

Faculty of Science

KEMM66, Chemistry: Applied Analytical Chemistry, 15 credits Kemi: Tillämpad analytisk kemi, 15 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2015-01-19 and was last revised on 2015-01-19. The revised syllabus applies from 2015-01-19, spring semester 2015.

General Information

The course is an optional second-cycle course for a degree of Master of Science, main field of subject Chemistry.

Language of instruction: English and Swedish When necessary, the course in full is given in English.

Main field of studiesDepth of study relative to the degree
requirementsChemistryA1N, Second cycle, has only first-cycle
course/s as entry requirements

Learning outcomes

The course aims to provide advanced theoretical and practical knowledge in sampling, sample preparation, quality assurance and method validation, experimental design and multivariate analysis. One goal is that the course will provide knowledge in green analytical chemistry. The course also aims to develop the student's ability to independently select, plan and carry out a complete analysis procedure, from sampling to sample preparation, separation, analysis and evaluation of results, within environment, medicine/health and food applications.

The aim of the course is that on its completion, students will have acquired the following skills and knowledge.

Knowledge and understanding

On completion of the course the student will be able to:

- Describe and compare different sampling and sample preparation methods for gases, liquids and solid samples, including environmental samples, biological and food samples
- Explain the basic theoretical principles of different extraction techniques and methods

Competence and skills

On completion of the course the student will be able to:

- Perform literature search that is relevant to a specific analytical problem
- Perform a complete analysis procedure, from experimental design to sampling, sample preparation, separation, analysis and evaluation of results
- Apply method validation of an analytical method that includes sample preparation, separation and analysis
- Evaluate the results by multivariate analysis
- For different groups, orally and in writing report and discuss the results obtained and conclusions based on the experiments and the underlying theory

Judgement and approach

On completion of the course the student will be able to:

• Critically discuss different analysis methods with respect to green analytical chemistry and its relevance to a more sustainable society

Course content

Theoretical part: Theory and practical application of complete analytical procedures with special emphasis on advanced methods of sampling and sample preparation of gases, liquids and solid samples. Samples that are discussed in the course are environmental samples (eg, air, aerosols, fresh water, sea water, sediments, plants), biological samples (eg, exhaled, blood serum, blood plasma, urine, biopsy) and food samples (eg, drinking water, milk, wine, meat, fish, vegetables).

Deeper theory regarding extraction techniques, such as headspace extraction, liquidliquid extraction (LLE), solid phase extraction (SPE) membrane-based extraction, microextraction techniques, solvent extraction, pressurized liquid extraction (PLE), microwave assisted extraction (MAE), ultrasonication and supercritical fluid extraction (SFE). A review of the principles of green analytical chemistry, and new research in this area.

Critical discussions of environmental sustainability of analysis methods, and its relevance to society at large. Experimental design with different optimization methods. Analysis of variance contribution of results from various sources by ANOVA. Method validation by standard operating procedure. Multivariate data analysis, eg principal component analysis (PCA), factor analysis and partial least squares (PLS).

Laboratory project: Students plan and perform a complete analysis procedure, from sampling to sample preparation, separation, analysis and evaluation of results. The student summarizes the results and conclusions, and present them orally at a seminar and written in the form of a scientific poster and project report. Students also act opponent for another student's work.

Course design

Teaching consists of lectures and exercises where the theoretical parts are treated. In addition to lectures, the course includes a field trip as well as a laboratory project that is presented in writing and orally at a seminar. Laboratory project, study visits and seminars are compulsory.

Assessment

The course is assessed with a written examination. A re-sit examination is offered soon after the examination to students who do not pass.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.

To be awarded Pass on the whole course, students must pass the examination and pass the compulsory components.

The examination grades are: Pass with Distinction, Pass or Fail. Grades for the compulsory components are: Pass or Fail.

The final grade for the course is determined by the grade on the final examination.

Entry requirements

To be eligible for this course students must have basic eligibility, English B and 90 higher education credits in completed Science courses, including passes in courses equivalent to:

KEMA10 General Chemistry 7.5 credits, KEMA01 Organic Chemistry – Basic Course 7.5 credits, KEMA12 Inorganic Chemistry – Basic Course 7.5 credits, KEMA03 Biochemistry – Basic Course 7.5 credits and KEMB06 Analytical Chemistry, 15 credits.

Equivalent knowledge that has been gained in another way also provides eligibility for the course.

Further information

The course cannot be fully credited as part of a degree programme that also includes KEMM56 Applied Analytical Chemistry 15 credits, KEMM46 Bioanalytical Chemistry 7.5 credits and KEMM16 Environmental Analytical Chemistry, 15 credits.

Applies from V15

- 1501 Applied Analytical Chemistry, 7,5 hp Grading scale: Fail, Pass, Pass with distinction
- 1502 Applied Analytical Chemistry Compulsory Elements, 7,5 hp Grading scale: Fail, Pass