



Faculty of Health, Science and Technology
Electrical Engineering

Syllabus

Renewable energy technologies

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| Course Code: | ELAD18 |
| Course Title: | Renewable energy technologies <i>Teknik för förnybar energi</i> |
| Credits: | 7.5 |
| Degree Level: | Master's level |
| Progressive Specialisation: | Second cycle, has only first-cycle course/s as entry requirements (A1N) |

Major Field of Study:
ETA (Electrical Engineering)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2022-01-26, and is valid from the Autumn semester 2022 at Karlstad University.

Prerequisites

Registered for 30 ECTS credits of programme courses in Mathematics at the Master level (Engineering), with 15 ECTS credits completed, and 7.5 ECTS credits in Engineering Physics, Industrial Engineering and Management, or Energy and Environmental Engineering, plus upper secondary level Swedish 3 or Swedish as a second language 3 and English 6, or equivalent

Learning Outcomes

The aim of the course is for students to acquire knowledge about renewable energy technologies.

Upon completion of the course, students should be able to:

- give an account of different energy sources in terms of future demands for a renewable energy supply,

- analyse principles and functions of energy technologies related to solar energy, wind power, biomass, geothermal energy, hydro power, and fuel cells,
- give an account of and perform calculations on energy storage systems, and
- give an account of and perform calculations on smart micro-grids for integration of renewable energy sources.

Content

The course comprises the following:

- Energy sources and their environmental, social, and economic consequences
- Bio energy and geothermal technology: Biomass, biofuels, biomass combined power and heating, geothermal resources, geothermal heating, geothermal power
- Hydro power technology: hydroelectric dams, operation, wave and tidal electric power generation
- Fuel cells: The structure, types, operation, and applications of fuel cells
- Solar cell systems: The interface of PV systems to the main grid, grid operation
- Wind power: Energy conversion, Betz's Law, wind turbines, wind power parks
- Storage systems: Battery systems, flywheel, supercapacitors, thermal storage, hydrogen energy storage, other methods of storage
- Renewable energy on the grid: Main components in electricity grids, distributed energy resources and production, smart micro-grids and energy management

Reading List

See separate document.

Examination

Assessment is based on a written exam, mandatory laboratory sessions, and laboratory reports.

If students have a decision from Karlstad University entitling them to Targeted Study Support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades

One of the grades Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course. For students in Engineering programmes, one of the grades 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), or U (Fail) is awarded in the examination of the course.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.