Reg No: ELGB18/20262

Faculty of Health, Science and Technology
Electrical Engineering

Syllabus

Renewable energy sources and applications

Course Code:	ELGB18
Course Title:	Renewable energy sources and applications *Förnybara energikällor och tillämpningar*
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 2025-11-13, and is valid from the Autumn semester 2026 at Karlstad University.

Prerequisites
Registered for Power electronics, 7.5 ECTS credits, Introduction to electrical power systems, 7.5 ECTS credits, and one more course (7.5 ECTS credits) in Electrical Engineering, Physics, or Engineering Physics from a Bachelor or Master program in Engineering, or equivalent

Learning Outcomes
The aim of the course is for students to acquire knowledge about renewable energy sources and their applications.

Upon completion of the course, students should be able to:
- give an account of different energy sources in terms of future societal demands on a sustainable and renewable energy supply, and
- analyse principles and functions related to energy sources such as solar energy, wind power, biomass, geothermal energy, hydro power, and fuel cells.

Content
Instruction is in the form of lectures, exercises, and laboratory sessions.

The course covers the following:
- Introduction to energy sources and their environmental impact
- Solar cells: The properties of photovoltaic cell structure, solar cell modules and their placement, data sheet parameters, concentrated photovoltaics
- Wind power: The wind power curve, Betz's Law, turbines with horisontal and vertical shafts, wind power parks
- Biomass technology: Biomass resources, biofuels, anaerobic digestion, biomass power and heating
- Geothermal technology: Geothermal resources, geothermal applications for electric power and heating
- Hydro Power: Energy in running water, hydroelectric technology and water turbines, wave and tidal electric power generation
- Fuel cells: The structure and function of the fuel cell, types of fuel cells, and applications

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.