



MJ2492 Advanced Renewable Energy Systems Technology

15.0 credits

Förnybar energisystemteknik, avancerad kurs

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 MJ2492 valid from Spring 2011

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

At the end of the course, the students should be able to analyze and design energy systems to supply the electricity/heat/cooling requirements using wind energy, bioenergy and/or solar energy.

After completion of the course, students will be able to:

- Describe in detail the fundamentals and main characteristics of wind energy, bioenergy and solar energy and their differences compared to fossil fuels.
- Describe in detail the main components of these 3 different renewable energy systems
- Explain the technological basis for harnessing these renewable energy sources including their possibilities and limitations
- Recognize the effects that current energy systems based on fossil fuels have over the environment and the society
- Compare different renewable energy technologies and choose the most appropriate based on local conditions
- Design and dimension technological solutions based on wind energy, bioenergy or solar energy that meet specific energy demands, are economically feasible and have a minimal impact on the environment

Course contents

is course deals with topics in advanced renewable energy system technology from an engineering point of view. The full spectrum of alternative and renewable energy is introduced and analyzed, including methods of integrating these solutions in the society in order to fulfill requirements for energy services in a sustainable way. The principles, possibilities, and limits of alternative and renewable energy is discussed.

This 15 hp course will be examined four parts: 1) a 4,5 hp exam after period 3, dealing with the principles of existing and up-and-coming alternative energy sources, including hydro, wind, solar, photovoltaic, thermosolar, fuel cells, and biomass; 2) a 2 day mandatory workshop (0 hp) on challenges in renewable energy systems; 3) a 4.5 hp exam after period 4 focusing on the methodology for, and dynamics in the integration of various renewable energy sources for providing various energy services; 4) a 6 hp project dealing with the concept of polygeneration in renewable energy systems.

Throughout this course, the students' ability to read, write, and talk about the topic "advanced renewable energy systems technologies" is trained, in particular through the project work and also through five planned half-day seminars where up-to-date topics are high-lighted by some proper literature or other documentation that everyone reads and discuss, or by a relevant lecture by industry, policy maker, etc that is later discussed in the seminar.

Disposition

The course will be given in period 3 and 4 with one exam after period 3 and the other after period 4.

Planned hours:

- Lectures -- 30 h (15 occasions)
- Seminars in class -- 20 h (5 occasions)
- Project work, P -- 60 h (sheduled time for project work, 8 occasions including study visits)
- Exam, TEN1 -- 3h (scheduled during exam period after period 3)
- Exam, TEN2 -- 3h (scheduled during exam period after period 4)
- Workshop, ANN1 -- 16 hrs (scheduled in period 4)
- Mid term project presentation PRO1 -- 4 h (scheduled late period 3 or beginning of period 4)
- Project presentation, PRO1 -- 8h (scheduled last week of period 4)

Specific prerequisites

MJ2411 Renewable Energy Technology, 6 hp.

Enrolled in the TMESM masterprogram

Course literature

F. A. Farret and M. G. Simoes

Integration of Alternative Sources of Energy ISBN 978-0-471-71232-9

Fransson, T.H., et al., 2009, "Computerized Educational Program", KTH, Energiteknik -- Kraft- och värmeteknologi

Lecture Handouts

Examination

- ANN1 - Seminar, - credits, grading scale: P, F
- PRO1 - Project, 6.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Exam 1, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- TEN2 - Exam 2, 4.5 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.

Other requirements for final grade

TEN1 -- EXAM 4,5 hp, Grading: A-F

TEN2 -- EXAM 4,5 hp, Grading: A-F

ANN1 -- Mandatory Workshop (2 days) on Challenges in Renewable Energy Systems, 0 hp

PRO1 -- Project 6 hp, Grading: A-F

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.