

Soil Physics (I002657)

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

Studiepunten 5.0

Studietijd 150 u

Aanbodsessies en werkvormen in academiejaar 2023-2024

A (semester 1)

Engels

Gent

werkcollege

hoorcollege

practicum

Lesgevers in academiejaar 2023-2024

Cornelis, Wim

LA20

Verantwoordelijk lesgever

Aangeboden in onderstaande opleidingen in 2023-2024

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

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

Werkcollege, Hoorcollege, Practicum

Toelichtingen bij de didactische werkvormen

Lecture: online lectures (short video's) in preparation of on campus seminars and practical.

Practical: (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.

Seminar: active hands-on teaching on case studies with quizzes to link theory to practice, on estimation of parameters of water retention model, on simulating water flow with Hydrus model to evaluate effect of land use and soil structural degradation, using data collected during practical.

Leermateriaal

A syllabus is available. Additional documentation (slide shows, background information, exercises, video) can be found on Ufora platform.

Cost: 5.0 EUR

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

Participatie, Werkstuk

Tweede examenkans in geval van niet-periodegebonden evaluatie

Examen in de tweede examenperiode is enkel mogelijk in gewijzigde vorm

Toelichtingen bij de evaluatievormen

Written assessment with open-ended questions (periodic evaluation): short answer and essay questions on theory + exercises. This evaluates the teaching methods lecture and seminar.

Participation (permanent evaluation): assessment of participation in and quizzes related to seminars and practicals. This evaluates the teaching methods seminar and practical.

Assignment (permanent evaluation): assessment of the quizzes related to seminars and practicals. This evaluates the teaching methods seminar and practical.

Eindscoreberekening

Written assessment with open-ended questions: 65%

Participation + Assignment: 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 voorkomend geval een cijfer van 10 of meer op 20 wordt gehaald, het cijfer naar 7/20 kan worden gebracht.