



LUND  
UNIVERSITY

Faculty of Science

## KEMM76, Chemistry: Advanced Analytical Chemistry, 15 credits

*Kemi: Avancerad analytisk kemi, 15 högskolepoäng*  
Second Cycle / Avancerad nivå

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### Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2018-11-23 to be valid from 2018-11-23, autumn semester 2019.

### General Information

The course is an elective second-cycle component of a Master of Science (120 credits) degree in Chemistry.

*Language of instruction:* English

*Main field of studies*

Chemistry

*Depth of study relative to the degree requirements*

A1N, Second cycle, has only first-cycle course/s as entry requirements

### Learning outcomes

The aim of the course is to enable students to acquire in depth theoretical and practical knowledge of common modern separation techniques, such as chromatography, mass spectrometry and capillary electrophoresis. Furthermore, the course aims to enable students to develop their ability to independently select and optimise a suitable separation technique/method and to present a coherent holistic view of the subject.

### Knowledge and understanding

On completion of the course, the students shall be able to

- provide a specialised account of principles and techniques of chromatography and mass spectrometry

- account for the basic elements of capillary electrophoresis and field flow fractionation

### **Competence and skills**

On completion of the course, the students shall be able to

- modify and apply analytical methods and techniques for quantitative as well as qualitative purposes
- plan trials and evaluate results with multivariate statistical tools
- select a separation technique for separation based on the properties of the substances and the sample
- compile results and present them orally and in writing

### **Judgement and approach**

On completion of the course, the students shall be able to

- critically assess and discuss analysis results with respect to parameters of analytical quality
- argue for the choice of an analytical method based on the problem and the properties of the sample
- critically discuss different analytical methods with regard to green analytical chemistry and its relevance for a more sustainable society

### **Course content**

*Lectures and exercises (7.5 credits):* In-depth theoretical treatment of chromatographic separation and underlying distribution and adsorption equilibria. Instrumentation and experimental techniques for high-resolution chromatography as well as linking of chromatography to mass spectrometry and its applications in e.g. food, drug and environmental analysis. Overview of capillary electrophoresis and field flow fractionation. Presentation of principles of green analytical chemistry and new research in this field. Critical discussions of the environmental sustainability of analytical methods and its relevance for society at large. Multivariate experimental design and different statistical analysis tools (variance analysis, principal component analysis and least squares method).

*Laboratory sessions (7.5 credits):* Experimental techniques for high-resolution chromatography. Optimisation of HPLC systems with different combinations of mobile and stationary phases. Gas chromatography with capillary columns and different injection techniques. Mass spectrometric detection for quantitative and qualitative analysis connected to both gas and liquid chromatography. Computer exercises within experimental design and multivariate statistics. Seminar with presentation and discussion of laboratory results.

### **Course design**

The teaching consists of lectures, laboratory sessions, exercises and seminars. Compulsory participation is required in the laboratory sessions, seminars and

associated elements.

## Assessment

The assessment is based on a written exam at the end of the course and on the compulsory components throughout the course.

Students who fail an assessment will be offered another opportunity for assessment soon thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

*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.

For a grade of Pass on the whole course, the student must have passed the exam and all compulsory components.

The grades awarded for the exam are Fail, Pass and Pass with Distinction and for the seminars and laboratory sessions Fail and Pass.

The final grade is determined by a weighted aggregate of the results of the assessed components.

## Entry requirements

To be admitted to the course, students must meet the general entry requirements for higher education and requirements for English proficiency corresponding to English 6 from Swedish upper secondary school, and have passed 90 credits in science courses including courses equivalent to:

- KEMA20 General Chemistry 15 credits, or KEMA10 General Chemistry 7.5 credits and KEMA12 Inorganic Chemistry- Basic Course 7.5 credits, KEMA01 Organic Chemistry- Basic Course 7.5 credits, KEMA03 Biochemistry- Basic Course 7.5 credits and
- KEMB06 Analytical Chemistry 15 credits

Students who have obtained the equivalent knowledge by other means may also be admitted to the course.

## Further information

The course may not be included in a degree together with KEMM06 Analytical Chemistry- Advanced Course 15 credits.

The course is partly taught together with KASN05 Chromatographic Analysis, 7.5 credits, at the Faculty of Engineering. The courses may be included in a degree with a total amount of 15 credits.

## Subcourses in KEMM76, Chemistry: Advanced Analytical Chemistry

Applies from H19

- 1901 Advanced Analytical Chemistry, 7,5 hp  
Grading scale: Fail, Pass, Pass with distinction
- 1902 Advanced Analytical Chemistry, Compulsory Elements, 7,5 hp  
Grading scale: Fail, Pass