



AL1130 Physics, Chemistry, Energy and the Environment for CL 14.0 credits

Fysik, Kemi, Energi och miljö för CL

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

The official course syllabus is valid from autumn semester 2026 as decided by the Director of First and Second Cycle Education. Decision date: 2026-04-14

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

General and specific entry requirements for Master of Science programmes.

Obligatory in year 1 at Master of Science in Engineering and in Education (CLGYM), not open for other students.

Intended learning outcomes

The course serves as an introduction to university studies in physics, chemistry, and engineering with a focus on energy, environment and sustainable development. The aim is to provide a broad scientific and technical foundation for continued studies and future professional work.

After completing the course, the student shall be able to:

- Solve problems in applied classical physics and assess the soundness of the solution.
- Explain and discuss physical problems, conditions, and limitations.
- Describe the structure of the atom and how the elements make up the periodic table, and from this draw conclusions about chemical reactivity and chemical bonding.
- Name and recognize chemical compounds based on systematic nomenclature and represent chemical compounds using molecular formulas, empirical formulas, and structural formulas.
- Classify reactions and predict which products are formed in certain reactions, as well as determine what functions as acid/base and oxidant/reductant, including calculations involving stoichiometry, thermochemistry, chemical equilibrium, and kinetics.
- Provide a written account of a chosen topic concerning the chemistry around us/in everyday life, or modern materials/the development of chemistry today, or instrumental analytical methods in modern chemistry.
- Perform basic chemical laboratory work in accordance with occupational health and safety regulations, make relevant observations of chemical reactions, and write balanced chemical equations.
- Apply systems thinking, demonstrate fundamental understanding of the Swedish energy system, energy use, and current developments.
- Possess knowledge of and reflect on challenges that need attention and some critical issues related to environmental effects.
- Give examples of the fulfilment of the Swedish environmental quality objectives as a reflection of current environmental problems and discuss the difficulties associated with the goal of sustainable development.
- Independently and in groups search for scientific information about a sustainability solution, compile the information, and present it in a scientific manner in both an oral presentation and a written report.

Course contents

The course is given in three parts:

The first part covers:

Electrical and magnetic fields – fundamentals. Atomic models. The band model for solids. Thermal radiation. Light sources. Lasers. Laser measurement techniques. Spectroscopy.

The second part covers:

Chemical reactions and reaction formulas. Representation of chemical compounds by names, formulas, and models. Atomic structure, the periodic table, electron configuration, orbitals, models for chemical bonding, Lewis structures, and the VSEPR model. Chemical re-

activity, kinetics, and equilibrium. Stoichiometry. Thermochemistry. Application examples. Chemical work environment and safety regulations.

The third part covers:

Systems thinking, environmental and energy issues, and sustainable development. Societal trends serve as important examples used to introduce both problem areas and the engineer's role in managing and finding solutions to environmental problems.

Examination

- TEN1 - Written exam, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- PRO1 - Project work, 2.0 credits, grading scale: P, F
- INL2 - Assignment, 1.0 credits, grading scale: P, F
- LAB2 - Laboratory work, 1.0 credits, grading scale: P, F
- TEN2 - Written exam, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN4 - Examination in Physics, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- SEM1 - Seminars in Physics , 1.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

To receive a passing grade in the course, the student must obtain a passing result in all examination modules.

Transitional regulations

The discontinued module TEN3 – Physics Exam, 4.0 credits, may be examined through the new modules TEN4 and SEM1.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.