



Faculty of Health, Science and Technology
Electrical Engineering

Syllabus

Electrical Machines and Transformers

Course Code:	ELGB32
Course Title:	Electrical Machines and Transformers <i>Elmaskiner och transformatorer</i>
Credits:	10
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:

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2020-09-09, and is valid from the Autumn semester 2021 at Karlstad University.

Prerequisites

Introduction to Physics for Electrical Engineering, 7.5 ECTS credits, or registered on the Electrical Engineering study programme, or equivalent

Learning Outcomes

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

- give an account of the properties of ferromaterials and the basics of analysing magnetic circuits,
- give an account of the construction and operation properties of single phase and three phase transformers,
- perform calculations of single- and three-phase transformers,
- give an account of the construction and operation properties in measuring transformers
- perform calculations of measuring transformers,
- give an account of function in variable, safety, isolation, and autotransformers
- give an account of the construction and operation properties of direct current,

asynchronous, and synchronous machines, and
- perform calculations of direct current, asynchronous, and synchronous machines.

Content

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

Magnetic circuits: important properties in non-linear magnetic materials, calculations of magnetic circuits, magnetising losses and magnetising current.

Transformers: step down and step up transformers, law of induction, transformer theorem, idling, electrical load, voltage drop, equivalent scheme, loss, efficiency, structure, materials, coiling, cooling, three-phase connections, rated current data in switching, transformer testing, short circuit impedance, winding connector, parallel connection of three-phase transformers.

Direct current machines: construction, theory, separate, shunt, and series magnetisation, armature reaction, commutation, loss, efficiency, start, brake, speed rotation control.

Asynchronous machines: construction, theory, short circuit and slip-ring machine, loss, efficiency, start, brake, speed rotation control, single phase operation, generator operation.

Synchronous machines: construction, theory, generator and machine operation, over- and under-magnetising, start, phase synchronisation, loss, efficiency.

Reading List

See separate document.

Examination

Assessment is based on an individual written exam and 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. Engineering students are awarded a grade on the scale Distinction (5), Some Distinction (4), Pass (3), or Fail (U).

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.

