GHENT UNIVERSITY

# Course Specifications

Valid as from the academic year 2026-2027

## Soil Chemistry (I002773)

**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 2026-2027**

| | | | |
|---|---|---|---|
| A (semester 1) | English | Gent | lecture |
| | | | practical |

**Lecturers in academic year 2026-2027**

| | | |
|---|---|---|
| Tack, Filip | LA24 | lecturer-in-charge |

| **Offered in the following programmes in 2026-2027** | **crdts** | **offering** |
|---|---|---|
| International Master of Science in Soils and Global Change (main subject Soil Ecosystem Services and Global Change) | 5 | A |
| International Master of Science in Soils and Global Change (main subject Soil-Plant System Processes and Global Change) | 5 | A |
| Exchange Programme in Bioscience Engineering: Agricultural Sciences (master's level) | 5 | A |
| Exchange Programme in Bioscience Engineering: Land and Forest management (master's level) | 5 | A |

**Teaching languages**

English

**Keywords**

soil, chemistry, pedology, dynamics of elements

**Position of the course**

This is a basic course for soil science students that provides knowledge on the chemical functioning and pedological analysis of soils, important for understanding soil functions, management and use.

**Contents**

1 General concepts in environmental chemical analysis
1.1 Chemical elements
1.2 Matter
1.3 Chemical binding
1.4 Chemical reactions
1.5 Chemical equilibria
1.6 Concentration
1.7 Chemical analysis
1.8 Analytical performance

2 Soil composition
2.1 Composition of soils
2.2 Soil sampling

3 Acidity and alkalinity
3.1 Aqueous acid-base theories
3.2 Acid-base equilibria in water
3.3 Autoprotolysis of water and the pH scale
3.4 Calculation of the pH of solutions
3.5 Soil reaction: acidity and alkalinity
3.6 Chemical analysis

4 Oxidation and reduction
4.1 Redox reactions
4.2 Redox equilibria
4.3 Redox and pH: the stability region of water
4.4 Microbial reduction processes
4.5 Redox processes in the environmental
4.6 Potentiometry

5 Carbonates
5.1 Calcareous soils
5.2 $CO_2$-equilibria
5.3 Chemical analysis

6 Organic matter
6.1 Soil organic matter
6.2 Peat soils
6.3 Chemical analysis

7 Sesquioxides
7.1 Hydrated oxides of iron and aluminium
7.2 Aluminium
7.3 Chemical analysis

8 Soluble salts
8.1 Solubility
8.2 Soluble salts and saline soils
8.3 Electrical conductivity
8.4 Sodium adsorption ratio and sodic soils
8.5 Effects of salinity and sodicity
8.6 Analytical determination

9 Sorption
9.1 Sorption phenomena
9.2 Cation exchange
9.3 Analytical determination
9.4 Anion exchange

10 Mayor nutrients: nitrogen
10.1 Nitrogen in soils
10.2 Analysis of nitrogen

11 Mayor nutrients: phosphorus
11.1 Introduction
11.2 Forms of occurrence
11.3 Phosphate solubility in the presence of Al, Fe and Ca
11.4 Behavior in soils
11.5 Analysis of P

12 Mayor nutrients: potassium and secondary macronutrients
12.1 Potassium in soils
12.2 Calcium and magnesium in soils
12.3 Sulfur

13 Trace elements
13.1 Environmental chemistry and behavior
13.2 Analysis of trace elements
13.3 Spectroscopic methods for elemental analysis

**Initial competences**

Elementary knowledge of inorganic chemistry

**Final competences**

1 Explain soil components and chemical reactions in soils
2 Explain the principle of analytical methods for soil characterization
3 Select suited analytical methods for characterizing soil properties
4 Interpret analytical results of soil analysis
5 Evaluate the accuracy and the reliability of analytical data

**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**

Lecture, Practical

**Extra information on the teaching methods**

Practicum: lab exercises: Analysis of soil

**Study material**

Type: Syllabus

Name: Soil Chemistry
Indicative price: € 25
Optional: no
Language : English

Type: Slides

Name: Slides
Indicative price: Free or paid by faculty
Optional: no

Type: Lab Material

Name: Alcohol Felt Tip Pen
Indicative price: € 10
Optional: no

**References**

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**Course content-related study coaching**

Illustration of theory via problems and hands-on laboratory exercises.

**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**

Continuous assessment: evaluation based on reports of practical laboratory exercises
End-of-term assessment: written examination with open-ended questions (60%) and numerical problems (40%)

**Calculation of the examination mark**

Continuous assessment: 8/20
End-of-term assessment: 12/20
Students who do not pass both the continuous assessment and the end-of-term assessment, or who eschew one or more evaluation moments without legal justification, may be failed by the examiner. In these cases, a score of at most 9/20 will be assigned.