

Advanced Instrumental Techniques for Chemical Analysis (E070650)

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

Credits 3.0 Study time 90 h Contact hrs 15.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 1) English lecture 15.0 h

Lecturers in academic year 2018-2019

Vincze, Laszlo WE06 lecturer-in-charge

Offered in the following programmes in 2018-2019

	crdts	offering
Master of Science in Chemical Engineering	3	A
Master of Science in Sustainable Materials Engineering	3	A
Master of Science in Chemical Engineering	3	A

Teaching languages

English

Keywords

Position of the course

The objective of this course is to introduce the student to some more advanced instrumental techniques for chemical analysis. Without tackling all the technical details of the corresponding instrumentation, insight is provided into the capabilities and limitations of advanced spectrometric techniques. Among others the basic principles of synchrotron radiation (SR) based spectroscopic techniques, such as SR X-ray fluorescence and absorption (micro)spectroscopy, are discussed. An active insight, enabling solving chemical problems in this context, is stimulated.

Contents

- Inductively coupled plasma optical emission spectrometry - ICPOES
- Inductively coupled plasma mass spectrometry - ICPMS
- Infrared spectrometry
- Synchrotron radiation X-ray micro-spectroscopy
- Some instrumental aspects of spectroscopic and mass spectrometric analysis techniques

Initial competences

Compulsory course 'Chemical analysis techniques' (Master 1)

Final competences

- 1 CONCEPTS: ICP, ICP as ion-source, mass spectrometer, spectral and non-spectral interferences, isotope dilution, monochromator, detector; synchrotron radiation (SR), synchrotron X-ray fluorescence, X-ray absorption techniques: XANES/EXAFS.
- 2 INSIGHTS: principles and possibilities of ICPOES, instrumentation; principles and possibilities of ICPMS, instrumentation; principles of IR-spectrometry and its use for compound identification; understanding of the working mechanism of the basic components of spectrometric and mass-spectrometric instrumentation; principles of element and local chemical structure analysis by means of synchrotron radiation (SR) X-ray micro-fluorescence and absorption spectroscopic techniques, basic components of SR instrumentation.
- 3 SKILLS: the ability to solve simple problems related to the use of SR X-ray fluorescence (micro)analysis methods, spectrum interpretation/quantitative analysis; skills to solve simple analytical problems by absorption spectroscopic techniques.

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

Extra information on the teaching methods

Classroom lectures

Learning materials and price

Syllabus in Dutch (10 #)

References

- Chemical Analysis : Modern instrumentation, methods and techniques, Francis Rouessac and Annick Rouessac, John Wiley & Sons, 2000, ISBN 0-471-97261-4.
- Principles of Instrumental Analysis (5th ed), Douglas A. Skoog, F. James Holler and Timothy A. Nieman, Brooks Cole, 1997, ISBN 0-03-002078-6.
- Spectrometrische analysetechnieken, M.T.C. de Loos - Vollebregt, Heron reeks - Bohn Stafleu Van Loghum, 2004, ISBN 90-313-4142-8.

Course content-related study coaching

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

Extra information on the examination methods

During examination period: written closed-book exam complemented with oral examination

Calculation of the examination mark

Evaluation during examination period