KE1160 Thermodynamics 7.5 credits

Termodynamik

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 KE1160 valid from Spring 2019

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Recommended courses: Engineering chemistry and the mathematic courses in the programme.

Language of instruction

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

Intended learning outcomes

After the course the student should be able to:

• Describe briefly which energy conversions and chemical reactions that are possible, impossible, spontaneous, and non-spontaneous .

• Explain and use state laws for gases.

• Describe and apply the laws of thermodynamics.

• Describe and understand equilibrium conditions.

• Describe and use the concepts of internal energy, enthalpy , entropy, free energy and chemical potential.

• Understand and apply partial molar quantities.

• Analyze chemical equilibria in ideal and non-ideal systems.

• Analyze thermodynamics of mixtures and solutions.

• Analyze phase equilibria.

• Using phase diagrams to solve problems in one- and two-component systems.

• Identify, describe and give examples of open and closed systems, and set up material and energy balances of such systems.

• Describe and apply thermodynamics first and second laws and describe the conditions and limitations for conversion between different types of energy.

• Describe the theoretical energy cycles: Carnot, Rankine and Brayton and indicate the differences between these theoretical cycles and their technical counterparts, steam turbines, gas turbines, cooling machines and heat pumps.

• Identify and resolve cycle process problems both in their entirety and in their sub-processes , by applying thermodynamics first and second laws.

Course contents

The energy situation in the world - conditions, problems and opportunities. Sustainability aspects of the production of power, heat and chemicals. State laws for gases. The laws of thermodynamics, internal energy and entropy. Open and closed thermodynamic system. Cycle processes for the production of technical work. Cycle processes for cooling machines and heat pumps. Equilibrium conditions, free energy. Partial molar quantities and the chemical potential. Chemical equilibria in ideal and non-ideal systems. Thermodynamics of mixtures. Phase equilibria and phase diagrams for one-and two-component systems.

Examination

- LAB1 - Laboratory Work, 1.0 credits, grading scale: P, F
- TEN1 - Written exam, 5.0 credits, grading scale: A, B, C, D, E, FX, F
- ÖVN1 - Compulsory Attendance, 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.

Examination, compulsory attendance and laboratory work.

One not compulsory intermediate test that gives credit at the examination.

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.