Linnæus University

Jnr: 2014/3702-3.1.2

Course syllabus

Faculty of Health and Life Sciences
Department of Chemistry and Biomedical Sciences

4KE508 Fördjupad analytisk kemi med bioanalys, 15 högskolepoäng
Advanced Analytical Chemistry with Bioanalysis, 15 credits

Main field of study
Chemistry

Subject Group
Chemistry

Level of classification
Second Level

Progression
A1N

Date of Ratification
Approved by Faculty of Health and Life Sciences 2014-10-30
The course syllabus is valid from autumn semester 2015

Prerequisites
Basic entry requirements for studies at second cycle level plus 60 higher education credits in Chemistry, or equivalent.

Objectives

Subcourse 1: Chromatography, 5 credits

At the end of the course the student should be able to:
- Demonstrate good skills in the practical management and basic maintenance of high-performance liquid chromatography (LC) and gas chromatography (GC) instruments and common detectors based on UV-VIS light absorbance, conductivity,, flame ionization (FID) and mass determination (MS)
- Give an account of the construction of the instruments and the various principles that can be used with LC and GC separations respectively and how these separations can be optimized with each approach;
- Give an account of the measurement principles and area of application for the detectors named above as well as mastering spectral interpretation from spectra obtained with a mass spectrometry detector and
- Demonstrate good skills in the statistical analysis of measurements and the ability to critically analyze and evaluate results obtained from analysis.

Subcourse 2: Spectroscopy, 5 credits

At the end of the course the student should be able to:
- Demonstrate good skills in the practical management of atomic and molecular spectroscopic techniques such as atomic absorption spectrophotometry (AAS), UV-VIS spectrophotometry and steady-state (emission, excitation and anisotropy) and time-

resolved fluorescence spectrophotometry;
- Demonstrate good knowledge of the theoretical basis for the techniques listed above as well as for near infrared (NIR) spectrophotometry, and
- Demonstrate good skills in statistical analysis (such as regression analysis and multivariate methods) and the evaluation of data obtained through these techniques.

Subcourse 3: Nucleic Acid Analysis, 5 credits

At the end of the course the student should be able to:
- Give an account of and apply common methods to the quantitative analysis of nucleic acid such as qPCR, hybridization assays, fluorescence assays, and
- Identify and control sources of variability and uncertainty when quantifying nucleic acids.

Content

Subcourse 1, Chromatography, 5 credits

In-depth theory of chromatographic separation methods (HPLC, including IEC, Ion Exchange Chromatography and GC) and chromatographic detectors (UV-VIS, conductivity detector for IEC, FID (Flame Ionization Detector) and MS (Mass Spectrometric Detector)). Construction and maintenance of chromatographic instruments. Optimization of the separation methods regarding retention, selectivity and resolution of analytes. Integration methods of chromatograms. Interpretation of spectra (MS). Statistics.

Subcourse 2: Spectroscopy, 5 credits

In-depth theory and practical use of spectrophotometric methods and instruments such as atomic absorption spectrophotometry (AAS), UV-VIS spectrophotometry and steady state (emission, excitation and anisotropy) and time-resolved (TCSPC) fluorescence spectrophotometry. Theory of NIR (near infrared spectrophotometry). Regression analysis and multivariate analysis methods.

Subcourse 3: Nucleic Acid Analysis, 5 credits

Quantitative Real time PCR. Primer and probe-design, hybridization assays. Spectrometric techniques for nucleic acid quantification, extraction methods for nucleic acids. Validation of methods for DNA quantification. MIQE guidelines.

Type of Instruction

The course is given in the form of lectures, seminars and laboratory work. Attendance at all elements of the course except lectures is mandatory.

Examination

The course is assessed with the grades A, B, C, D, E, Fx or F.
The grade A constitutes the highest grade on the scale and the remaining grades follow in descending order where the grade E is the lowest grade on the scale that will result in a pass. The grade F means that the student's performance is assessed as fail.

Examination occurs through active participation in seminars and written and/or oral reports.
The criteria for a passing grade are listed in the Objectives (see above).

Course Evaluation

A written course evaluation is conducted at the end of the course. The results of the evaluation are compiled in a course report which is archived by the department's administration. The results and any measures taken are communicated to the head of department och presented to the students at the next occasion.

Other

Grade criteria for the A–F scale are communicated to the student through a special document. The student is to be informed about the grade criteria for the course by the start of the course at the latest.

Required Reading and Additional Study Material

Holler, F. James, Skoog, Douglas A., Crouch, Stanley. (2006) *Principles of Instrumental Analysis.* 6th ed, ISBN13: 9780495125709

Current scientific articles within the field of study.

Jennings, Walter, Mittlefehldt, Eric. (1997) *Analytical Gas Chromatography.* 2nd ed, ISBN13: 9780123843579

Lakowicz, Joseph R. (2006) *Principles of Fluorescence Spectroscopy.* 3rd ed, ISBN13: 9780387312781

Miller, James, Miller, Jane. (2010) *Statistics and Chemometrics for Analytical Chemistry.* 6th ed, ISBN 13: 9780273730422

Snyder, Lloyd R., Kirkland, Joseph J., Dolan, John W. (2009) *Introduction to Modern Liquid Chromatography.* 3rd ed, ISBN13: 9780470167540

Current scientific articles within the field of study.