KE1080 Chemical Engineering Principles 7.5 credits

Kemitekniska principer

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

Establishment

Course syllabus for KE1080 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

When you have passed the course you will be able to:

- analyse the use of energy and materials in a production unit based on chemical engineering and environmental criteria
- size simple components in a chemical process system
- explain the concept of an ideal stage and utilize this in sizing separation equipment in continuous systems
- suggest a suitable separation method in a two-component system based on the physical properties of the compounds
- explain how the driving force for mass transport influences the sizing of a separation process with mass transfer
- suggest design and operational parameters for ideal reactors to minimize by-product formation based on ideal reactor models and the selectivity concept
- explain the importance of volume change in gas-phase reactions in ideal reactors and calculate the actual residence time
- briefly describe the most common battery and fuel cell systems
- analyse electrochemical systems by applying fundamental electrochemical concepts as Faraday´s law, the Nernst equation and the Butler-Volmer equation.
- show the ability to present and discuss ideas and results in both oral and written form

Course contents

Fundamental kinetic and reaction engineering concepts. Kinetics for electrode reactions. Multiple reactions and systems with volume change. Ideal reactor models and models for catalytic reactors. Residence times and space velocities. Heterogeneous catalysis, enzymatic reactions and bioreactors. Fundamentals in separation engineering directed towards heat and mass transfer between two phases. Phase equilibria and the ideal stage principle. Distillation, absorption and extraction. Evaporation and drying. Orientation about crystallisation and membrane separation processes. Orientation about equipment for separation techniques and for production of chemicals. Equipment for heat exchange. Electrochemical power sources. Choice and operation of ideal reactors.

Course literature

Fogler, H.S., Elements of Chemical Reaction engineering. 4rd ed., Pearson Education, Upper Saddle River, N.J., USA, 2005.

Coulson, J.M. and Richardson, J.F., Chemical Engineering, Vol. 1,6th ed., 2000 (köpt i TEO) och Vol. 2, 5th ed., 2002

Behm, M., Lagergren, C. Och Lindbergh, G., Elektrokemi för bränsleceller och batterier, Inst för kemiteknik, 2001.

Övningsuppgifter i reaktions- och separationsteknik, Inst för kemiteknik, 2003.

Diagramsamling, reaktions- och separationsteknik, Inst för kemiteknik, 2004.

Examination

- TEN1 - Written exam, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Course, 3.0 credits, grading scale: P, 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.

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.