MJ2462 Achieving Energy Efficiency in Existing Buildings 6.0 credits

Energieffektivisering i befintliga byggnader

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 MJ2462 valid from Autumn 2011

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

The student should have basic knowledge in energy engineering and in energy systems in buildings.

Prerequisite courses: MJ1112 Applied Thermodynamics 9 ECTS, MJ1401 Heat Transfer 6 ECTS, MJ2407 Sustainable Energy Utilization 9.0 ECTS, SG1220 Fluid Mechanics for Engineers 6.0 ECTS, MJ2422 Thermal Comfort and Indoor Climate 6.0 ECTS, or equivalent courses on the subjects.

Language of instruction

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

Intended learning outcomes

This course will discuss how energy is used in buildings today and how energy technology can be used to increase energy performance of existing buildings. The course will focus on how the energy use may be reduced by collecting and interpret information of the energy systems in buildings.

After the course the student should be able to

- Make a plan to audit energy systems in buildings according to the degree of detail needed
- Perform the planned energy audit
- Measure heat dissipation of ventilation and radiator heating systems
- Measure electric power of pumps, fans and other typical equipment
- Estimate the UA-Value of typical building elements
- Account for reference values of energy performance in different building types
- Estimate the energy use of typical air conditioning applications
- Calculate a buildings energy signature and normalize energy use
- Interpret measurements on heating systems and identify defects
- Interpret measurements on electric systems and identify defects
- Distribute the measured energy use between the different sub systems
- Describe how the different energy systems in a building interacts
- Describe how the control systems interact with the energy systems in buildings
- Identify typical errors in complex energy systems
- Identify measures that results in a reduced energy demand
- Evaluate measures and combination of measures from an technical perspective
- Evaluate measures and combination of measures from an economical perspective

Course contents

The course will give a fundamental understanding on how energy technology can be applied to reduce energy demand of buildings. Thermodynamics, heat transfer, thermal indoor climate, measurement technology, building simulation software and problem solving will be applied in surveys to find the possibilities to increase the energy performance of buildings.

The course is divided in two parts; one theoretical part that consist of a series of lectures and one practical part where the student will work with surveys of real energy systems in buildings. The course focuses on typical buildings in the Swedish building stock, but the knowledge attained in this course can be adapted to any building and energy system in the world.

Course literature

To be announced

Examination

- PRO1 - Project, 1.0 credits, grading scale: P, F
- PRO2 - Project, 2.0 credits, grading scale: P, F
- TEN1 - Written exam, 3.0 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.

- TEN1 - Examination, 3.0 credits, grade scale: A, B, C, D, E, FX, F
- PRO1 - Project assignment in energy surveys of buildings I, 1 credit, grade scale: P, F
- PRO2 – Project assignment in energy surveys of buildings II, 2 credits, grade scale: P, F

Other requirements for final grade

Examination (TEN1; 3 hp), Project assignments (PRO1; 1 hp) and (PRO2; 2 hp).

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.