

## Soil Physics (1002657)

**Cursusomvang** (nominale waarden; effectieve waarden kunnen verschillen per opleiding)

**Studiepunten 5.0**                      **Studietijd 150 u**

**Aanbodsessies en werkvormen in academiejaar 2024-2025**

A (semester 1)	Engels	Gent	werkcollege hoorcollege practicum
----------------	--------	------	---

**Lesgevers in academiejaar 2024-2025**

Cornelis, Wim	LA20	Verantwoordelijk lesgever
---------------	------	---------------------------

**Aangeboden in onderstaande opleidingen in 2024-2025**

	stptn	aanbodsessie
Master of Science in Sustainable Land Management (afstudeerrichting Land and Groundwater Management)	5	A
International Master of Science in Soils and Global Change (afstudeerrichting Physical Land Resources and Global Change)	5	A
International Master of Science in Soils and Global Change (afstudeerrichting Soil Biogeochemistry and Global Change)	5	A
International Master of Science in Soils and Global Change (afstudeerrichting Soil Ecosystem Services and Global Change)	5	A
International Master of Science in Soils and Global Change (afstudeerrichting Soil-Plant System Processes and Global Change)	5	A
Master of Science in Sustainable Land Management (afstudeerrichting Urban Land Engineering)	5	A
Master of Science in de bio-ingenieurswetenschappen: land, water en klimaat	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: land- en bosbeheer (niveau master-na-bachelor)	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: landbouwkunde (niveau master-na-bachelor)	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: milieutechnologie (niveau master-na-bachelor)	5	A

**Onderwijstalen**

Engels

**Trefwoorden**

soil-water content, soil-water potential, soil-water retention, flow of water and chemicals in soils, soil structure

**Situering**

Soils constitute a central link between air, ground and surface water, and living organisms and are thus crucial to ecosystem functioning. This basic course aims at providing profound knowledge on and insights in physical properties and processes of and in soil, and how to measure and model them, applying physical and mathematical laws. Soil-water relationships are central to the course. A profound understanding of soil physical properties and processes is essential in studies on water and chemical transport in soils, irrigation and drainage, biomass production, trafficability, gas emission from soils, soil erosion, soil compaction, salinization and ecosystem functioning, among others.

**Inhoud**

**Concepts and principles**

1. Introduction to soil physics

*Part 1. Soil solid phase*

2. Composite soil properties

3. Soil structure

*Part 2. Water retention in soils*

4. Properties of water related to porous media

5. Soil-water content

6. Energy status of water in soil

7. Water retention curve

*Part 3. Water movement in soil*

8. Water flow in capillary tubes

9. Water flow in saturated soil

10. Water flow in unsaturated soil

*Part 4. Chemical transport in soil*

11. Conservation and flux equations

12. Convection-dispersion equation

**Measuring and modeling in practice**

During lab and field work, intact soil samples are taken from fields with different land use, and soil physical and hydraulic properties are measured. At the field, water content and matric potential is measured. Data are used to assess the effect of land use on 1) soil health using soil physical quality indicators and 2) on the water regime with the Hydrus model.

**Begincompetenties**

The student should have good knowledge of mathematics and physics, and some basic understanding of earth sciences and soil science or pedology.

**Eindcompetenties**

- 1 Apply standard lab and field methods to determine hydrophysical properties of soil.
- 2 Use soil-moisture sensors and tensiometers to measure soil-moisture status.
- 3 Explain the principles behind lab and field methods, and instrumentation for monitoring soil-moisture status.
- 4 Analyse simple to more complex water transport processes in soil.
- 5 Evaluate physical quality of soils.
- 6 Apply parameter estimation methods to determine soil hydraulic properties.
- 7 Apply numerical models to predict changes in water content and matric potential with time.
- 8 Explain hydrophysical and soil mechanical properties of soil.
- 9 Explain the principles behind water and chemical transport in soil.

