KE1140 Engineering Chemistry 14.0 credits

Teknisk kemi

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

Establishment

Course syllabus for KE1140 valid from Autumn 2023

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

The upper-secondary school before 1 July 2011 and adult education at upper-secondary level before 1 July 2012

Specific entry requirements: mathematics E, physics B and chemistry A. In each of the subjects the grade required is Passed or 3.

The upper-secondary school from 1 July 2011 and adult education at upper-secondary level from 1 July 2012 (Gy2011)

Specific entry requirements: Physics 2, Chemistry 1 and Mathematics 4. In each of the subjects the minimum grade required is Pass.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

For a passing grade, students must be able to:

- Explain and use the relationships between the electron structure of atoms, chemical bonding, the periodic table, and physical and chemical properties of the elements.
- Describe instrumental analysis methods in modern chemistry.
- Balance chemical reaction formulas and perform stoichiometric and thermochemical calculations.
- Define and use material and energy balances.
- Use the course's tools for sustainable development.
- Perform simple chemical laboratory work, considering the working environment and safety regulations.

Course contents

Chemical bonding, measurement methods, periodic table:

- the electron structure of atoms and the structure of the periodic table.
- the theoretical foundations of chemistry: chemical bonding, chemical equilibrium, chemical reactivity, and intermolecular interaction.
- the relationship between the electron structure of atoms and the physical and chemical properties of the elements.
- different forms of isomerism.
- various instrumental methods of analysis in modern chemistry: chromatographic separation methods, spectroscopic methods, diffraction methods.

Stoichiometry, thermochemistry, kinetics, material and energy balances:

- balanced chemical reaction formulas.
- stoichiometric and thermochemical calculations.
- rate expressions defined based on chemical elemental reactions.
- simpler calculations on chemical equilibrium and reaction kinetics.
- the important tools material and energy balances - adapt the basic form of these to a given process and solve the resulting system of equations.

- models for material and energy balances for different design alternatives, combine and apply these models in problem solving and use tables for enthalpies, specific heat, and other material data to help with calculations.
- description of and examples of processes such as continuous/batch process, stationary/non-stationary process, open/closed system, as well as the concepts of excess air, recirculation ratio, total turnover, yield and selectivity.
- apply a system thinking to problems of a chemical technical nature and identify the system delimitation to which the problem applies and choose system boundaries so that the problem becomes solvable based on given information.

Lab course:

- simpler chemical laboratory work, considering the working environment and safety regulations.

The project:

- use projects as a form of work to structure and chemically analyse real chemical engineering problems and processes, also regarding sustainable development.

Examination

- PRO1 - Project, 2.0 credits, grading scale: P, F
- TEN1 - Written examination, theory, 2.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboration, 2.0 credits, grading scale: P, F
- TEN3 - Written exam, calculations, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN4 - Written exam, calculations, 5.0 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

Passed examinations (TEN1, period 1, TEN2, period 2), and to have passed the laboratory course (LAB1, period 1) and passed project (PRO1, period 2).

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.