Course Specifications
Valid as from the academic year 2014-2015

Advanced X-ray Spectroscopic Techniques for Chemical Analysis
(C002961)

Course size

<table>
<thead>
<tr>
<th>Credits</th>
<th>Study time</th>
<th>Contact hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>75 h</td>
<td>15.0 h</td>
</tr>
</tbody>
</table>

Course offerings and teaching methods in academic year 2017-2018

A (semester 1) lecture

Lecturers in academic year 2017-2018

Vincze, Laszlo

Offered in the following programmes in 2017-2018

<table>
<thead>
<tr>
<th>Crdts</th>
<th>Offering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master of Science in Chemistry</td>
<td>3 A</td>
</tr>
<tr>
<td>Master of Science in Chemical Engineering</td>
<td>3 A</td>
</tr>
<tr>
<td>Master of Science in Chemical Engineering</td>
<td>3 A</td>
</tr>
<tr>
<td>Exchange Programme in Chemistry (master's level)</td>
<td>3 A</td>
</tr>
</tbody>
</table>

Teaching languages

English

Keywords

X-ray spectroscopy, Monte Carlo simulation, synchrotron radiation, XRF, XAFS, XANES, EXAFS

Position of the course

This course provides a detailed knowledge of the principles of the most important analytical methods based on advanced X-ray induced (micro)spectroscopic techniques which make use of either laboratory or synchrotron radiation sources. The course discusses in detail the principles of chemical/structural analysis on the microscopic level by X-ray absorption/emission techniques. Special attention is given to the use of synchrotron radiation for trace-element microanalysis, absorption microspectroscopy and novel X-ray imaging methods such as transmission, phase-contrast and fluorescence microtomography. Throughout the course, examples of applications of the discussed techniques will be given in the field of materials science, geochemistry, archaeology and environmental science.

Contents

- Quantitative X-ray fluorescence (XRF) spectroscopy
- Monte Carlo simulation for XRF
- Complementary information on X-ray interactions with matter (polarisation effects in X-ray scattering, Doppler effect in Compton scattering, X-ray resonant Raman scattering, effects of secondary photoelectrons via impact ionisation and photoelectron bremsstrahlung)
- X-ray absorption spectroscopy (XAS) using synchrotron radiation

Initial competences

Having followed successfully the course “Spectroscopische analysemethoden / Spectroscopic Methods of Analysis” or having achieved these competences in an alternative way.

Final competences

The student has a thorough knowledge of the concepts of advanced X-ray (micro) spectroscopic methods for chemical analysis. He/she knows how to apply them in specific applications.

Conditions for credit contract

(Approved)
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

**Learning materials and price**

English syllabus Cost: 8 EUR

**References**


**Course content-related study coaching**

Interactive support through Minerva, personal: upon electronic appointment.

**Evaluation methods**

end-of-term evaluation

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

Written examination

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

Written examination

**Examination methods in case of permanent evaluation**

**Possibilities of retake in case of permanent evaluation**

not applicable

**Calculation of the examination mark**

Written exam counts for 100%.