GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Environmental Modelling (C003809)

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

Credits 3.0 **Study time 90 h**

Course offerings and teaching methods in academic year 2026-2027

A (semester 2)	English	Gent	lecture
			seminar

Lecturers in academic year 2026-2027

Soetaert, Karline	WE11	lecturer-in-charge
Bonte, Dries	WE11	co-lecturer

Offered in the following programmes in 2026-2027	**crdts**	**offering**
Master of Science in Marine and Lacustrine Science and Management	3	A

Teaching languages

English

Keywords

Position of the course

Contents

Present day environmental problems (e.g. eutrophication, contaminant dispersal, climate change, ocean acidification) require a quantitative approach. To better understand how natural systems respond to such changing inputs and boundary conditions, biogeochemical models of varying complexity are being called upon. The central aim of this course is to learn how to develop and apply such models. In this course we will focus particularly on elemental cycling (Carbon, Nitrogen etc) and transport of contaminants within aquatic ecosystems (e.g. rivers, estuaries, lakes, oceans). Models are implemented in the open-source programming language R.

Models in the environmental sciences.
- What is a model?
- Types of models
- Model examples (e.g. North Sea, Scheldt estuary, ocean acidification)

Construction of models
- Balance equations, boundary conditions, transport formulation, kinetic rate laws
- Reactive transport models (box models, 1D, 2D and 3D)
- pH models, acid-base chemistry and CO2 uptake

Model solution
- steady-state solutions versus transient solutions
- analytical versus numerical solution
- numerical integration procedures

Model applications
- Causes of uncertainty in model predictions
- Sensitivity analysis
- Fitting models to data: parameter estimation, cost functions, estimators (least squares, maximum likelihood)
- Parameter uncertainty
- Model selection

Initial competences

Final competences

1
2
3
4
5

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

Seminar, Lecture

Study material

None

References

Course content-related study coaching

Assessment moments

end-of-term assessment

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

Oral assessment

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

Oral assessment

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Calculation of the examination mark

oral exam: 100%