GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2024-2025

Soil Water Management (I002708)

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 2024-2025

A (semester 2)	English	Gent	lecture seminar

Lecturers in academic year 2024-2025

Cornelis, Wim	LA20	lecturer-in-charge

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Master of Science in Sustainable Land Management(main subject Land and Groundwater Management)	5	A
International Master of Science in Soils and Global Change (main subject Physical Land Resources and Global Change)	5	A
International Master of Science in Soils and Global Change (main subject Soil Ecosystem Services and Global Change)	5	A
Master of Science in Bioscience Engineering: Forest and Nature Management	5	A
Master of Science in Bioscience Engineering: Land, Water and Climate	5	A
Exchange Programme in Bioscience Engineering: Agricultural Sciences (master's level)	5	A
Exchange Programme in Bioscience Engineering: Environmental Technology (master's level)	5	A
Exchange Programme in Bioscience Engineering: Land and Forest management (master's level)	5	A

Teaching languages

English

Keywords

Soil-hydrological processes, soil hydraulic properties, water conservation, water harvesting, water balance, sustainability, water productivity, rainfed

Position of the course

Soil-water management is essential for sustainable crop production while minizing environmental risks, and to build resilience to droughts and floods, particularly under a changing climate. The course provides deeper insight in soil hydrological processes and presents a wide range of practices to improve the partitioning of rainwater hence optimizing the water regime. Such practices contribute to address several Sustainable Development Goals directly and indirectly, and to formulate evidence-based sustainable solutions to climate change (i.e. adaptation). They are an essential part of climate-smart agriculture.

Contents

PARTIM A. Concepts and principles of rainwater partitioning and soil-water management practices

1. Building resilience against drought: the soil-water management perspective

Part 1. Rainwater partitioning

2. Infiltration - entry of water into soil
3. Redistribution of water in soil
4. Evaporation from bare soil
5. Surface runoff

Part 2. Soil-water management practices to increase crop productivity

6. Improving restricted rainfall infiltration

7. Physical structures across slope or along contour
8. Reducing water losses from evaporation and excessive transpiration
9. Reducing rainwater drainage beyond the rooting zone
10. Improving soils with restricted rooting
11. Maximizing usefulness of low and erratic rainfall

PARTIM B. Methods to evaluate and model rootzone water balance

12. Assessing components of rootzone water balance
13. Crop response to water using the crop-water model AquaCrop

Initial competences

'Soil-water Management' primarily builts on the learning outcomes of the course 'Soil Physics'. The learning outcomes may also have been achieved in a different way.

Final competences

1 Explain how to use water sustainably and advice policy makers accordingly.
2 Explain the components of the field water cycle.
3 Select and evaluate techniques to conserve and harvest rainwater, in order to increase water productivity while minimising the environmental risks.
4 Use the Hydrus computer model to simulate changes in water content and matric potential during infiltration, redistribution and evaporation processes.
5 Use the AquaCrop model to predict crop-response to water under various conditions.
6 Critically evaluate Generative AI generated answers to knowledge and insight domain-specific questions

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

Seminar, Excursion, Lecture

Extra information on the teaching methods

Lecture: on campus lectures; all lectures are given in PC rooms which enables a mix between theory and practical work
Seminar: a variety of excercises in Excel, and with the computer simulation models Hydrus and AquaCrop are made. Information on future precipitation, soil moisture, frequency of droughts, blue and green water shortage, and soil-water management practices needs to be collected for each student's home country/region and shared (on a wiki page).
Excursion: a visit to greenhouse and rainout shelter facilities, and field plots is organized.

Study material

Type: Syllabus

Name: Soil-Water Management. Lecture notes
Indicative price: € 10
Optional: no
Language : English
Number of Pages : 290
Oldest Usable Edition : 2024-2025
Available on Ufora : No
Online Available : No
Available in the Library : No
Available through Student Association : Yes

References

Hillel, D. (1998). Environmental soil physics. Academic Press, San Diego Hudson, N. W. (1987). Soil and water conservation in semi-arid areas FAO Soils Bulletins 57, Rome
Shaxson, F. and Barber, R. (2003). Optimizing soil moisture for plant production. The significance of soil porosity. FAO Soils Bulletin 79, Rome
Oweis, T. Y. , Prinz, D. and Hachum, A.Y. (2012). Rainwater harvesting for

agriculture in the dry areas. CRC press

Course content-related study coaching

The lectures enable intensive interaction between instructors and students, during which ample opportunity is provided for questioning and discussion. Instructors (professor/assistants) are available for questions and further explanations 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

Participation, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Extra information on the examination methods

Written exam with open-ended questions (end-of-term assessment): short answer and essay questions + exercises
Participation (continuous assessment): solutions to exercises (Excel files or Hydrus simulation model results) need to be uploaded on Ufora
Assignment (continuous assessment): scenario analys of various options to build resilience to drought with the AquaCrop model.

Calculation of the examination mark

End-of-term assessment: 70%, continuous assessment: 30%
Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner. This means that if, in that case, a grade of 10 or more out of 20 is obtained, the grade may be brought down to 7/20.