



# KE1140 Engineering Chemistry

## 14.0 credits

Teknisk kemi

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

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

### Establishment

Course syllabus for KE1140 valid from Autumn 2018

### 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

After completing and passing course, the student should be able to:

### **Chemical bonding, methods of measurement, periodic system:**

- understand the electron structure of atoms and periodic system structure.
- understand the theoretical basis of chemistry at a general level: chemical bonding, chemical equilibrium, chemical reactivity and intermolecular interaction.
- understand the relationship between the electron structure of atoms and the physical and chemical properties of the elements.
- account for different forms of isomerism.
- account for different instrumental analytical methods within modern chemistry: chromatographic separation methods, spectroscopic methods, diffraction methods.

### **Stoichiometry, thermochemistry, kinetics, material - and energy balances.**

- write balanced chemical reaction formulas.
- carry out stoichiometric and thermochemical calculations.
- define rates based on reactions of chemical elements.
- carry out simple calculations of chemical equilibrium and reaction kinetics.
- use the important tools of material - and energy balance – adapt the basic form for these to a given process and solve the resulting equation system.
- set up models of material and energy balances for different design alternatives, combine and apply these models in problem-solving and use enthalpy, specific heat and other material properties to aid in calculations.
- describe and give example of processes such as continuous/stepwise processes, stationary/not stationary processes, open/the end system, and explain the concepts of air surplus, relationship to recirculation, total yield, exchange and selectivity.
- apply a system awareness for problems of a chemico-technical nature and identify the limitations for which the problems apply, and choose limits so that the problem becomes solvable based on given assignments.

**Laboratory course:**

- carry out simple chemical laboratory work considering the working environment and safety precautions.

**Project:**

- use project as a working method to methodically solve technical problems or processes in a structured way.

## Course contents

### Disposition

To achieve the expected learning outcomes, the course is divided into the four subparts.

Part 1: Chemical binding, methods of measurement, periodic system (2 credits), period 1

Part 2: Stoichiometry, thermochemistry, material balance, energy balance, kinetics (8 credits), period 1-2

Part 3: Laboratory course (2 credits), period 1

Part 4: Project (2 credits), period 2

### Course literature

- För moment 1 och för stökiometri, och termokemi inom moment 2:  
Chemistry<sup>3</sup>: Introducing inorganic, organic and physical chemistry, Burrows et al., Oxford University Press, 3rd edition 2017, ISBN 978-0198733805
- För material- och energibalanser inom moment 2:  
Elementary Principles of Chemical Processes, R.M. Felder & R.W. Rosseau, John Wiley & Sons, Inc., Global edition 2016, ISBN 978-1-118-09239-2
- Utdelat material.
- Föreläsningsanteckningar.
- For part 1, and stoichiometry and thermochemistry, part 2:  
Chemistry<sup>3</sup>: Introducing inorganic, organic and physical chemistry, Burrows et al., Oxford University Press, 3rd edition 2017, ISBN 978-0198733805
- For material balance and energy balance, part 2:  
Elementary Principles of Chemical Processes, R.M. Felder & R.W. Rosseau, John Wiley & Sons, Inc., Global edition 2016, ISBN 978-1-118-09239-2
- Distributed material.
- Lecture notes.

## Examination

- LAB1 - Laboration, 2.0 credits, grading scale: P, F
- 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
- TEN2 - Written examination, computations, 8.0 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.

## 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.