



Faculty of Health, Science and Technology
Chemical Engineering

Syllabus

Chemical reaction engineering

Course Code:	CKGB5D
Course Title:	Chemical reaction engineering <i>Kemisk reaktionsteknik</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has at least 60 credits in first-cycle course/s as entry requirements (G2F)

Major Field of Study:

KEA (Chemistry)
KTA (Chemical Engineering)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2019-08-29, and is valid from the Spring semester 2020 at Karlstad University.

Prerequisites

At least 60 ECTS credits completed in the Master Programme in Chemical Engineering and admitted to Chemical Calculations (7.5 ECTS credits), or equivalent

Learning Outcomes

Upon completion of the course, students should be able to:

- provide possible physical explanations to common kinetic expressions,
- analyse experimental reaction data with regard to order of reaction and temperature dependence,
- illustrate an industrial process with reaction and separation stages and heat exchanger graphically in a process chart,
- formulate and solve materials and energy balances and analyse degrees of freedom for a process

consisting of reaction and separation stages and heat exchangers,

- describe the hypothesis on which ideal reactor models, the tank reactor and the tube reactor, are based,
- set up and solve stationary materials and energy balances for ideal reactor models under isothermal as well as adiabatic conditions,
- set up transient materials and energy balances for ideal reactors under isothermal as well as adiabatic conditions,
- explain the interaction between flow conditions and residence time distribution for non-ideal reactors,
- set up mathematical models for non-ideal reactors based on reaction kinetics, energy balances, and residence time distribution,
- set up and explain mathematical models that explain interactions between kinetics and equilibrium limitations for reactor operation, and
- use computer software for computer simulation of materials and energy balances for chemical reactors.

Content

Instruction is in the form of lectures, exercises, and computer sessions.

The course comprises the following components:

Basic kinetics: speed expressions, speed constants, and temperature dependence. Connection between kinetics and balance. Analysis of batch reactors to determine reaction kinetics.

Integral balances: Process chart overview. Materials and energy flows.

Ideal reactors: Tank and tube reactor. Multi reaction systems. Parallel and serial connection of reactors.

Non-isothermal reactors: Tank reactor stability. Adiabatic tube reactor. Adiabatic equilibrium reactions.

Non-ideal reactors: Residence interval distribution. Characterisation of flow images.

Reading List

See separate document.

Examination

Assessment is based on a written report of completed computer aided calculation tasks and a written exam.

If students have a decision from Karlstad University entitling them to special pedagogical support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades

One of the grades Pass with Distinction (5), Pass with Some Distinction (4), Pass (3), or Fail (U) is awarded in the examination of the course.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.

The course CKGBD5 cannot be included in the same degree programme as the courses CKGB4A or CKGB4D.