GHENT UNIVERSITY

Course Specifications

From the academic year 2019-2020 up to and including the academic year

Carbon Cycling and Climate Change (I002465)

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

Credits 10.0 **Study time 280 h** **Contact hrs** 70.0h

Course offerings in academic year 2022-2023

A (semester 1) English Gent

Lecturers in academic year 2022-2023

Andersen, Mathias AARHUS01 lecturer-in-charge

Offered in the following programmes in 2022-2023	crdts	offering
International Master of Science in Soils and Global Change (main subject Physical Land Resources and Global Change)	10	A

Teaching languages

English

Keywords

Position of the course

The carbon cycling and the functioning of managed and natural ecosystems are highly influenced by climate and climate change, and climate change is also likely to substantially change the interactions among agricultural and natural ecosystems. The human use of biomass for food, feed, fibre and fuel are substantially changing the global carbon cycle affecting greenhouse gas emissions. The course aims to give the students an interdisciplinary understanding of carbon flows in ecosys-tems and the effects of climate on ecosystem processes. This will allow the students to evaluate and quantify effects of measures for reducing greenhouse gases from agriculture and to assess effects of climate change on managed and natural ecosystems.

Contents

The course focuses on carbon flows in natural and managed ecosystems (soils, plants and animals), including the effects of interactions between carbon and other nutrients, in particular nitrogen, on the internal regulations in plants (C and N metabolism) and net greenhouse gas emissions (CO2, CH4 and N2O) from agricultural systems. An important aspect in this context is the quantification of greenhouse gas emissions and how these can be reduced. The course also deals with effect of climate variability and climate change on plants and ecosystems, and how acclimation and adaptation processes work in natural and managed ecosystems. An important starting point is the relationship between processes at different scales and how effects can be scaled up to regional and global estimates, but also how climate changes can be downscaled to regional and local effects. The course has both a regional and a global focus to ecosystems and ecosystem responses. However, a large part of the experimental and data analysis parts of the course will be based on examples from agricultural systems (including livestock) and natural ecosystems in Denmark. The following topics are covered in the course: drivers and mechanisms of climate change, photosynthesis and respiration in plants, stress physiology, carbon cycling in soils, carbon cycling from plants to global scale, responses of agricultural and natural ecosystems to climate change, greenhouse gas emissions from agricultural systems (including livestock), measures for reducing greenhouse gas emissions from agriculture, and modelling of greenhouse gas emissions from ecosystems and food systems.

Initial competences

Basic chemistry, physics, plant physiology and soil science.

Final competences

• Describe and explain the effects of climate variability and climate change (CO2, temperature, precipitation and irradiance) on ecosystem functioning depending on processes operating at different scales (ranging from plant, ecosystem to global)

• Describe and analyse effects of climate change on major agricultural systems and the interaction with nature and environment

• Analyse and quantify the processes in soils, plants, animals etc. affecting carbon cycling and greenhouse gas emissions from ecosystems

• Analyse measures for adapting agricultural systems to climate change and describe the possible consequences of such measures for production, nature and environment

• Compare measures for reducing greenhouse gas emissions from agriculture with respect to efficiency, including the accounting of possible side effects on nature, environment and other ecosystem services

Conditions for credit contract

This course unit cannot be taken via a credit contract

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture, Project

Extra information on the teaching methods

The first part of the course will be based on lectures and exercises, where data analysis and modelling constitute major elements. The last part of the course will be partly project-based and connected to ongoing research activities at the AU-DJF and AU-DMU research centres. This project-based work will conducted in groups and may include field experiments, measurements, data analysis and modelling.

Learning materials and price

The following textbook is used in the course can be bought at the bookstore at Mathematical Institute below auditorium E:
Alcamo, J. & Olesen, J.E. (2012). Life in Europe under climate change. Wiley & Blackwell.
Other material includes book chapters, notes and review articles.

References

Course content-related study coaching

Assessment moments

end-of-term and continuous assessment

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

Oral examination

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

Oral examination

Examination methods in case of permanent assessment

Report, Participation

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Extra information on the examination methods

Prerequisites for examination participation: approved participation in practical exercises and submitted project report

Calculation of the examination mark