



Faculty of Health, Science and Technology
Electrical Engineering

Syllabus

Integration of Renewable Energy in Electrical Power Systems

Course Code:	ELGC24
Course Title:	Integration of Renewable Energy in Electrical Power Systems <i>Integrering av förnybar energi i elkraftsystem</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has at least 60 credits in first-cycle course/s as entry requirements (G2F)

Major Field of Study:
ETA (Electrical Engineering)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2020-03-11, and is valid from the Autumn semester 2020 at Karlstad University.

Prerequisites

Power Electronics (7.5 ECTS credits), Introduction to Electrical Power Systems (7.5 ECTS credits), Automatic Control (7.5 ECTS credits), and Renewable Energy Sources and Their Applications (7.5 ECTS credits), or registered in the Electrical Engineering Master Programme, or equivalent

Learning Outcomes

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

- give an account and perform calculations of energy storage systems,
- give an account and perform calculations of solar energy systems,
- give an account and perform calculations of wind power systems,
- give an account of and perform calculations for the steering of grid-connected photovoltaic systems and wind power systems, and

- give an account and perform calculations of smart micro-grids for the integration of renewable energy sources.

Content

- Energy storage systems: Electromechanical storage, battery storage, thermal storage, hydrogen energy storage, and other storage methods
- Solar power systems: Solar thermal systems, grid-connected and autonomous photovoltaic systems, systems for solar tracking and tracking of maximum solar power
- Wind power systems: Dynamic elements for wind parks, conversion of energy from wind power, onshore and offshore systems
- Control of grid-connected photovoltaic systems and wind power systems: Control of one-phase systems and three-phase systems, filters and transformers, control of wind systems, power electronics, and electric generators
- Smart micro-grids for the integration of renewable energy sources: Types of micro-grids and operating modes of grid-connected and autonomous micro-grids.

Reading List

See separate document.

Examination

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

If students have a decision from Karlstad University entitling them to special pedagogical 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.