

Soil Science (1002448)

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

Credits 5.0 **Study time 150 h**

Course offerings and teaching methods in academic year 2023-2024

A (semester 1)	Dutch	Gent	excursion
			lecture
			practical

Lecturers in academic year 2023-2024

De Neve, Stefaan	LA20	lecturer-in-charge
Finke, Peter	LA20	co-lecturer

Offered in the following programmes in 2023-2024

Bachelor of Science in Bioscience Engineering	crdts	offering
	5	A

Teaching languages

Dutch

Keywords

Weathering, soil genesis, chemical and physical soil characteristics, soil quality, soil classification

Position of the course

Soils are the ecosystem compartment for interactions between the biosphere (plants, microorganisms, fauna), the atmosphere and hydrosphere (exchange of gases, precipitation, soil water, groundwater, surface water) and the lithosphere (the soil itself and the geological substrate). Soils act as extremely efficient buffers for water storage, climate change, pollution of air and water, ... This course deals with the fundamental and practical aspects of soil science, with emphasis on those aspects that are important in Bioscience Engineering (land and water management, agriculture and forestry, environment). Study of soil formation, soil composition and physico-chemical and biological characteristics aims at understanding soil's behaviour and to take adapted managerial decisions that take into account considerations about production, ecology and environment. At relevant places in the course, a direct link is made with current research within the different domains of applied soil science.

Besides an excursion, the practical training consists of a number of lab exercises and theoretical exercises and calculations.

Contents

1. Introduction, functions of soils
2. Parent materials of soils and weathering
3. Soil genesis
4. Structure and origin of clay minerals
5. Organic matter: composition, properties and functions, peat soils
6. Colloidal soil properties: exchange capacity, double layers, dispersion and flocculation, sorption processes
7. Soil reaction: origin of soil acidity, buffering capacity, pH and nutrient availability, Al toxicity, liming
8. Physical soil characteristics
9. Soil classification: introduction, international classification systems (WRB, Soil Taxonomy), Belgian system of soil classification
10. Case studies of ongoing research in the various fields of (applied) soil science

Initial competences

Soil Science builds on certain learning outcomes of course units 'Earth Sciences' and 'Environmental Sciences'; or the learning outcomes have been achieved differently. Student should also have a profound knowledge of mathematics, chemistry, biology and physics.

Final competences

- 1 The students have acquired general knowledge to understand the genesis and composition of soils.
- 2 The students can explain the behaviour of soils based on the physico-chemical properties, and have acquired general insight in systems of soil classification (both international and Belgian)
- 3 Students are able to quantitatively describe practical soil related problems and solve those, e.g. related to soil management including evolution of soil organic matter, acidification, improvement of soil chemical properties, and to understand and critically analyse soil profile descriptions.
- 4 The students understand the methods for measuring basic soil properties and basic soil processes, including the boundaries of applicability and the limitations of these methods
- 5 This course offers the necessary competences for more specialised courses such as nutrient management, soil physics, soil genesis, soil biology.

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

Excursion, Lecture, Practical

Extra information on the teaching methods

Guided self-study: making calculations independently (solutions to the calculations are provided subsequently)

Lecture: ex cathedra teaching (slides can be downloaded from Ufora)

Lecture: plenary exercises: example exercises are solved by the teacher and solutions are discussed.

Practical: a number of lab exercises to determine basic soil properties and processes

Excursion: study of a number of representative soil profiles and introduction to soil sampling

Seminar: coached exercises: exercises are solved individually in class using a calculator, and then corrected and discussed. Soil classification exercises are partly based on the DOV-website Soil Explorer.

Demonstration: demonstrations of processes, set-ups, instruments during the lectures

Learning materials and price

Extended syllabus and notes for the practical exercises. The slides which are used during the lessons are made available as .pdf files on the electronic learning platform. Estimated total cost: 15 EUR

References

- Weil R.R. (2022). The nature and properties of soils. 15th Edition, Pearson, Essex, ISBN: 978-0133254488.

- Sumner M.E. (2000). Handbook of soil science. CRC Press, Boca Raton, Florida, USA, ISBN 0-8493-3136-6.

Course content-related study coaching

Consultation of the professor and assistants is possible, before/after the lecture, during breaks, or on other moments preferably on appointment.

Assessment moments

end-of-term and continuous assessment

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

Written assessment with open-ended questions

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

Written assessment with open-ended questions

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

The period aligned examination consists of both open theory questions and practical problems (exercises). The practical problems part of this examination is considered very important and will count for at least one third of the total mark.

Calculation of the examination mark

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner. The soil classification section (theory+exercises) has a weight of 1/6 of the total grade. For the soil classification section, theory (period aligned evaluation) and labs (non-period aligned evaluation) are each weighted at 1/12 of the total grade. The remaining practicals (field trip reports and lab exercises) are weighted at 1/5 of the total grade excluding the part on Soil classification. Some of the practical exercises (especially class calculations) are evaluated on the period aligned evaluation (calculations to be made on the exam).