MJ2503 Small Scale Polygeneration 6.0 credits

Polygenerering - småskaliga system

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

Establishment

Course syllabus for MJ2503 valid from Autumn 2019

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

- The other year TMESM student
- The other year RENE student
- The other year SEE Student

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 student should be able to:

- In detail describe systems for simultaneous generation of several energy services that are run by a combination of different energy sources with special focus on:
- Describe and be able to carry out engineering design of energy storage (batteries, warm or cold thermal energy storage, pre-treated fuel, reservoirs with purified water etc)
- Describe and in an engineering manner create functional control strategies for combined energy systems
- Describe how small-scale Polygeneration systems can function connected or not connected to an electric grid, where the grid can be a classical national grid or a grid with distributed power generation
- Carry out thermo-economic optimisation for technically robust, environmentally friendly and economic, small-scale combined energy systems

Course contents

In the Polygeneration course, simultaneous generation of several energy services is in focus, for example electricity, heat, cold, purified water or dry air. It can take place by using a combination of several renewable energy sources to feed a system of energy converters. To achieve increased sustainability, a large part of the energy losses are captured and utilised for simultaneous generation of different energy services.

The following subject areas are covered:

- Properties of different energy converters and their suitability for different system configurations.

- Efficiency compared with separate generation of such energy services.

- Environmentally and economically positive and negative properties.

- Bridging of temporal variations in the inflow of energy and the need for energy services.

- Cogeneration.

- Control principles and control strategies.

- Integration of intelligent energy buffers and their interplay with control systems and energy converters.

- Thermo-economic optimisation of Polygeneration systems.

- Sustainability consequences (positive and negative) of to introduce Polygeneration systems.

The course intends to integrate the different engineering skills that the students have acquired,and apply them to small-scale combined energy systems- Polygeneration.

Course literature

- Utdelat och inspelat material
- Vetenskapliga artiklar genom KTHB
- CompEDU www.compedu.net
- Distributed and recorded material
- Scientific articles through KTHB
- CompEDU at www.compedu.net

Examination

- INLA - Assignments, 1.0 credits, grading scale: P, F
- PROA - Project work, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- TENA - Written exam, 2.0 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.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

The final mark is put through joining of the results of TENA and PROA with consideration taken to their parts of the credits.

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.