



# KE2010 Industrial Energy Processes 7.5 credits

## Industriella energiprocesser

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 KE2010 valid from Autumn 2019

## Grading scale

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

## Education cycle

Second cycle

## Main field of study

Chemical Science and Engineering, Chemistry and Chemical Engineering

## Specific prerequisites

At least 150 credits from grades 1, 2 and 3 of which at least 110 credits from years 1 and 2, and bachelor's work must be completed, within a programme that includes: 75 university credits (hp) in chemistry or chemical engineering, 20 university credits (hp) in mathematics and 6 university credits (hp) in computer science or corresponding.

# Language of instruction

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

## Intended learning outcomes

After finished course, you should be able to:

- Analyse the technical performance for energy processes in industrial scale with the help of thermodynamic relationships.
- Calculate combustion reactions and heat yields for different fuels.
- Perform thermodynamic calculations on thermal power and combined heat and power cycles, e.g. steam cycles, combined cycles, and stationary motors.
- Estimate the potential for energy efficiency by utilizing process integration (pinch analysis) including heat exchanging, heat pumping, and waste heat recovery.
- Apply relevant system boundaries to energy-related problems.
- Analyse the performance of energy conversion systems in relation to ideal systems and with this as a starting point suggest improvements.
- Evaluate the economic consequences of different energy solutions.

## Course contents

Energy conversion systems are something that all people are dependent upon for transports, heating, household appliances, etc. The energy systems of the world are under a steady change and the major challenge today is how to combine sustainability with increased primary energy consumption globally. The special attention is on the close relationship between the use of primary energy and human-induced climate change.

In Sweden, the industrial sector uses more than one third of the energy (final use) and the industrial sector is the second emitter of fossil carbon dioxide after the transport sector. The supply and use of energy have become an increasingly strategic issue for energy intensive industrial companies due to volatile global energy prices and the perceived risk with unstable policy instruments intended to mitigate the use of fossil fuels (carbon taxes, energy taxes, etc.).

This course is covering advanced applied thermodynamics of importance for energy processes of industrial scale. During the course you will learn about technical, economic and, to some extent, environmental characteristics of real energy processes. The main part of the course is attributed to theory and problem solving within the field of technical thermodynamics.

## Examination

- BER1 - Calculation Task, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 4.5 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.

The two parts of the examination are evaluated and reported separately, but both are linked to the final grade. The homework assignment includes: a presentation, a final report and a reflective report about your own contributions in relation to the project as a whole. The final report is linked to the final grade through the number of revisions of the report before it is passed. The final grade will be one step higher than the grade for the exam if the report passes without revision and the final grade will be equal to the grade for the exam if the report passes after the first revision. The final grade will thereafter decrease with one step compared to the grade for the exam for each time the report is revised before it passes.

Over the course, two intermediate tests that together could give up to 20 credits are offered. If 12 or more credits are achieved in these tests, full score will automatically be given on one specified problem at the exam. This problem should therefore not be solved.

## **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.