Course Specifications
Valid as from the academic year 2020-2021

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)

<table>
<thead>
<tr>
<th>Credits</th>
<th>Study time</th>
<th>Contact hrs</th>
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<tbody>
<tr>
<td>5.0</td>
<td>150 h</td>
<td>40.0 h</td>
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Course offerings and teaching methods in academic year 2020-2021

| A (semester 2) | English | Gent | lecture | 20.0 h |
|               |         |      | practicum | 20.0 h |
|               |         |      | online lecture | 0.0 h |

Lecturers in academic year 2020-2021

Dewaele, Stijn
WE13 lecturer-in-charge

Offered in the following programmes in 2020-2021

| Master of Science in Physical Land Resources (main subject Land Resources Engineering) | 5 | A |
| Master of Science in Physical Land Resources (main subject Soil Science) | 5 | A |
| Master of Science in Geology | 5 | A |
| Exchange programme in Geology (master's level) | 5 | A |

Teaching languages

English

Keywords

Clay, clay minerals, identification of clay and clay minerals, physical and chemical properties of clay, clay surfaces

Position of the course

The aim of this course is the identification and characterization of minerals present in clay by using different techniques (XRD, TG, DTA, SEM, TEM, ...) and the interpretation of clay mineralogical data in combination with chemical analyses. The physical and chemical (including electrokinetic) properties of clay minerals that are important with regard to the environment are discussed comprehensively.

Contents

- The importance of clay mineralogy and the definition of clay and clay minerals.
- Structural concepts (coordination, electrical charge and bonding in silicates).
- Discussion (advantages, disadvantages, sample preparation procedures) of different techniques (XRD, TG, DTA, SEM, TEM, IR, Mössbauer Spectroscopy, ...) and chemical analyses and treatments, used in clay research and for the identification of clay minerals.
- Properties and identification of major silicate clay minerals (kaolin-serpentine group, talc-pyrophyllite group, micas, vermiculites, smectites, chlorites, mixed-layered clay minerals, palygorskite-sepiolite group, allophane and imogolite). The structural properties, chemical composition and identification possibilities are discussed for each group. Their chemical and physical properties, as well as the natural occurrence, are treated in detail.
- Identification of nonclay minerals, present in clays (silica minerals, iron oxides, aluminium hydroxides and oxyhydroxides, manganese oxides and hydroxides, titanium oxides, slightly soluble salts,feldspars, feldspathoids and zeolites).
- Environmentally significant properties of clays : nature of clay mineral surfaces; processes at clay mineral surfaces; stabilization of smectitic materials; clay-organic matter interactions.
- Economic Geology of different clay minerals

(Approved) 1
Practical exercises: identification and characterization of clay minerals and materials using different techniques; study of transformation processes in clay minerals and reactions on clay mineral surfaces; calculation of structural formulas of clay minerals.

Initial competences
Course for students majoring in earth sciences or related fields; students are familiar with the fundamentals of chemistry and mineralogy.

Final competences
1. The students are able to identify clay minerals using different techniques.
2. The students are able to determine the mineralogical composition of clays.
3. The students are able to interpret clay mineralogica data in combination with chemical analyses.
4. The students are able to understand the environmental significant properties of clay and clay minerals.

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, practicum, online lecture

Extra information on the teaching methods
Lecture, practicum, seminar: coached exercises
Due to COVID19, the type of education can be modified if it seems to be necessary.

Learning materials and price
Course books available: yes
Obligatory handbooks: no
Cost: 10 €

References
1) "Crystal structures of clay minerals and their X-ray identification", G.W. Brindley & G. Brown, 1980
2) "Chemistry of clays and clay minerals", A.C.D. Newman, 1987
3) "Clays", A. Meunier, 2005

Course content-related study coaching
Consultancy by professor and staff members (interactive support via Ufora)
Library for additional information

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

Possibilities of retake in case of permanent evaluation
examination during the second examination period is possible

Extra information on the examination methods
Due to COVID19, the type of evaluation can be modified if it seems to be necessary

Calculation of the examination mark
periodic evaluation 80% and permanent evaluation 20%

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