GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2022-2023

Ecosystem Modelling (I002681)

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

Credits 4.0	**Study time 120 h**	**Contact hrs** 40.0h

Course offerings and teaching methods in academic year 2022-2023

A (semester 2)	English	Gent	lecture: plenary exercises	5.0h
			seminar: practical PC room classes	25.0h
			lecture	10.0h

Lecturers in academic year 2022-2023

De Schamphelaere, Karel	LA22	lecturer-in-charge

Offered in the following programmes in 2022-2023	**crdts**	**offering**
Master of Science in Bioscience Engineering: Environmental Technology	4	A
Master of Science in Chemical Engineering	4	A
Master of Science in Chemical Engineering	4	A
Exchange Programme in Bioscience Engineering: Environmental Technology (master's level)	4	A

Teaching languages

English

Keywords

Applied ecology, ecotoxicology, environmental management, environmental stress, (mechanistic) modelling, populations, food webs, ecosystems

Position of the course

This course aims to let students acquire theoretical knowledge and practical skills for analyzing, protecting, managing and restoring ecosystems under anthropogenic stress. The focus of this course is on a quantitative description and analysis by means of ecological models.

Contents

This course will deal (in 4 modules) with a wide variety of ecological models that are used in current practice in environmental management:
1. Population models: Matrix Projection Models
2. Population models: Dynamic Energy Budget (DEB), General Unified Theory of Survival (GUTS) and Individual Based Models (IBM)
3. Ecosystem models: Nutrient Phytoplankton Zooplankton Detritus (NPZD) models and extensions
4. Ecosystem models: Hybrid Models (IBM + NPZD) and Pattern Oriented Modeling (POM)
Population models are considered as important building blocks of ecosystem models. DEB models are mechanistic models in which energy fluxes are translated to organism-level processes that matter at population and ecosystem level (e.g. feeding, reproduction, growth). GUTS models are mechanistic models for translating stress levels into survival of organisms. A variety of animal populations and ecosystems are investigated, as well as a variety of stressors (e.g. nutrients, chemical pollution, temperature).
Every module will be taught according to a common outline:
1. Introduction, policy background, theory
2. Model development and data needs (e.g. monitoring)
3. Model implementation in programming and simulation environment

4. Model application in environmental management

Initial competences

Basic knowledge ecology, basic knowledge mathematical modelling/simulation and basic knowledge programming

Final competences

1 *Develop, calibrate, analyse and apply ecological models.*
2 *Identify the relevant ecological processes in populations and ecosystems and describe and assess quantitatively the anthropogenic influences on these processes.*
3 *Use calculations methods, models and simulation tools to assess the current and predict the future state of populations and ecosystems.*
4 *Use models to determine the human impact on populations and ecosystems, to determine how this impact can be minimised, and to determine how disturbed ecosystems can be repaired.*

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

Lecture: plenary exercises, Lecture, Seminar: practical pc room classes

Extra information on the teaching methods

Every module starts with a theoretical introduction during a lecture. For some modules there will also be plenary lectures on the black board (with active participation of students). In the PC exercises the theory is applied and cases are being worked out with modelling software. In addition, there are guest lectures in which researchers present their recent research on population and ecosystem models.

Learning materials and price

PowerPoint slide show presentations of theory and practical courses; Solutions to the exercises; Selection of scientific publications; Software for simulations (with manual); maximum 10 euro

References

Course content-related study coaching

Problems or unclarities related to theory and practice can be resolved on an individual basis, after making an appointment. There will be interactive support through the online learning platform (e.g., solutions of PC exercises will be made available).

Assessment moments

end-of-term and continuous assessment

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

Skills test, Written examination

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

Skills test, Written examination

Examination methods in case of permanent assessment

Participation, Written examination with multiple choice questions

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Extra information on the examination methods

End-of-term evaluation: The focus of the exam is on the practical aspects and skills, with use of PC and software. There will be questions about both population and ecosystem models
Permanent evaluation: participation in the guestlectures (seminar format) + multiple choice questions at the end of these lectures

Calculation of the examination mark

End-of-term evaluation (18/20)
Module 1 and 2 (population models): 10/20
Module 3 and 4 (ecosystem models): 8/20
Permanent evaluation (2/20)
Students who eschew end-of-term or permanent evaluations for this course unit may be failed by the examiner. The maximum global score in that case is 8/20.