EI1228 Electromagnetic Theory, Smaller Course 6.0 credits

Teoretisk elektroteknik, mindre kurs

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

Establishment

Course syllabus for EI1228 valid from Autumn 2019

Grading scale

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

Education cycle

First cycle

Main field of study

Electrical Engineering, Technology

Specific prerequisites

Completed courses equivalent to the courses in Engineering in energy and environment (CENMI) as well as in the education Master of Engineering & teachers (CLGYM) in

- linear algebra
- differential and integral calculus, in an and several variables
- analysis of electric circuits
- vector calculus.

Language of instruction

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

Intended learning outcomes

After a pass mark on course, the student shall from a description of an electromagnetic problem be able to

- solve electrostatic problems by choosing correct method, analyse the problem with correctly applied theory and mathematical tools (vector algebra, integral calculus, approximations), to obtain and present correct results, and evaluate the plausability of the results.
- solve magnetostatic problems and induction problems by choosing correct method, analyse the problem with correctly applied theory and mathematical tools (vector algebra, integral calculus, approximations), to obtain and present correct results, and evaluate the plausability of the results.

Note that ’solve problems’ in the intended learning outcomes above means also that based on an appropriate part of Maxwell's equations by means of e g vector calculus, integral calculus and differential calculus be able to show how, in the electromagnetism, known expressions are related to one another. E g Gauss law on integral form should be possible to be derived based on the differential equation.

Course contents

Electrostatics:

- Coulomb's law; the electric field E; charge distriubutions; Gauss law, where fields are defined based on their force, calculate fields from given charge distriubutions
- the scalar potential; electrostatic energy; conductors; capacitance
- method of images, for boundary value problems,
- the electric dipole; polarisation; bound charges; The D-field; dielectrics; permittivity; the interaction of the electric field with material.
- current density; conductivity; resistance; Joule's law.

Magnetostatics and induction:

- Biot-Savart's law; the magnetic field B; the continuity equation; Ampère's law; the vector potential; The B-field defined from its force; calculate magnetic fields from a given stationary current density
- the magnetic dipole; magnetisation; bound current density; The H-field; permeability; magnetic field interaction with materials.
- electromotive force; the induction law; inductance; magnetic energy.

Disposition

Lectures and tutorials.

Course literature

The course literature list is announced on the course page.

Examination

- TEN1 - Written Exam, 6.0 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.

In agreement with KTH´s coordinator for disabilities, it is the examiner who decides to adapt an examination for students in possess of a valid medical certificate. The examiner may permit other examination forms at the re-examination of few students.

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.