GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2018-2019

Ecotechnology (I001130)

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

Credits	5.0	Study time	135 h
Contact hrs	60.0 h		

Course offerings and teaching methods in academic year 2018-2019

A (semester 2)	English	guided self-study	10.0 h
		seminar: practical PC room classes	27.5 h
		lecture	22.5 h

Lecturers in academic year 2018-2019

De Schamphelaere, Karel	LA22	lecturer-in-charge
Goethals, Peter	LA22	co-lecturer

Offered in the following programmes in 2018-2019	crdts	offering
Master of Science in Chemical Engineering	5	A
Master of Science in Chemical Engineering	5	A
Master of Science in Bioscience Engineering: Environmental Technology	5	A
Exchange Programme in Bioscience Engineering: Environmental Technology (master's level)	5	A

Teaching languages

English

Keywords

Ecology, ecosystem effect analysis, ecological engineering techniques, ecological modelling, population models, metapopulation models, ecosystem models, ecological monitoring, ecosystem repair, ecosystem management

Position of the course

This course aims to present theoretical and practical knowledge to the student in the area of advanced technological tools for analyzing, protecting and repairing populations, metapopulations and ecosystems. The focus of this course is on a quantitative description and analysis by means of ecological models.

Contents

Ecotechnology or Ecological Engineering is the new, internationally recognised term for the application of engineering techniques to all quantitative aspects concerning the monitoring, assessment, construction, repair and management of ecosystems.
Advanced monitoring strategies and analytical techniques are dealt with, as well as ecological models for the prediction of changes in populations, metapopulations, and ecosystems.
The use of ecological engineering techniques implies that the insights into ecological processes play an important role in the discussion and application of technological instruments for the analysis, protection and repair of ecosystems. To achieve this goal, ecological models and simulation environments will be taught in order to indicate in a transparent way how the relations between the different components should be used in the analysis and management of ecosystems.
Several PC-exercise classes and one case study (group work) will allow the students to bring the theory of investigating natural, disturbed and threatened ecosystems into practice.
This course consists of two partims, each of which are taught by one of the course responsibles, and consist of the following subjects:
Partim Prof. De Schamphelaere
1. Population models: matrix projection models

2. Population models: Individual based models
3. Ecosystem models
Partim Prof. Peter Goethals
1. Monitoring of ecosystems: basic and advanced techniques
2. Ecological assessment of surface waters
3. Ecological modelling
3.1. Data driven habitat suitability models
3.2. Knowledge driven habitat suitability models
3.3. Hybrid models
4. Integrated ecological water system models
5. Case study: Model development based on data and questions from water resource management

Initial competences

Basic knowledge about ecosystems and ecological risk assessment is an absolute prerequisite for following this course. Basic knowledge of the MATLAB/SIMULINK programming and simulation environment software (or similar software) is an advantage.

Final competences

1 Being able to develop, calibrate, analyse and apply ecological models.
2 Being able to identify the relevant ecological key processes in populations, metapopulations and ecosystems and to assess and describe quantitatively the anthropogenic influences on the processes.
3 Being able to determine the most suitable monitoring and modeling technique to monitor and protect ecosystems on the basis of process based insights.
4 Being able to use calculations methods, models and simulation tools to assess current and predict future state of ecosystems.
5 Being able to use models to determine the human impact on 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

Guided self-study, lecture, seminar: practical PC room classes

Extra information on the teaching methods

Lecture: theory
Seminar PC room classes: use of software for application of models for solving realistic ecological questions
Group Work: Developing and applying ecological models and preparing a report (case study)
Microteaching: Presentation of results of groupwork for fellow students and guided group discussion

Learning materials and price

• Copies of PowerPoint slide show presentations of theory and practical courses
• Selection of scientific publications (available via Minerva)
• Software for simulations (with manual)

References

Jorgensen & G. Bendoricchio, 2001. Fundamentals of ecological modelling. Elsevier, Amsterdam, 530 p.
R.A. Pastorok, S.M. Bartell, S. Ferson & L.R. Ginzburg, 2002. Ecological modelling in risk assessment: chemical effects on populations, ecosystems and landscapes. Lewis Publishers, 302 p.
H. Caswell. 2001. Matrix Population Models. Second edition. Sinauer Associates, Sunderland, MA, USA, 722 p.
I. Hanski. 1999. Metapopulation Ecology. Oxford University Press.
W.S.C. Gurney & R.M. Nisbet, 1998. Ecological dynamics. Oxford University Press, New York-Oxford, 335 p.
J. Treweek, 2001. Ecological impact assessment. Blackwell Science, Oxford, 351 p.

Course content-related study coaching

• Problems and/or unclarities related to theory and practice can be resolved on an individual basis, after making an appointment (via E-mail).
• For each of the case studies there is an obliged contact moment, during which the

students can present their problems and during which the teacher will giude the students toward a solution. The students can also make additional appointments for further clarification.
• There will be interactive support through Minerva (e.g., solutions of PC exercises will be made available).-

Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination

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

Written examination, report

Examination methods in case of permanent evaluation

Written examination, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Calculation of the examination mark

1. Partim Prof. De Schamphelaere (50%)
1.1. Period aligned evaluation: written exam (50%)
2. Partim Prof. Goethals
2.1. Period aligned evaluation: written exam (37,5%)
2.2. Non-period aligned evaluation: report (12,5%)
Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examinator.