MJ2404 Energy Conversion Systems 6.0 credits

Energiomvandlingssystem

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 MJ2404 valid from Spring 2020

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Language of instruction

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

Intended learning outcomes

After a successfully completed course the students would be able to:

- Identify the components and draw the conceptual schematic layout of thermal power cycles and other technological solutions for state-of-art power generation facilities;
- Assess the operational conditions and estimate the design parameters of existing or newly constructed energy conversion systems based on various technological solutions, both large-scale plants and small-scale distributed generation units;
- Calculate the efficiency factors and evaluate the potential for further optimization;
- Evaluate the feasibility of hybrid solutions and the synergy potential of various blends of energy conversion techniques;
- Estimate the potential role of energy storage processes and assess the optimum one for a particular application, together with the relevant electrical engineering hardware;
- Valorize the economy aspects and produce a simplified project budget for innovative solutions in the field of thermal power and electrical engineering.

Course contents

The proposed course Energy Conversion Systems treats the subject areas of applied thermodynamics, energy technology and electrical power engineering, in particular the theoretical principles and the practical design aspects of various technologies for heat and power generation. A wide focus of both conventional and renewable energy systems is provided, including electrical engineering aspects and monitoring or control processes, primarily in view of possibilities for system integration together with the enormous potential for synergies and innovations. Technical solutions are discussed in a systems' perspective with a closer view on vital application areas.

The specific technological overview is focused primarily on the following fields:

- Thermal power cycles and power plants (steam cycles, gas cycles, combined cycles);

- Direct energy conversion methods, niche technologies, fuel cells and their integration with conventional power plants;

- Mainstream renewable energy sources and their integration in the power system;

- Energy storage technologies and the solutions they offer for integration with contemporary and future power systems;

- Electrical generators and power electronics, and their role in both large-scale and small-scale solutions as well as the potential for improvements and innovations that they offer;

- Systems monitoring, control strategies and regulation techniques.

Disposition

Exercise 1, 1.0 ECTS, Pass/Fail
Exercise 2, 1.0 ECTS, Pass/Fail
Mid-term Exam 1 / Partial Exam, 2.0 ECTS, graded A-F
Mid-term Exam 2 / Partial Exam, 2.0 ECTS, graded A-F

Specific prerequisites

Course literature

Course literature and suggested reading will be listed in the course syllabus.

Examination

- KON1 - Partial exam, 2.0 credits, grading scale: A, B, C, D, E, FX, F
- KON2 - Partial exam, 2.0 credits, grading scale: A, B, C, D, E, FX, F
- ÖVN1 - Exercise, 1.0 credits, grading scale: P, F
- ÖVN2 - Exercise, 1.0 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.

Exercise 1, 1.0 ECTS, Pass/Fail
Exercise 2, 1.0 ECTS, Pass/Fail
Mid-term Exam 1 / Partial Exam, 2.0 ECTS, graded A-F
Mid-term Exam 2 / Partial Exam, 2.0 ECTS, graded A-F

Other requirements for final grade

All parts of the course need to be passed

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.