Reg No: KEGB42/20251

Faculty of Health, Science and Technology
Chemistry

Syllabus

Analytical Chemistry

Course Code:	KEGB42
Course Title:	Analytical Chemistry *Analytisk kemi*
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

Major Field of Study:
KEA (Chemistry)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2024-01-31, and is valid from the Spring semester 2025 at Karlstad University.

Prerequisites
Registered for 30 ECTS credits in Chemistry, with 12 ECTS credits completed, and for students in the Master programme in Chemical Engineering at Karlstad University, registered for 22.5 ECTS credits in Chemistry, with 11 ECTS credits completed, or equivalent

Learning Outcomes
The purpose of the course is for participants to acquire basic knowledge of the most common instrumental chemical analysis techniques and fundamental skills in performing and evaluating results of chemical analysis.

Upon completion of the course, students should be able to:
1. characterise, evaluate, and assess results from chemical analysis using basic statistical methods,
2. give an account of the chemical, physical, and measurement-related principles used in the

most common instrumental chemical analysis techniques,
3. assess the possibilities and limitations of applying the most common instrumental chemical analysis techniques to common analytical problems, and
4. perform quantitative chemical analyses using the most common instrumental analysis techniques in accordance with instructions and evaluate the results.

Content
The course comprises two parts: a theoretical component and a practical component.

The theoretical part covers the following concepts and topics related to the various learning outcomes:
i) Analytical-chemical nomenclature and methodology (calibration and validation of analysis methods, sampling, accuracy, precision, outliers, detection limits, measurement uncertainty) and basic applied statistics (confidence intervals, hypothesis testing with F-test, t-test, and Grubbs test, linear regression analysis).
ii) Quantitative applications of molecular spectroscopy (UV/VIS, fluorescence, IR, and NIR spectroscopy) and atomic spectroscopy (emission and absorption in flames and plasmas).
iii) pH and other ion-selective measurements, amperometry, coulometry, and conductometry.
iv) Chromatographic separation methods (gas, liquid, size exclusion, ion exchange, and ion chromatography) and capillary electrophoresis.
v) Quantitative applications of mass spectrometry in combination with chromatography and capillary electrophoresis.

In the practical component, some of the instrumental techniques are applied for quantitative analysis in process, environmental, and food analysis.

Reading List
See separate document.

Examination
Assessment of the theoretical component is based on a written exam. Assessment of the practical component is based on mandatory participation in laboratory sessions and presentation of laboratory results within specified time limits. To participate in laboratory work, passing a laboratory safety test is required.

If students have a decision from Karlstad University entitling them to Targeted Study Support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades
One of the grades Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course. For students in Engineering, one of the grades 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), or U (Fail) 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 KEGB42 cannot be included in the same degree programme as the courses KEGBAA, KEGBAF, BLGAK0, KEGBAM, CKGB61, or KEGB41.

The course many include up to five days of mandatory attendance at Karlstad University.