Course Specifications
Valid as from the academic year 2017-2018

Lecturers in academic year 2017-2018
Adriaens, Mieke WE06 lecturer-in-charge
Dendooven, Jolien WE04 co-lecturer

Offered in the following programmes in 2017-2018

| Master of Science in Chemistry | 6 | A |
| Master of Science in Chemical Engineering | 6 | A |
| Master of Science in Chemical Engineering | 6 | A |
| Exchange Programme in Chemistry (master's level) | 6 | A |

Teaching languages
English

Keywords
Chemical surface analysis, electron interaction, photon interaction, ion interaction, local probe methods

Position of the course
- Acquiring an overview in the current state-of-the-art surface analysis techniques
- Understanding the principles of these techniques together with their capacities in various types of applications

Contents
1 General introduction on surfaces
   • Why study surfaces?
   • How do we define a surface?
   • Which information do we obtain?
2 Methods based on electron interaction
   • Interaction of electrons with matter
   • Overview of techniques based on electron interaction
   • Transmission electron microscopy (TEM) and electron energy loss spectroscopy (EELS)
   • Scanning electron microscopy (SEM, SEM-EDS, EPMA ...)
   • Auger electron spectroscopy (AES, SAM)
3 Methods based on photon interaction
   • Interaction of photons with matter
   • Overview of techniques based on electron interaction
   • X-ray photoelectron spectroscopy (XPS)
4 Methods based on ion interaction
   • Interactions van ions with matter
   • Overview of techniques based on ion interaction
   • Secondary ion mass spectrometry (SIMS)
   • Rutherford backscattering (RBS)
   • Particle Induced X-ray Emission (PIXE)
5 Local probe methods
   • Principle
   • Scanning probe microscopy (SMP)

Credits 6.0
Study time 152 h
Contact hrs 47.0 h
Course size (nominal values; actual values may depend on programme)
Course offerings and teaching methods in academic year 2017-2018
A (semester 2) practicum 12.5 h
lecture 35.0 h

(Approved)
• Scanning force microscopy (SFM)
• Scanning tunnelling microscopy (STM)
• Atomic force microscopy (AFM)

6 Case studies in which a combination of the above-mentioned techniques are used.

For each of the methods listed above we will discuss principle, instrumentation, type of chemical information obtained and a set of applications.

**Initial competences**
Completion of the courses ‘Physics I and II’, ‘Analytical chemistry: principles’ and ‘Spectroscopic methods of analysis’ or having mastered the corresponding competences in another way.

**Final competences**
1. The student has an overview of methods for chemical surface analysis, their application area, capabilities and limitations.
2. The student is aware of and can explain the basic operating principles of analytical instrumentation for chemical surface analysis.
3. The student is capable of suggesting and appropriate analytical technique for a given chemical problem in this context.

**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

**Learning materials and price**
Estimated cost: 15 EUR
English lecture notes
Documents available through Minerva

**References**

**Course content-related study coaching**
Through individual feedback by lecturer
Interactive guidance through Minerva

**Evaluation methods**
end-of-term evaluation

**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**

**Possibilities of retake in case of permanent evaluation**
not applicable

**Extra information on the examination methods**
Evaluate understanding of basic concepts and being apply to them in concrete problem cases.

**Calculation of the examination mark**

(Approved)