Reg No: ELGA15/20242

Faculty of Health, Science and Technology
Electrical Engineering

Syllabus

Power electronics

Course Code:	ELGA15
Course Title:	Power electronics *Kraftelektronik*
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 2024-02-26, and is valid from the Autumn semester 2024 at Karlstad University.

Prerequisites
Circuit Analysis, 7.5 ECTS credits, or equivalent

Learning Outcomes
Upon completion of the course, students should be able to:
- demonstrate theoretical and practical knowledge of basic concepts and power electronic components,
- perform calculations on rectifiers for alternating current to direct current,
- perform calculations on inverters for direct current to alternating current,
- perform calculations on direct current converters, and
- demonstrate knowledge of basic concepts for switching patterns of power converters in power electronics.

Content

- Introduction to power electronic systems and classification of power electronic semi-conductor switch: Scope and application, power processors and power switch, stable state, three phase voltage source, and non-sinusoidal waveforms in stable states.
- Power and energy: Effect calculations for sinusoidal and non-sinusoidal source, non-sinusoidal source and linear load, sinusoidal source and non-linear load
- Line frequency diode rectifiers: Basic concepts for rectifiers, single phase diode bridge rectifier and 3-phase fullbridge wave rectifier.
- Phase regulated line frequency rectifiers and inverters: Thyristor cuircuits and regulation, single phase converters and 3-phase converters.
- Direct current converters: Regulation, buck converter, boost converter and buck-boost converter.
- Switched inverters for direct and alternating current: Basic concepts for switched inverters, single phase inverters and 3-phase converters.

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 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 and Master levels at Karlstad University stipulate the obligations and rights of students and staff.