



## DEPARTMENT OF CHEMISTRY AND MOLECULAR BIOLOGY

### **KEM490 Environmental Chemistry, 15 credits**

Miljö kemi, 15 högskolepoäng

*First Cycle*

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#### **Confirmation**

This course syllabus was confirmed by Department of Chemistry and Molecular Biology on 2017-09-25 and was last revised on 2017-09-25 to be valid from 2017-09-25, autumn semester of 2017.

*Field of education:* Science 100%

*Department:* Department of Chemistry and Molecular Biology

#### **Position in the educational system**

The course is classified at the level 30-60 credits for Degree of Bachelor in chemistry or environmental science and can furthermore be read as a freestanding course.

The course can be part of the following programmes: 1) Atmosphere, Climate and Ecosystems, Master's Programme (N2ACE), 2) Master's Programme in Organic and Medicinal Chemistry (N2KEL), 3) Medicinal Chemistry (NLKEM), 4) Teacher Training Programme (L1LÄR), 5) No translation available (NKEMM), 6) Chemistry and learning, Master's Programme (N2KOL), 7) No translation available (LFLÄY), 8) Atmospheric science (NATVM), 9) Bachelor of Science in Environmental Science (N1MVN), 10) Study Program in Marine Science (NMARM), 11) Bachelor of Science Programme in Medicinal Chemistry (N1LMK), 12) Master's Programme in Chemistry (N2KEM) and 13) Bachelor of Science Programme in Chemistry (N1KEM)

*Main field of studies*

Chemistry

*Specialization*

G1F, First Cycle, has less than 60 credits in first-cycle course/s as entry requirements

#### **Entry requirements**

For admission to the course, passed course KEM011, Basic chemistry 1 (15 credits) or equivalent knowledge is required.

## Learning outcomes

On successful completion of the course the student will be able to:

### *Knowledge and understanding*

- **explain**
  - basic aquatic chemistry,
  - the causes of acidification and overfertilisation and their impact in aquatic systems,
  - the causes and driving forces of climate changes,
  - consequences of trends in energy production and energy use,
  - the importance of detoxification systems and relationships between exposure for pollutants and biological effects/diseases,
- **describe**
  - the structure and content of the atmosphere as well as meteorologic phenomena,
  - the chemistry of ozone formation and the origin of acid rain,
  - the importance of the ozone layer for life on earth as well as mechanisms for its structure and decomposition,
- **define** the concept "aerosol" as well as **account for** the importance of aerosols for atmospheric processes,
- **account for** sources and sinks for atmospheric particles
- at a general level **describe** the global distribution of water,
- **name** important types of interaction between water and other materials/phases as air sediment, and particles.

### *Competence and skills*

- **identify** scientific material (including primary and secondary sources) from databases and research publications,
- **assimilate** scientific material into a scientific report of their own,
- **plan** and **carry out** laboratory sessions related to environmental chemistry problems,
- **analyse** environmental chemical problems, **identify** and **acquire** the information that are required for their solution,
- **present** result from own laboratory sessions and information from scientific literature orally and in writing,
- **give constructive feedback** on scientific presentations.

### *Judgement and approach*

- critically **assess** results from own laboratory activities,
- critically **discuss** the state of environment and its relationship with human activity,

- **discuss** connections and differences between scientific understanding and what is presented as popular knowledge.

The course is sustainability-focused, which means that at least one of the learning outcomes clearly shows that the course content meets at least one of the University of Gothenburg's confirmed sustainability criteria. The content also constitutes the course's main focus.

### **Course content**

Environmental related problems with important chemical components are often characterised by high complexity, and the subject of environmental chemistry integrates knowledge from several traditional chemical subjects. Furthermore, the influence of human activities on the chemical aspects of environment will be investigated in detail. Also, the course provides a base of knowledge for further studies in the area and related subjects.

The following subjects will be treated:

1. Introduction to environmental chemistry
2. Aquatic chemistry
3. Atmospheric chemistry
4. Environment-related biochemistry
5. Technology, resources and energy. Sustainable development

### *Sub-courses*

- 1. Theory (*Teori*)**, 9 credits  
Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
- 2. Laboratory exercises (*Laborationer*)**, 6 credits  
Grading scale: Pass (G) and Fail (U)

### **Form of teaching**

**Part 1:** Teaching comprises

- lectures,

- a group project that follows the principles of Problem-based learning (PBL). The group project is compulsory.

**Part 2:** The instruction includes laboratory sessions and presentations. All components in module 2 are compulsory.

*Language of instruction:* Swedish and English

The course is given as principal rule in English but can be given in Swedish completely or partly when the circumstances admits it.

### **Assessment**

**Part 1:** Examination takes place through

- a written examination at the end of the course,
- presentations as a part of the group project.

**Part 2:** Examination takes place through written presentations.

If a student who has failed the same examined component twice wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons against this (Chapter 6, Section 22 of Higher Education Ordinance).

In cases where a course has been discontinued or has undergone major changes, the student shall normally be guaranteed at least three examination occasions (including the ordinary examination) during a period of at least one year from the last time the course was given.

### **Grades**

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

**Part 1:** For grade Pass (G) is required participation in all compulsory components of the group project, passed result in the presentation of the group project as well as passed result in the final examination.

For grade Pass with distinction (VG) grade Pass with distinction (VG) in the final examination is required in addition.

**Part 2:** For grade Pass (G) participation in all laboratory sessions and passed result in presentations are required.

**Final grade:**

For final grade Pass (G), grades Pass (G) in both modules are required.

For final grade Pass with distinction (VG), grade Pass with distinction (VG) in module 1 and grade Pass (G) in module 2 are required.

**Course evaluation**

A course evaluation is performed in relation to the intended learning outcomes and content of the course and are implemented at the end of the course through an individual written questionnaire on University of Gothenburg's virtual learning environment. A student who participates in or has completed a course should be given the opportunity to anonymously express experiences of and views in the course in a course evaluation. A compilation of course evaluation and course coordinator reflection, including possible changes in the set-up of course, should make available for students within reasonable time after course ends and communicate to the students who will start course at future occasions.