GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2020-2021

Soil Erosion Control: Principles and Practice (I002664)

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.

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

Credits 4.0 Study time 120 h Contact hrs 40.0 h

Course offerings and teaching methods in academic year 2020-2021

A (semester 1)	English	Gent	excursion	1.25 h
			fieldwork	2.5 h
			practicum	7.5 h
			seminar: practical PC room classes	8.75 h
			lecture	20.0 h

Lecturers in academic year 2020-2021

Verdoodt, Ann	LA20	lecturer-in-charge

Offered in the following programmes in 2020-2021	crdts	offering
Master of Science in Physical Land Resources (main subject Land Resources Engineering)	4	A
Master of Science in Physical Land Resources (main subject Soil Science)	4	A
Master of Science in Bioscience Engineering: Forest and Nature Management	4	A
Master of Science in Bioscience Engineering: Land and Water Management	4	A
Exchange Programme in Bioscience Engineering: Land and Forest management (master's level)	4	A

Teaching languages

English

Keywords

water erosion, rainfall erosivity, soil erodibility, topography, land use and land cover, ecosystem service, (bio)-engineering strategies, erosion risk, erosion control, introduction to wind erosion

Position of the course

Soil erosion is the removal and transport of soil by a transporting agent (water, wind, tillage, gravity). It results from interactions between atmosphere (rain, wind) and the land surface (roughness, steepness, soil, vegetation), and thus is found at the **interface of climate, land and water components** of both natural and anthropogenic ecosystems.
The ability to control soil erosion is an important ecosystem service. While erosion is a natural process, inappropriate human action and climate change can strongly accelerate soil losses. Soil erosion by water is extensively reported globally and has a large impact on the environment and man, as part of the sediment ends up in water bodies or in the built-up zones.
This course aims to provide **advanced knowledge in water erosion**, allowing students to recognise, measure, understand and control (inter)rill erosion processes at field and landscape level. An introduction is given to tillage erosion, gully erosion, landsliding and wind erosion.

Contents

Erosion control entails insights in processes at stake, identification of erosion hotspots, understanding the main drivers/causes, encouraging effective and efficient land management, and design of erosion control measures.

The course reveals the **processes and mechanics** of soil erosion, and assesses the **influencing factors** (climate, landscape, soil, vegetation) of these phenomena. The students learn how to **measure** and interpret soil erosion losses at different spatial and temporal scales, and how to apply and critically evaluate an available **soil erosion model**. Diverse **(bio)-engineering strategies to control soil loss** by water are discussed, visited and evaluated. Due attention is given to **socio-economic aspects** that affect the adoption of erosion control practices (if time allows by a role-play).
The **practicals** have a twofold aim: (1) to support the theory by promoting insights and critical reflections in the processes and models, respectively, and (2) to offer practical skills in **measuring, assessing, modeling and reporting soil erosion** at various scales. **Simulations using the rainfall simulator** offer insights in the temporal behaviour of different processes at lab/field scale and/or reveal the impact of particular erosion control measures. The students also explore the use of a **soil erosion model** (e.g. RUSLE) and the identification of **erosion risk zones in GIS, under current and future climate scenarios**. During a field **excursion/fieldwork**, students observe different erosion control measures in place and are introduced to the development of erosion control plans.

Initial competences

The course builds on general insights in soil science, soil physics and hydrology. More specifically, the student is expected to

- have insight in the composition of soils, the hydrophysical properties and behaviour of soils, and understands international soil classification nomenclature,
- have basic knowledge of meteorological phenomena related to rainfall and wind,
- be able to perform basic analyses using GIS software on digital maps representing vector and raster data structures.

Final competences

1. Correctly use specific terminology and principles in soil erosion assessment and control when communicating with experts
2. Understand mechanical and physical processes that underlie occurrence of water erosion
3. Have insights in the importance and appropriate quantification of the main abiotic (climate, land, soil) and biotic (vegetation, soil) factors influencing soil loss by water in temperate and tropical zones
4. Be able to select and design appropriate soil erosion measuring schemes at various spatial scales
5. Predict soil erosion losses under current and future climate scenarios
6. Be able to identify water erosion risk zones within a GIS
7. Be able to apply and critically evaluate an erosion model to predict the impact of various (dynamic) influencing factors as well as erosion control measures on soil erosion losses
8. Have insights in the action and applicability of diverse agronomic, biotic and infrastructural erosion control measures
9. Be aware of the socio-economic context that might affect adoption of erosion control strategies
10. Collaborate with fellow students to solve (interdisciplinary) assignments

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, practicum, fieldwork, seminar: practical PC room classes

Learning materials and price

An English syllabus will be made available during the first lectures, downloadable from Minerva. During the course of the lectures, an electronic version of the slides will be deposited at the Minerva site. Relevant papers will be posted to Minerva.
An estimated contribution of 20.0 EUR will be asked to cover the expenses of the excursion (excursion guide, transport).

References

- R. Morgan: Soil Erosion and Conservation, Longman Ltd
- R.Bagnold: The Physics of Blown Sand. Chapman & Hall, London
- Y. Shao: Physics and modelling of wind erosion, Kluwer, Dordrecht
- J.M. Garcia-Ruiz et al. (2015). A meta-analysis of soil erosion rates across the world. Geomorphology 239

Course content-related study coaching

Personal coaching before and after the lectures, and consultancy by assistant during the guided exercises.
Feedback about the corrected applications during the guided exercises.

Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination with open questions

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

Written examination with open questions

Examination methods in case of permanent evaluation

Assignment, skills test, peer assessment, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

Extra information on the examination methods

The **period-aligned written examination** comprises theoretical questions that evaluate the knowledge and insight of the student in soil erosion processes and control, as well as limited calculations that reflect the students individual understanding of the practicals.
During the course of the semester, students have to submit **individual and group reports (depending on kind of task) on the fieldwork, lab- and computer work**. Deadlines for submission need to be strictly respected. Two/Four aspects will be evaluated:

- the acquired **skills**, evaluating to what extent calculations, software were correctly done/used,
- the ability to critically and thoroughly analyse specific cases, come to integrated conclusions (**assignment**), and
- the group dynamics (planning, tasks, individual contributions summarised in a **report**).
- the students' performance/evolution as a team member (**peer assessment**)

Each student is held responsible for the timely submission and reporting of a part of the practicals. Each student is expected to contribute to all practicals and group reports. The group members can organise themselves and agree upon a fair task distribution (reflected in the reports). Through peer assessment they help each other in understanding and exploiting/correcting their strengths and weaknesses when working in a team.

Calculation of the examination mark

- periode-aligned written exam: 60%
- individual and group reports: 40%

The lecturer can decide to deviate from or not consider the peer assessment scores at all when determining individual scores per student for the group tasks.
Unfoundedly eschewing a practical for this course unit leads to an individual score of 0 for that report. In case of foundedly eschewing the practicals or excursion, (an) alternative task(s) can be provided and/or solutions developed in consultation with other team members and the lecturer.