KE1070 Chemical Reaction Dynamics for Energy and the Environment 7.5 credits

Kemisk reaktionsdynamik inom energi och miljö

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 KE1070 valid from Autumn 2012

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Completed upper secondary education including documented proficiency in English corresponding to English A. For students who received/will receive their final school grades after 31 December 2009, there is an additional entry requirement for mathematics as follows: documented proficiency in mathematics corresponding to Mathematics A.

And the specific requirements of mathematics, physics and chemistry corresponding to Mathematics E, Physics B and Chemistry A.

Language of instruction

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

Intended learning outcomes

After passing the exam, the student should be able to:

- Apply fundamental thermodynamics on chemical reactions in energy systems and in enverionemtal issues
- Understand and describe the concept chemical equilibrium and be able to independently analyse equilibrium problems for chemical reactions in energy systems and in environmental issues
- Understand and identify dynamic processes for chemical reactions in energy systema and in environemental issues.
- Folmulate and analytically solve rate expressions in non-complex chemical reaction kinetics.
- Analyse experimental kinetic data with regard to reaction order and temperature dependence parameters.
- Explain the relations and links between chemical reaction rates and thermodynamic equilibrium constants
- Explain reaction rate dependencies on parameters like temperature, pressure, ioni strengt in solution, etc.
- Account for the molecularly related steps and events that govern thermal reaction kinetics or transport rates.

The student should also know and be able to exemplify:

- Possible strategies to solve complex kinetic and transport problems through numerical computer algorithms, through commercial or freeware computer programs.
- Existing experimental methodology for investigating rapid chemical reactions.

Course contents

The course deals with fundamental chemical reaction dynamics, which is important for understanding various chemical processes in energy systems and in envireonmental issues. The following is included:

- Molecular dynamics in general
- Chemical thermodynamics and equilibrium
- Kinetic theory of gases

- Diffusion and other transport phenomena
- Chemical reaction kinetics, molecular reaction mechanisms
- Experimental techniques for studies of rapid chemical reactions

Course literature

P. Atkins and J. de Paula, **Physical Chemistry**, 9th, Oxford University Press 2010, ISBN-13: 978-0-19-954337-3

Examination

- LAB1 - Laboratory Course, 1.0 credits, grading scale: P, F
- PRO1 - Project, 1.5 credits, grading scale: P, F
- TEN1 - Examination, 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.

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.