises about read-across systems.

Study material

Type: Slides

Name: Slides
Indicative price: Free or paid by faculty
Optional: no
Available on Ufora : Yes

References

Is available in course material.

Course content-related study coaching

Guidance of students in developing a presentation on an ERA of a pharmaceutical.

Assessment moments

end-of-term and continuous assessment

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

Oral assessment, Written assessment

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

Oral assessment, Written assessment

Examination methods in case of permanent assessment

Participation, Peer and/or self 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: oral exam starts after a written preparation.

Calculation of the examination mark

The seminar activities, leading to an oral presentation (in the last coached seminar for oral presentation), and the practical sessions, leading to different reports, are responsible for 50% of the course score. The examination at the end of the semester is responsible for the other 50% of the points. If the student obtains a score below 9/20 for one of the separate parts of the evaluation (seminar activities, practical sessions or examination), then the final mark is automatically reduced to the lowest score obtained for one of the separate parts.
Students who eschew period aligned and/or non-period aligned activities or evaluations in this course may be failed by the examiner.