

Course syllabus

Elmaskinkonstruktion Design of Electrical Machines

EIEN20, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED E

Date of Decision: 2023-04-11

General Information

Elective for: E5, M4

Language of instruction: The course will be given in English on demand

Aim

This course introduces students to the calculation methods and experience of manufacturing options used by engineers to design electromagnetic devices such as transformers, actuators, and electric machines. The aim of the design of an electromagnetic device is the desired function, integration and rational manufacturing method, and thus the aim of the course is to develop the related and relevant skills and experience. The course provides theoretical knowledge through lectures, and the acquisition of modelling skills and experience through assignments and course projects.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to compile calculation models and use them for the analysis and development of electromagnetic devices;
- understand how magnetic, electric, thermal and mechanical properties interact for the desired function of the actuator;
- know the essential characteristics and methods of manufacture of the commonly used materials in electromagnetic devices.

Competences and skills

For a passing grade the student must

- be able to make fundamental magnetic, mechanic, thermal and electric analysis of an electromagnetic device;
- be able to use a FEM software for magnetic and thermal characterisation and design of an electromagnetic device;
- be able to perform tests and measurements on an electromagnetic device and analyze these.

Judgement and approach

For a passing grade the student must

- be able to discuss and evaluate the properties of an electric actuator design in a certain application with the application design engineer.

Contents

Lectures: Electromagnetic devices, magnetic cores, windings, current and flux density, torque production, torque quality and losses. Integration and thermal design. Optimisation, lumped parameter network models, FEM analysis and design tools for electromagnetic devices.

Assignments: Heat transfer and electromagnetic analyses of transformer and permanent magnet synchronous machine.

Project: Design of an electromagnetic device with the use of a design model and a FEM design program.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Approved design report grants the grade 3. For higher grade a written exam is required.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts

Code: 0113. **Name:** Design of Electrical Machines.

Credits: 0. **Grading scale:** TH.

Code: 0213. **Name:** Project, Oral and Written Report.

Credits: 7,5. **Grading scale:** UG.

Admission

Assumed prior knowledge: EIEF15 Electrical Engineering (EE), ETE055, EITF85 Electromagnetic Field Theory (PhyE), MIE012, EIEF35 Electrical Engineering, basic course (ME), ETEF01 Electromagnetic Field Theory (MathE).

The number of participants is limited to: No

The course overlaps following course/s: EIE050

Reading list

- Compendium: Electrical machine design, IEA, LTH.

Contact and other information

Course coordinator: Dr Avo Reinap, avo.reinap@iea.lth.se

Course homepage: <https://www.lth.se/iea/utbildning/valfria-kurser-i-lund/elmaskinkonstruktion/>