FEJ3222 Introduction to AC Machine Analysis 7.5 credits

Introduktion till elmaskinanalys

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

Establishment

Course syllabus for FEJ3222 valid from Spring 2019

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

PhD students at KTH, PhD students from other universities

Language of instruction

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

Intended learning outcomes

After completion of the course the student shall be able to:

· Analyze induction and permanent-magnet machines using analytical methods and the finite element method

· Carry out a preliminary electromagnetic sizing of an industrial induction machine

· Carry out thermal analysis of electric machinery using methods based on the finite element method and a lumped parameter approach

· Implement a finite-element based solver in a Matlab environment

Course contents

Methods for design and analysis of induction and permanent machinery:

· The magnetomotive force concept and its applications in electric machinery

· Fundamental and harmonic winding factors

· A thorough derivation of the equivalent-circuit induction machine model

· Electromagnetic sizing of induction machines using the progressive rotor growth concept

· An introduction to the finite element method applied to electric machinery

· The dq transformation: machine modeling, voltage current constraints, impact of zero sequence

· Magnetic saturation, cross saturation and impact of flux-linkage harmonics

· Transient permanent-magnet machine models utilizing FEM data

· The heat equation

· Newton’s and Fourier's cooling laws

· A model for predicting equivalent thermal conductivity of stator slots using the theory of two-component composite materials

· Air-gap heat transfer

· Lumped-parameter thermal modeling

Examination

• EXA1 - Examination, 7.5 credits, grading scale: P, 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.

The examination consists of five project works where the student demonstrates that he/she has obtained the necessary knowledge to verify the models and methods described in the course literature. The results shall then be compiled into five written project reports clearly showing how the models have been implemented together with comments on the obtained results. The projects and the associated project reports should be carried out individually.

Other requirements for final grade

Five approved project reports. A project report is deemed approved (by the course examiner) if all tasks have been solved and given a clear account for.

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.