

Renewable Energy Systems 7.5 credits

Förnybara energisystem 7.5 hp

Second cycle

Main field: Energy Engineering, Second cycle, has only first-cycle course/s as entry requirements (AIN)

Syllabus is adopted by the Research and Education Board (2024-03-05) and is valid for students admitted for the autumn semester 2024.

Placement in the Academic System

The course is included in Master's programme (120 credits) in Energy Smart Innovation in the Built Environment.

Prerequisites and Conditions of Admission

Bachelor's degree in Building Technology, Energy Engineering, Mechanical Engineering or the equivalent. Including courses of 7.5 credits Engineering Mechanics and 7.5 credits Applied Physics or the equivalent, and 22.5 credits Mathematics. The degree must be equivalent to a Swedish högskoleingenjörsexamen and must have been awarded from an internationally recognised university. English 6. Exemption of the requirement in Swedish is granted.

Course Objectives

The aim of the course is that the student develops a broad knowledge and understanding of the renewable energy sources, their interplay in today's energy system and how they can be used efficiently. A particular focus is placed on the established renewable energy sources. The student is expected to develop an ability to judge how renewable energy sources can be adequately integrated into the built environment.

Following successful completion of the course the student should be able to:

Knowledge and understanding

- explain the underlying physical and technical principles behind the most important renewable energy sources and district heating

Skills and ability

- perform calculations of relevance for the understanding of renewable energy sources
- perform calculations of relevance for the implementation of renewable energy sources and district heating
- identify adequate methods and techniques for implementing renewable energy sources in different built environments

Judgement and approach

- judge how energy systems and built environments are affected by an increased share of renewable energy sources and district heating.

Primary Contents

The course focuses on solar and wind power, as well as the benefits of district heating in a renewable energy system, but other renewable energy sources are covered, such as hydro power and bio energy. Physical and technical background, interplay with the energy system, conditions for usage and reuse, and applications are studied. Related considerations regarding economy, environment and health are also considered.

Teaching Formats

The teaching consists of lectures, exercise sessions, and a seminar. Teaching is in English.

Examination

The overall grades of F (Insufficient), E (Sufficient), D (Satisfactory), C (Good), B (Very Good), A (Excellent) will be awarded for the course.

Examination involves a written examination, a written project report and an oral presentation.

Name of the test		Grading
Written Examination	6 credits	F/E/D/C/B/A
Written Report and Oral Presentation	1,5 credits	U/G

If there are special reasons, the examiner may make exceptions from the specified examination format and allow a student to be examined in another way. Special reasons can e.g. be a decision on learning support.

For elite sports students according to Riktlinjer för kombinationen studier och elitidrott vid Högskolan i Halmstad, DNR: L 2018/177, the examiner has the right to decide on an adapted examination component or let the student

complete the examination in an alternative way.

of the course. Course evaluations should be documented and made available to the students.

Course Evaluation

Course evaluation is part of the course. This evaluation should offer guidance in the future development and planning

Course Literature and Other Study Resources

Connolly, D., Lund, Henrik & Mathiesen, Brian Vad. Smart energy europe: The technical and economic impact of one potential 100% renewable energy scenario for the european union. *Renewable and Sustainable Energy Reviews*, 60:1634–1653, 2016.

Frederiksen, Svend & Werner, Sven. *District heating and cooling*. Studentlitteratur, senaste upplagan.

Jacobson, Mark Z & Delucchi, Mark A. Providing all global energy with wind, water, and solar power, part I: Technologies, energy resources, quantities and areas of infrastructure, and materials. *Energy policy*, 39(3):1154–1169, 2011.

Jenkins, Nick & Ekanayake, Janaka. *Renewable Energy Engineering*. First edition, Cambridge University Press, 2017

Ottermo, Fredric. *Using MATLAB in Energy Engineering*. Compendium, 2019.