



Faculty of Health, Science and Technology
Electrical Engineering

Syllabus

Power electronics

Course Code:	ELGA15
Course Title:	Power electronics <i>Kraftelektronik</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

Major Field of Study:
ETA (Electrical Engineering)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2026-01-28, and is valid from the Spring semester 2026 at Karlstad University.

Prerequisites

Circuit analysis (7.5 credits). Registered for Circuit analysis 2 (7.5 credits).
An equivalence assessment can be made.

Learning Outcomes

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

1. describe the conceptual applications of basic power electronic components, such as direct current converters, rectifiers, and switched inverters,
2. explain the basic concepts of direct current converters, rectifiers, switched inverters, and the switching patterns for power-electronic converters,
3. perform calculations for input and output currents, voltages, and power in rectifiers, direct current converters, and switched inverters,
4. analyse harmonics in rectifiers and switched inverters, and
5. compare the performance of different basic configurations of rectifiers, direct current converters, and switched inverters.

Content

- Power computations: power and energy, effect calculations for sinusoidal signals, effect calculations for non-sinusoidal signals, non-sinusoidal source with a linear load, sinusoidal source with a non-linear load.
- Half-wave rectifiers: uncontrolled half-wave rectifiers, freewheeling diodes, controlled half-wave rectifiers.
- Full-wave rectifiers: single-phase full-wave rectifiers, bridge rectifiers, centre tapped transformers, controlled rectifiers, three-phase rectifiers, controlled three-phase rectifiers.
- Direct current converters: buck converters, boost converters, buck-boost converters.
- Switched inverters: half-bridge switched inverters, full-bridge switched inverters, square-wave switched inverters, three-phase switched inverters.

Reading List

See separate document.

Examination

Assessment is based on an individual on-campus written exam, laboratory sessions with mandatory attendance, and lab reports. After each laboratory session, the student groups complete a brainstorming task and submit the results together with their lab 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, 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's and Master's levels at Karlstad University stipulate the obligations and rights of students and staff.