



Board of Teacher Education  
Chemistry

## Syllabus

### Chemistry and Chemistry Education 5

<b>Course Code:</b>	KEAL92
<b>Course Title:</b>	Chemistry and Chemistry Education 5 <i>Kemi med didaktisk inriktning 5</i>
<b>Credits:</b>	22.5
<b>Degree Level:</b>	Master's level
<b>Progressive Specialisation:</b>	Second cycle, has only first-cycle course/s as entry requirements (A1N)

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

#### Course Approval

The syllabus was approved by the Board of Teacher Education 2018-02-12, and is valid from the Autumn semester 2018 at Karlstad University.

#### Prerequisites

Chemistry and Chemistry Education I, II and III totalling 90 ECTS with at least 75 ECTS credits completed, or equivalent.

#### Learning Outcomes

The aim of the course is that students acquire further knowledge and understanding of the teaching profession. Students acquire further knowledge of chemistry and chemistry education through a research and development project, and develop skills in identifying and formulating complex research and development problems.

Modules 1 and 2a are required for students whose first subject is chemistry and who have completed an independent project 15 ECTS credits in their second subject. Modules 1 and 2b are required for other students. Module 2b is an independent project in chemistry and chemistry education.

Module 1 Academic writing and theory of science in chemistry education, 7.5 ECTS cr.

Upon completion of the module, students should be able to

1. use science databases to find relevant literature in the form of research articles,
2. summarise and evaluate research literature in a limited area of chemistry education,
3. outline the research front in a limited area of chemistry education,
4. author and defend a well-founded synopsis for a planned research and development project in the chosen area,
5. explain basic theory of science concepts, and
6. give an account of and discuss good research ethics.

Module 2 The chemistry of products, 15 ECTS cr

Upon completion of the module, students should be able to

1. explain the life cycle of some selected products,
2. explain the chemical and chemical engineering questions that arise when the life cycle of some selected products are evaluated from a sustainability perspective,
3. analyse how chemical and chemical engineering principles can answer questions related to the life cycle of some selected products,
4. plan, conduct and present a project orally and in writing according,
5. review and give feedback to written and oral presentations.

Module 2b, Independent project, 15 ECTS cr.

1. independently identify and formulate research questions in chemistry and chemistry education,
2. independently plan and complete an individual research project in chemistry or chemistry education within given time frames,
3. perform literature searches and data collection in chemistry and chemistry education,
4. analyse and compile data and information and make relevant assessments based on compiled research data and information,
6. orally present, defend and critically review the projects presented by others in the chosen area.

### **Content**

Module 1, Academic writing and theory of science in chemistry education

The course comprises the following components:

- basic theory of science concepts and their relevance to research ethics
- using science databases
- research literature with relevance to the chosen area of chemistry education
- the need to acquire more knowledge
- research articles in a wider field than the chosen area
- standard practice in reporting and publishing research results,
- referencing and citing in academic writing
- plagiarism and copyright
- project planning.

Students are expected to work independently and actively, taking responsibility for their learning. Instruction varies with the number of students and chosen areas.

Module 2a, The chemistry of products

A product's life cycle refers in this module to a sustainable perspective in terms of

- choosing raw materials,
- studying the production process,
- quality assurance of process and finished product,
- analysing product developing potential,
- studying the use of the product,
- studying recycling and destruction of the product.

The course is divided into three parts.

Part 1 treats a forest industrial product, for example, paper, cellulose and textile raw material.

Part 2 treats a chemical product, for example, pharmaceuticals, food, and plastic.

Students must meet the requirements regarding learning outcomes 1-3 and part of 5. Outcomes are assessed in groups for Part 1 and individually for Part 2.

Part 3 involves a project in which each student choose a product and apply knowledge from parts 1 and 2 of the course to describe a product's life cycle. Students work individually. Learning outcomes 1-5 must be met for a Pass grade. At the mandatory presentation seminars, students are acquainted with each others' projects which means that they learn about the life cycles in many product areas. Performing as a peer reviewer means that each student, in addition to their own project, gets detailed knowledge of a second area.

Module 2b, Independent project 15 ECTS cr

The module is an individual research project that the students choose in consultation with the examiner and/or the supervisor. The project builds on and enhances students' previous studies in chemistry/chemical engineering. Literature studies are also required. The form of instruction is supervision and seminars.

### **Reading List**

See separate document.

### **Examination**

Assessment is individual and based on

Module 1, Academic writing and theory of science in chemistry education

Learning outcomes 1 and 2: compilation of research literature in the chosen area and oral presentation and discussion of it.

Learning outcome 3: seminar discussion of a research article in chemistry education.

Learning outcome 4: project plan for a research or development product in chemistry education.

Learning outcomes 5 and 6: hand-in assignment i theory of science and research ethics, discussed in seminar and peer review of a cohort assignment.

Module 2a, The chemistry of products

Learning outcomes 1-3: active participation in at least 80% in seminars, group and individual hand-in assignments and feedback on the assignments according to instructions.

Learning outcomes 4 and 5: mandatory attendance at project presentations, written and oral presentation of a project, and peer review of a student's report and project presentation.

Module 2b, Independent project

Assessment is based on the submitted, presented and defended independent project, participation in at least three research seminars and peer review performance.

### **Grades**

One of the grades Distinction (VG), Pass (G) or Fail (U) 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.