

Global Soil Threats and Ecosystem Services (I002464)

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

Credits 10.0

Study time 280 h

Contact hrs

70.0h

Course offerings and teaching methods in academic year 2022-2023

A (semester 1)

English

Gent

seminar: coached exercises

7.5h

guided self-study

27.5h

lecture

21.25h

seminar

13.75h

Lecturers in academic year 2022-2023

Iversen, Bo V.

AARHUS01 lecturer-in-charge

de Jonge, Lis Wollesen

AARHUS01 co-lecturer

Greve, Mogens H.

AARHUS01 co-lecturer

Lamandé, Mathieu

AARHUS01 co-lecturer

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 course provides students with critical analyses of the threats facing soils globally, discusses mitigation and prevention measures, and a general overview of the numerous ecosystem services provided by soils. The course will also provide a fundamental understanding of the measurement and modeling methods used to characterize the soil properties and processes that are critical to assessing the threats to the soil's optimal provision of the ecosystem services.

Contents

The course focuses on identifying, quantifying and suggesting solutions to the threats affecting soils' provision of ecosystem services. Important threats that will be covered include (but not limited to) soil compaction and sealing, decline in organic matter content, loss of biodiversity, soil contamination, soil salinization and desertification. Discussions will be conducted from a global perspective, considering the main threats prevalent in different regions in the world. An important aspect of the course will focus on outlining prevention and mitigation approaches to these threats. Ecosystem services that will be covered in the course will include provisional services (food, biomass, genetic, medicinal and other resources); regulatory and support services (air quality, erosion, climate, pollination, water storage and filtration, nutrient cycling, etc.), and cultural services. The experimental and data analyses parts of the course focus on describing and understanding concepts such as water and air storage and transport and how this relates to the soil's regulatory services. In addition, the latest knowledge on diffusive and convective transport of air and water in relation to pore characterization and the soil's role as a filter will be presented. Field visits and experiment will explore how the soils responds to contamination, pollution, and the soil's ability to transport and degrade nutrients, and pesticides. Finally, Mathematical models describing the soil's physical processes will be presented in

the context of quantifying the effects of soil degradation on its provision of ecosystem services.

Initial competences

Basic knowledge in soil science, as well as some soil physics and soil chemistry courses

Final competences

At the end of the course the student should be able to: (i) Explain the importance of soils in provision of ecosystem services (ii) Explain the anthropogenic and natural threats facing soils worldwide (iii) Use the appropriate methodology to quantify soil functions and identify different soil degradation types (iv) Elucidate measures to prevent the degradation of soil (v) Suggest practical solutions for mitigating the threats to soils

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

Guided self-study, Seminar, Lecture, Seminar: coached exercises

Extra information on the teaching methods

The course combines theoretical lectures, laboratory/field exercises, data analysis and modeling exercises, field excursions and project reports.

Learning materials and price

Learning material includes book chapters, notes and review articles

References

1. Jannes Stolte, Mehreteab Tesfai, Lillian Øygarden, Sigrun Kværnø, Jacob Keizer, Frank Verheijen, Panos Panagos, Cristiano Ballabio, Rudi Hessel ; Soil threats in Europe; EUR 27607 EN; doi:10.2788/488054 (print); doi:10.2788/828742 (online)
2. Baveye PC, Baveye J and Gowdy J (2016) Soil "Ecosystem" Services and Natural Capital: Critical Appraisal of Research on Uncertain Ground. Front. Environ. Sci. 4: 41. doi: 10.3389/fenvs.2016.00041
3. Akhikari, K and Hartemink, A.E. (2016), Linking soils to ecosystem services — A global review. Geoderma, 262, 101-111
4. Robinson, D. A., and Lebron, I. (2010). On the natural capital and ecosystem services of soils. Ecol. Econ. 70, 137–138. doi: 10.1016/j.ecolecon.2010.08.012

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

