EJ2221 Design of Permanent Magnet Synchronous Machines 7.5 credits

Konstruktion av permanentmagnetiserade synkronmaskiner

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for EJ2221 valid from Autumn 2008

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After the course, the student should be able to:

- list different existing topologies of permanent magnet machines
- describe and compare distributed and concentrated windings
- explain the principle of field-weakening for permanent magnet synchronous motors
- choose the appropriate permanent magnet materials for a given construction with regard to functionality, operating conditions, economical and environmental factors
- explain and compare the properties of iron laminations and soft magnetic composites in relation to their use in electrical machines
- enumerate different loss components in a machine and relate them to different existing models
- develop a simple analytical model of the thermal behaviour of a machine taking into account the relevant losses for the application
- explain all the tasks in the design procedure and apply them to a surface mounted permanent magnet motor with distributed windings with simplified analytical models
- explain discrepancies between results from different analytical methods through knowledge about the various approximations they are based on
- describe the concepts of finite element software tools and apply them in the analysis of permanent magnet synchronous machines
- report and present the results of the design project that has been conducted for a chosen application
- do a critical evaluation of the report and presentation of the specific studies conducted by the other students

Course contents

Synchronous electrical machines, permanent magnets, iron lamination, soft magnetic composite, models for losses, thermal modelling, field-weakening, windings, design procedure, finite-element method simulations.

Disposition

- Lectures 12 hours
- Tutorials 28 hours
- Project 36 hours

The main activity in the course is the project.

Course literature

Course folder Design of Permanent Magnet Synchronous Machines, KTH, 2008.

The course literature consists mainly of current research articles and reports that will be passed out when the course starts. The list of references used for the previous academic year course is available on the course webpage.

Equipment

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Examination

- PRO2 - Assignments, 1.5 credits, grading scale: P, F
- PRO1 - Project Report, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Oral examination (TEN1; 3 credits), project reports (PRO1; 3 credits), oral presentations with opposition (PRO2; 1.5 credits)

Other requirements for final grade

All the different moments have to be passed before the course credits are registered.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.