



DEPARTMENT OF CHEMISTRY AND MOLECULAR BIOLOGY

KEM170 Atmospheric Chemistry, 15 credits

Atmosfärskemi, 15 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Chemistry and Molecular Biology on 2017-09-22 and was last revised on 2024-03-08 to be valid from 2024-09-02, autumn semester of 2024.

Field of education: Science 100%

Department: Department of Chemistry and Molecular Biology

Position in the educational system

The course is placed on the level 60-90 credits for Degree of Bachelor in chemistry or environmental sciences and can be counted in as a second-cycle course for Degree of Master (120 credits) in chemistry or environmental sciences. The course can be read as a free-standing course.

The course can be part of the following programmes: 1) Atmosphere, Climate and Ecosystems, Master's Programme (N2ACE), 2) Chemistry and learning, Master's Programme (N2KOL), 3) Marine Science, Master's Programme (N2MAV), 4) Bachelor of Science in Environmental Science (N1MVN), 5) Master's Programme in Organic and Medicinal Chemistry (N2KEL), 6) Master's Programme in Chemistry (N2KEM), 7) Bachelor of Science Programme in Medicinal Chemistry (N1LMK), 8) Bachelor of Science Programme in Chemistry (N1KEM) and 9) Atmospheric Science, Master's Programme (N2ATM)

Main field of studies

Chemistry

Specialization

A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

Completed and passed courses comprising 90 credits in the field of science, including

passed course KEM490 Environmental chemistry (15 credits) or equivalent knowledge.

Applicants must prove their knowledge of English: English 6/English B from Swedish Upper Secondary School or the equivalent level of an internationally recognized test, for example TOEFL, IELTS.

Learning outcomes

On successful completion of the course the student will be able to have a good knowledge and understanding within the field of atmospheric chemistry. This means to be able to understand and describe how natural and anthropogenic gaseous compounds form, transform and disappear from the atmosphere. The student shall also have developed a deeper understanding for the chemistry that takes place in the atmosphere and how it affects the environment.

Knowledge and understanding

- **explain**

- how chemical gas-phase kinetics and reaction mechanisms are applied to problems in atmospheric chemistry and how such data are determined in laboratory,
- important light-absorbing compounds, their photochemistry and how to calculate and apply rates of photolysis,
- how organic compounds, sulphur and nitrogen-containing compounds are converted and give origin to the formation of photochemical oxidants, smog, and acidification,
- transformation of air pollutions in the particle phase,
- the chemistry of stratosphere,

- **describe**

- the effect of weather on air pollutions,
- global influence from air pollutions,
- interaction between troposphere and stratosphere,
- aerosols and their properties.

Competence and skills

- **plan** a laboratory session based on current research literature,
- **investigate** relevant processes in atmospheric chemistry experimentally,
- **model** processes in atmospheric chemistry,
- independently **study** and **summarise** research literature about a subject of their own choice,
- **present** result orally and in writing.

Judgement and approach

- **analyse** how human activity influences processes in the atmosphere,
- **discuss** consequences of this impact for the living conditions of humankind both locally and global as well as conclusions for a sustainable development,
- **critically assess** results from their own modelling and laboratory sessions,
- **critically assess** research literature and other sources.

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

- The structure of atmosphere up to about 50 km
- The clean and the contaminated atmosphere
- Photochemistry and spectroscopy applied to the troposphere
- Important absorbing species
- Gas-phase kinetics
- Experimental methods to determine reaction rates
- Hydrocarbon-radical reactions
- Reactions of nitrogen-containing compounds
- Photochemical oxidants including ozone formation
- Acid fallout
- Aerosols
- Global impact from air pollution including greenhouse effect
- The chemistry of the stratosphere

Sub-courses

1. **Theory** (*Teori*), 7.5 credits
Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
2. **Laboratory exercises and seminars** (*Laborationer och seminarier*), 7.5 credits
Grading scale: Pass (G) and Fail (U)

Form of teaching

Part 1: Teaching is conducted in the form of lectures.

Part 2: Teaching includes laboratory sessions (modelling and experiment) including preparatory and follow-up seminars and student seminars. The activities in module 2 are compulsory.

Language of instruction: English and Swedish

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

Assessment

Part 1: The examination is done by a written in-class examination at the end of the course. For students who have not passed at the regular examination, additional examination sessions are offered.

Part 2: The examination is done by oral and written presentations during the course. Normally no opportunity is given for subsequent completion of the laboratory session and seminar part is given after the end of the course; rather, the student will be referred to the next time the course is held.

If a student who has failed the same part of the examination 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 (Chapter 6, Section 22 of Higher Education Regulation).

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: The grade is determined by the result of the written examination.

Part 2: For grade Pass (G), participation in all compulsory activities as well as grade Pass (G) on all presentations are required.

Final grade: For grade Pass (G), grade Pass (G) on both modules is required. For grade Pass with distinction (VG), grade Pass with distinction (VG) on module 1 and grade Pass (G) on module 2 are required.

Regarding application of the ECTS scale for grade please see Vice-Chancellor decision 28/05/2007, diary nr G 8 1976/07.

Course evaluation

A course evaluation is done in relation to the intended learning outcomes and content of the course. It is performed at the end of the course through an individual written questionnaire on the virtual learning environment at University of Gothenburg. A student who participates in or has completed a course should be given possibility to anonymously express experiences of and views in the course in a course evaluation. A compilation of the course evaluation and reflections of the course coordinator, including changes in the structure of the course if applicable, should be made available for the students within reasonable time after the end of the course and be communicated to students who start the course at a later time.

