



KE2051 Environmental Catalysis 7.5 credits

Miljökatalys

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

Establishment

Course syllabus for KE2051 valid from Spring 2020

Grading scale

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

Education cycle

Second cycle

Main field of study

Chemical Science and Engineering

Specific prerequisites

KE1175 and KE1160

or

MF2015

or

MF2016

or equivalent knowledge

Language of instruction

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

Intended learning outcomes

On completion of the course, the technology student should be able to

- assess air pollution problems in industry or in the society
- propose a suitable sustainable method to reduce emissions of hazardous substances from mobile or stationary sources from given data
- analyse various emission sources, both mobile and stationary, and determine their impact on society
- explain the role of the catalyst in environmental catalysis and identify its constraints

Course contents

The course gives an in-depth knowledge of modern emission reduction technologies using catalytic methods, which are sustainable. The course includes subjects such as characterization of emissions, health effects, pollutant formation, test cycles, emission standards, influence of fuel on emissions, exhaust gas catalysts for different kinds of vehicles, control of stationary emissions (VOC, NO_x, SO_x), catalysis in oil refining, production of motor fuels with low content of sulfur and aromatics, hydrogen generation for fuel cell vehicles and fuel cell vehicle technology, catalytic combustion, and new reactor technologies in environmental catalysis.

- characterize the most important emissions of hazardous compounds and their health effects
- explain the function of spark-ignition engines and diesel engines and how pollutants are formed in these engines depending on fuel and combustion principle
- identify a suitable emission reduction technology for contemporary low-emission vehicles
- explain how commercial catalysts are prepared
- describe the most important methods for abatement of volatile organic compounds and nitrogen oxides in stationary applications
- analyse an oil refinery, discuss the various inherent processes and especially describe catalytic cracking
- describe the production of low-sulfur motor fuels by ultra-deep hydrodesulfurization
- explain how to generate hydrogen from various fuels and how to utilize hydrogen in mobile applications including fuel cell systems
- explain the fundamentals in catalytic combustion and how the technique can be used in industrial applications, such as heaters in vehicles
- discuss various reactor technologies and their suitability for use in environmental catalysis

- write a consistent literature report in English on a subject related to environmental catalysis
- present your ideas and findings in oral form and discuss the results
- perform a laboratory assignment with an internal combustion engine equipped with an exhaust gas catalyst and explain how the technology works

Examination

- SEM1 - Seminars, 3.0 credits, grading scale: P, F
- TEN1 - Written exam, 3.0 credits, grading scale: P, F
- LAB1 - Laboratory work, 1.5 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.