

# Syllabus

for course at advanced level

**Atmosphere, Biogeosphere and Climate Change**  
**Atmosfär, biogeosfär och klimatförändringar**

**15.0 Higher Education  
Credits**  
**15.0 ECTS credits**

<b>Course code:</b>	MI7016
<b>Valid from:</b>	Autumn 2019
<b>Date of approval:</b>	2018-10-01
<b>Department</b>	Department of Environmental Science
<b>Main field:</b>	Environmental Science
<b>Specialisation:</b>	A1N - Second cycle, has only first-cycle course/s as entry requirements

## Decision

### Prerequisites and special admittance requirements

Admission to the course requires knowledge equivalent to a Bachelor of Science or Engineering, 15 ECTS in Mathematics or Statistics and English corresponding to Swedish upper secondary school English 6.

## Course structure

Examination code	Name	Higher Education Credits
HELA	ABCC	15

## Course content

a. This course provides the environmental science perspective on climate change. The course focus is the human-induced (anthropogenic) perturbations of the Earth system, the biogeosphere, the atmosphere and climate.

The course will provide knowledge about:

- \* The functioning of the natural climate and the biogeosphere-atmosphere system: the water cycle, carbon cycle, energy balance, ocean and atmosphere general circulation
- \* Mechanisms and concepts: emissions of greenhouse gases and aerosols, climate forcing, earth system and climate feedback, climate sensitivity
- \* Natural variations in the climate: How has climate varied during pre-industrial human history?
- \* Anthropogenic climate change: What are the evidences? How is it observed? What are causing it? And how is it varying over space and time?
- \* Climate change over coming decades-centuries-millennia: What are different scenarios for future emissions and atmospheric concentrations? What effects can we expect on large-scale biogeosphere-atmosphere cycles, ecosystem services, and human societies?
- \* Climate change mitigation and adaptation: The UN climate agreements and other initiatives

## Learning outcomes

Upon completion of the course, students are expected to be able to:

- \* Explain large-scale biogeosphere-atmosphere cycles, energy balances and the climate system
- \* Describe major features in natural climate variability and change over geological timescales, during the period of human civilization and under anthropogenic human-perturbed climate
- \* Evaluate the relative importance of different climate perturbation mechanisms, and feedback mechanisms in the biogeosphere-atmosphere system, and uncertainties associated in these over different time and space scales
- \* Reflect on climate change effects on the earth system, on the composition of the biogeosphere and atmosphere, on ecosystem services and on human societies
- \* Reflect on options for society to mitigate emissions and adapt to climate change

### **Education**

Instruction consists of lectures, seminars, and visits to relevant organizations and/or agencies. Participation in seminars and study visits, and any associated integrated instruction is compulsory. In the event of special circumstances, the examiner may, after consultation with the teacher concerned, grant a student exemption from the obligation to participate in certain compulsory instruction.

### **Forms of examination**

- a. The course is examined as follows: Knowledge assessment takes the form of a written exam, active participation in seminars and written assignments. If the instruction is in English, the examination may also be conducted in English.
- b. Grades will be set according to a seven-point scale related to the learning objectives of the course:  
A = Excellent  
B = Very good  
C = Good  
D = Satisfactory  
E = Adequate  
Fx = Fail, some additional work required  
F = Fail, much additional work required
- c. The grading criteria will be distributed at the beginning of the course.
- d. In order to pass the course, students must receive a passing grade and participate in all mandatory instruction.
- e. Students who receive a failing grade on a regular examination are allowed to retake the examination as long as the course is still provided. The number of examination opportunities is not limited. Other mandatory course elements are equated with examinations. A student who has received a passing grade on an examination may not retake the examination to attain a higher grade. A student who has failed the same examination twice is entitled to have another examiner appointed, unless there are special reasons to the contrary. Such requests should be made to the department board. The course includes at least two examination opportunities per year when the course is given. At least one examination opportunity will be offered during a year when the course is not given.
- f. Students awarded the grade Fx are given the opportunity to improve their grade to E. The examiner decides the supplementary assignments to be performed and the pass mark criteria. The supplementary assignments will take place before the next examination session.

### **Interim**

Students may request that the examination be conducted in accordance with this course plan even after it has ceased to be valid. However, this may not take place more than three times over a two year period after course instruction has ended. Requests must be made to the departmental board. The provision also applies in the case of revisions to the course plan (and the revisions of the course literature).

### **Misc**

The course could be a part of the Master programme in Environmental Science focussing on Atmosphere Biogeosphere and Climate but may also be taken as an separate course.

### **Required reading**

The course literature is decided by the department board and published on the Department of Environmental Science and Analytical Chemistry's website at least two months before the start of the course.