MJ2519 Energy Supply Systems for Buildings 6.0 credits

Energiförsörjningssystem för 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

On 2021-10-15, the Dean of the ITM school has decided establish this official course syllabus to apply from spring term 2023, registration number: M-2021-2024.

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

Knowledge in thermodynamics and heat transfer equivalent to contents of courses

MJ1112 Applied Thermodynamics (9 higher education credits) and MJ1401 Heat Transfer (6 higher education credits)

Documented knowledge in English, e.g. English B/6 in an international recognised English language test, for example an IELTS Academic/IELTS UKVI total points on 6.5 and no section during 5.5.

Special admission requirements are also fulfilled through Swedish or foreign education, practical experience or due to other circumstances is in a position to benefit from the education. Regulation 2018:1503, section 5b.

Language of instruction

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

Intended learning outcomes

After passing the course, the student should be able to:

1. perform operations on functions Explain the principles of the different power systems for buildings.

2. Identify and discuss the most important differences between different heat pump solutions in different cooling and heating applications.

3. Describe the functions of the main components in the most important power supply systems for buildings.

4. Solve problems in the fields of heating and cooling by means of acquired principles and tools.

To receive higher grades the student should also be able to:

5. Solve advanced problems in the fields of heating and cooling.

6. Analyse performance for heat pump, solar and geothermal systems and compare the performance of different system solutions.

7. Choose and design an suitable system solution for cooling and heating applications.

8. Solve advanced problems with integrated energy system solutions in cooling and heating applications.

9. Evaluate and propose improvements of existing system solutions for relevant applications.

Course contents

Systems for heating and cooling of buildings such as heat pump systems, Solar thermal systems, systems with geothermal storage, Integrated energy systems.
The function of important system components
Guidelines for energy efficient system design

Performance modelling
The sustainability aspects for heat pumps and refrigeration systems

The course intends to give advanced competence to handle environmentally friendly energy systems to cover thermal energy requirements for buildings. The thermal needs that are covered by this course are heating, air conditioning, hot water production and cooling.

The following subjects will be treated in the course:

· A broad range of systems for heating and cooling of residential and commercial buildings. Some of the most important energy systems that are included are:

o Heat pump systems

o Solar thermal systems

o System with geothermal storage

o Integrated energy systems

· Explanation of the function of important system components
Guidelines for energy efficient system design
Performance modelling
Design, and evaluate performance for integrated system solutions with important application areas as examples.

Furthermore, the course will discuss the sustainability aspects of heat pumps and cooling systems and introduce the new environmentally friendly refrigerants.

Examination

- INL1 - Assignment, - credits, grading scale: P, F
- INL2 - Assignment, - credits, grading scale: P, F
- INL3 - Assignment, - credits, grading scale: P, F
- LAB1 - Laboratory work, 1.5 credits, grading scale: P, F
- TEN1 - Written exam, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- ÖVN1 - Excersises, - credits, grading scale: P, F
- ÖVN2 - Excersises, - credits, grading scale: P, F
- ÖVN3 - Excersises, - credits, grading scale: P, F
- ÖVN4 - Excersises, - credits, grading scale: P, F
- ÖVN5 - Exercises, - 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.

Other requirements for final grade

Approved written examination TEN1 and Labs LAB1.

During the course, the students are offered to participate in assignments (INL1, INL2och INL3) and practical assignments (ÖVN1-5), where each passed examination items will count in the item TEN1. If all of the items INL1-3 and ÖVN1-5 are passed, a Pass grade is granted for the item TEN1. For higher grades, further achievements in TEN1 are required.

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.