

## Global soil threats and ecosystem services (1002464)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

|                     |  |                    |        |
|---------------------|--|--------------------|--------|
| <b>Course size</b>  | <i>(nominal values; actual values may depend on programme)</i> |                    |        |
| <b>Credits</b> 10.0 | <b>Study time</b> 280 h  | <b>Contact hrs</b> | 70.0 h |

### Course offerings and teaching methods in academic year 2022-2023

|                |         |      |                            |         |
|----------------|---------|------|----------------------------|---------|
| A (semester 1) | English | Gent | seminar: coached exercises | 7.5 h   |
|                |         |      | guided self-study          | 27.5 h  |
|                |         |      | lecture                    | 21.25 h |
|                |         |      | seminar                    | 13.75 h |

### 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 |
|---|-------|----------|
| <a href="#">International Master of Science in Soils and Global Change (main subject Physical Land Resources and Global Change)</a> | 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, lecture, seminar, 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**

#### **Evaluation methods**

end-of-term evaluation and continuous assessment

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

Oral examination

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

Oral examination

#### **Examination methods in case of permanent evaluation**

Participation, report

#### **Possibilities of retake in case of permanent evaluation**

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**