Spectroscopic Analysis (I630001)

Valid as from the academic year 2019-2020

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 Specifications

Lecturers in academic year 2020-2021
Verheust, Yannick LA23 staff member
Dumoulin, Ann LA24 lecturer-in-charge

Offered in the following programmes in 2020-2021
Bachelor of Science in Bioindustrial Sciences

Course offerings and teaching methods in academic year 2020-2021

A (semester 1) Dutch Kortrijk practicum 36.0 h
lecture 24.0 h

Course size (nominal values; actual values may depend on programme)
Credits 6.0 Study time 180 h Contact hrs 60.0 h

Teaching languages
Dutch

Keywords
Atomic Spectroscopy, AAS, AES, XRF, molecular spectroscopy, UV/VIS-spectroscopy, Fluorescence, IR spectroscopy, Raman spectroscopy, Mass spectrometry, ICP-MS

Position of the course
The goal of this course is to provide the students with an overview of the important spectroscopic analytical methods. For each technique, we will discuss the theoretical background, the instrumentation, qualitative and quantitative analysis and the applications. The course aims at providing knowledge and insight by theoretical considerations, examples and exercises. During the labs, the students will gain hands-on experience and practical skills on the spectroscopic techniques.

Contents
1 Pre-analysis: sample destruction
2 Introduction to spectroscopy
3 Atomic Spectroscopy
   1 Flame Atomic Absorption Spectroscopy (F-AAS)
   2 Electrothermal Atomic Absorption Spectroscopy (ET-AAS)
   3 Arc and Spark Atomic Emission Spectroscopy
   4 Laser induced breakdown spectroscopy (LIBS)
   5 Inductively coupled plasma optical emission spectroscopy (ICP-OES)
   6 X-Ray Fluorescence
4 Molecular spectroscopy
   1 UV/VIS-absorption
   2 Fluorescence
   3 IR-Spectroscopy (incl. FTIR, ATR-IR, NIR)
   4 Raman Spectroscopy
5 Mass spectrometry (MS)
6 ICP-MS

Practicum
Lab exercises following the theoretical course.
Examples: determination of free fatty acids in oil with FT/IR, determination of K+ in water with AES and validation of the method, determination of metals in cattle feed with ICP, determination of Fe in water with spectrophotometer, determination of COD of waste water, evaluation of different correction mechanisms with furnace/AAS for determination of Cd.
planning of a small project and the implementation: sample pretreatment and

(Approved) 1
measurement

Initial competences
The course builds on certain learning outcomes of the following course units: 'General Chemistry', 'Analytical Chemistry 1' and 'Analytical Chemistry 2'

Final competences
1. Have knowledge and insight in the possibilities and limitations of the spectroscopic analytical methods and be able to apply this for complex analytical problems in his/her specialization.
2. Understand the theoretical background, have knowledge of the parts and the operation of the instrumentation.
3. Analyze a problem and select the most appropriate technique based on a literature search (scientific literature, application notes, standards)
4. He/she has gained the analytical skills, methods and technologies to conduct the experiments in team, including the implementation of environment, health and safety rules
5. Statistical treatment of the data, interpretation and communication of the results.
6. solving technical problems and processes by the integration of knowledge from different scientific disciplines

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

Extra information on the teaching methods
36h hands-on lab in small groups
24 h lectures with powerpoint presentation and coached exercises

Learning materials and price
Digital learning environment
Dutch syllabus for theoretical course, €18
Notes for practical exercises

References
overige referenties worden per hoofdstuk weergegeven

Course content-related study coaching
The teaching staff (both professor and teaching assistants) can allways be contacted to solve problems. Minerva will be used to post exercises and solutions of exercises.

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, oral examination

Examination methods in case of periodic evaluation during the second examination period
Written examination with open questions, oral examination

Examination methods in case of permanent evaluation
Oral examination, skills test, job performance assessment, report

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

Extra information on the examination methods
permanent evaluation: evaluation of attitude, knowledge and technical skills during the hands-on lab sessions. Evaluation of the results in written reports and lab notebook.
Evaluation of the results of the measurements and a lab exam (a practical test and oral

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Calculation of the examination mark

First examination period
periodic evaluation (theory/exercises): 50%
permanent evaluation (practicum): 50%
In order to pass, one has to attain a score of at least 8/20 for both periodic and permanent evaluation. If this condition is not fulfilled, and when the calculated score is 10/20 or more, the student may be failed by the examiner and gets a score of 9/20.

Students who eschew (part of) non-period aligned evaluations for this course get score AFW for the permanent evaluation.

Second examination period
periodic evaluation: 50%
permanent evaluation:
40%: score from the first examination period
10%: replacement assignment in order to re-evaluate part of the lab skills
In order to pass, one has to attain a score of at least 8/20 for both periodic and permanent evaluation. If this condition is not fulfilled, and when the calculated score is 10/20 or more, the student may be failed by the examiner and gets a score of 9/20.