



Faculty of Health, Science and Technology  
Environmental and Energy Systems

## Syllabus

### Air and flue gas treatment, Environmental technology I

<b>Course Code:</b>	EMGA21
<b>Course Title:</b>	Air and flue gas treatment, Environmental technology I <i>Luft- och rökgasrening, Miljöteknik I</i>
<b>Credits:</b>	7.5
<b>Degree Level:</b>	Undergraduate level
<b>Progressive Specialisation:</b>	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

**Major Field of Study:**  
MEI (Environmental and Energy Systems)

#### Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2023-03-08, and is valid from the Autumn semester 2023 at Karlstad University.

#### Prerequisites

General admission requirements and registered for a basic course in Environmental Studies, 7.5 ECTS credits, plus upper secondary level Mathematics 3c/Mathematics D, Physics 2, and Chemistry 1, or equivalent

#### Learning Outcomes

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

- explain key concepts in basic chemistry, such as chemical bonding and chemical equilibrium,
- describe stoichiometry and mass balance in chemical reactions and perform basic chemical calculations,
- give an account of the chemical processes of climate change, acidification, and ozone

conversion,

- give an account of purification techniques for flue gas,
- design dimensions for purification techniques for flue gas,
- give an account of purification techniques for air in buildings,
- use basic statistics to analyse the reliability of measurement results,
- handle chemicals and equipment safely in the laboratory, and
- demonstrate skills in a few common measuring methods used in environmental analysis.

## **Content**

The course includes lectures, dimension design projects, and practical exercises and laboratory sessions where students practise measuring methodology and laboratory safety as well as measurement methods used in environmental analysis.

The course covers the following:

- Environmental chemistry as a practical tool. Correlations between different environmental problems. Using reaction rates and equilibrium constants in calculations in order to assess the significance of different reaction pathways and to calculate substance concentrations. Equilibrium between gases and liquids (Henry's law).
- Stratospheric ozone - formation and degradation, natural and created catalysts, how ozone holes are formed.
- Tropospheric ozone - photochemical smog, the interaction of nitrogen oxides, ozone, hydrocarbons, and light, primary and secondary pollutions.
- Acidification - how nitrogen oxides and sulphur oxides react into acidifying substances, alkalinity, buffer systems.
- Climate change - greenhouse gases and their absorption of heat radiation, the carbonate system, aerosols, weighting of greenhouse gases.
- Processing of measurement data - propagation of error, confidence interval, measurement data analysis, uncertainty assessment.

## **Reading List**

See separate document.

## **Examination**

Assessment is based on an individual written exam, and written and oral presentations of laboratory work and dimension design projects. Students are required to pass a safety test to be allowed to participate in laboratory sessions.

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 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.