



Faculty of Health, Science and Technology  
Chemistry

## Syllabus

### Advanced analytical chromatography - theory and practice C

<b>Course Code:</b>	KEGC41
<b>Course Title:</b>	Advanced analytical chromatography - theory and practice C <i>Avancerad analytisk kromatografi - teori och praktik C</i>
<b>Credits:</b>	7.5
<b>Degree Level:</b>	Undergraduate level
<b>Progressive Specialisation:</b>	First cycle, has at least 60 credits in first-cycle course/s as entry requirements (G2F)

**Major Field of Study:**  
KEA (Chemistry)

#### Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2017-02-13, and is valid from the Autumn semester 2017 at Karlstad University.

#### Prerequisites

Admission to the Master of Science programme in chemical engineering at Karlstad University, and at least 60 ECTS credits programme courses completed or attended with at least 45 ECTS cr completed, including analytical chemistry 7.5 ECTS cr, or equivalent.

#### Learning Outcomes

Upon completion of the course, students should be able to:

1. give an account of general analytical processes, and formulate, delimit and interpret an analytical chemical problem,
2. develop, validate and give an account of the most important regulatory demands placed on analytical quality control methods,
3. give an account of advanced theories and models of separation in the chromatographic analytical separation process,
4. give an account of the most recent applications of liquid chromatography from a theoretical as well as an experimental perspective,
5. carry out and give an account of different types of sample preparation depending on the type of analysis and the composition of the test matrix,
6. give an account of the most common sources of interference and displacement of the analytical peaks and of the analytical separation system and how to avoid them,
7. give an account of the potentials and limitations of the modern instrumental separation techniques, and
8. perform method development of and optimise a complete analysis method including sampling, sampling preparation, separation method and detection technique in relation to a given task.

## **Content**

The course components are treated in lectures, exercises, mandatory laboratory sessions and reports. The theoretical part of the course includes advanced studies of the following main components:

- Outline of analytical separation processes from a regulatory perspective
- Advanced modern analytical separation theory
- Different liquid chromatographic variants as reversed-phase chromatography, polar-phase chromatography, hydrophilic interaction chromatography, ion pair chromatography, and chiral separation of optical isomers
- Modern chromatographic matrices such as pH stable phases, semi-porous phases, monoliths
- Different trends in separation processes: Green modern chromatographic techniques, super critical fluid chromatography, miniaturisation and separation at high pressure
- Outline of empirical and mechanical modelling of separation processes
- Validation of chemical analysis methods
- Sample preparation of analysis components/pharmaceuticals from different sampling matrices/preparation forms
- Detection principles based on molecule spectroscopy and mass spectroscopy.

In the laboratory part of the course students apply the theoretical components to a task that they get at the beginning of the course and report on it individually before the laboratory session. The task has a focus on the quality control of pharmaceuticals. Students are expected to plan and author the submitted laboratory compendium independently before the laboratory session. Students present the result of the completed laboratory work in writing.

## **Reading List**

See separate document.

## **Examination**

Assessment of the theoretical components is based on:

- an individual written exam
- the report on an analytical project assignment in the form of their own produced laboratory compendium with references to science articles to support their choice of analysis method and its validation.

Participation in laboratory sessions is mandatory, and assessment is based on written reports.

## **Grades**

One of the grades Distinction (VG), Pass (G), or Fail (U) or one of the grades Fail (U), Pass (3), Pass with Some Distinction (4) or Pass with Distinction (5) is awarded in the examination of the course.

## **Quality Assurance**

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

## **Course Certificate**

A course certificate will be provided upon request.

## **Additional information**

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.

The course may require students to spend four days with mandatory attendance at Karlstad University.

The KEGC41 cannot be included in the same degree programme as the course KEAD41.