**Creditcontractvoorwaarde**

Toelating tot dit opleidingsonderdeel via creditcontract is mogelijk mits gunstige beoordeling van de competenties

**Examencontractvoorwaarde**

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

**Didactische werkvormen**

Groepswerk, Werkcollege, Hoorcollege, Practicum

**Toelichtingen bij de didactische werkvormen**

**Hoorcollege:** online lectures (short videos) in preparation of on campus seminars and practicals.

**Practicum: (1) Fieldwork:** soil sampling and measurement of 1. soil structural quality with visual evaluation methods, 2. soil-moisture status with sensors and tensiometers, 3. hydraulic conductivity and infiltration rate, **(2) Laboratory work:** measuring bulk density and porosity, water content (gravimetrically), water retention curve, hydraulic conductivity curve.

**Werkcollege:** active hands-on teaching on case studies with quizzes to link theory to practice, on parameterisation of the water retention curve, and on simulating the effects of land use and soil structural degradation on soil-water dynamics with the Hydrus model, using data collected during practical.

**Groepswerk:** results from the seminars on parameterisation of the water retention curve, and on simulating the effects of land use and soil structural degradation on soil-water dynamics have to be shared and prepared for oral discussion.

**Studiemateriaal**

Type: Syllabus

Naam: Soil Physics. Lecture notes and exercises

Richtprijs: € 15

Optioneel: nee

Taal : Engels

Aantal pagina's : 368  
Oudst bruikbare editie : 2024-2025  
Beschikbaar op Ufora : Nee  
Beschikbaar in de bibliotheek : Nee  
Beschikbaar via studentenvereniging : Ja

## Referenties

Jury, W.A. & Horton, R. 2004. Soil Physics. John Wiley & Sons.  
Hillel, D. 1998. Environmental Soil Physics : Fundamentals, Applications, and Environmental Considerations. Academic Press.  
Radcliffe, D.E. & Simunek, J. 2010. Soil Physics with HYDRUS: Modeling and Applications. CRC Press, Taylor & Francis Group

## Vakinhoudelijke studiebegeleiding

Instructors (professor/assistants) are available for questions and further explanations on appointment.

## Evaluatiemomenten

periodegebonden en niet-periodegebonden evaluatie

## Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode

Schriftelijke evaluatie met open vragen

## Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode

Schriftelijke evaluatie met open vragen

## Evaluatievormen bij niet-periodegebonden evaluatie

Mondelinge evaluatie, Participatie, Schriftelijke evaluatie open boek

## Tweede examenkans in geval van niet-periodegebonden evaluatie

Examen in de tweede examenperiode is enkel mogelijk in gewijzigde vorm

## Toelichtingen bij de evaluatievormen

**Schriftelijke evaluatie met open vragen** (periodegebonden evaluatie): short answer and essay questions on theory + exercises. This evaluates the teaching methods lecture and seminar.

**Schriftelijke evaluatie met open vragen** (niet-periodegebonden evaluatie): assessment of the quizzes related to seminars and practicals. This evaluates the teaching methods seminar and practical.

**Participatie** (niet-periodegebonden evaluatie): assessment of participation in quizzes related to seminars and practicals. This evaluates the teaching methods seminar and practical.

**Mondelinge evaluatie** (niet-periodegebonden evaluatie): assessment of the parameterisation and modeling exercise related to seminars and practicals. This evaluates the teaching methods seminar and practical.

## Eindscoreberekening

**Schriftelijke evaluatie met open vragen** (periodegebonden evaluatie): 65%

**Schriftelijke evaluatie met open vragen, mondelinge evaluatie, participatie** (niet-periodegebonden evaluatie): 35%

De examiner kan de student die zich onttrekt aan periodegebonden en/of niet-periodegebonden evaluaties voor dit opleidingsonderdeel niet-geslaagd verklaren. Dit betekent dat wanneer in voorvallend geval een cijfer van 10 of meer op 20 wordt gehaald, het cijfer naar 7/20 kan worden gebracht.