EI1222 Electromagnetic Theory, Continuation Course 6.0 credits

Teoretisk elektroteknik, fortsättningskurs

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

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

Establishment
Course syllabus for EI1222 valid from Spring 2019

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

Education cycle
First cycle

Main field of study
Technology

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

Intended learning outcomes
General goals
After the course the student shall from a description of a situation that leads to an electromagnetic field problems be able to

- use their conceptual understanding of the electromagnetic laws in order to qualitatively describe the behavior of the solution to the problem
- use their ability to manage the electromagnetic laws to, in simple situations, set up a computational model and perform the necessary calculations: select appropriate methods; make appropriate approximations; plausibility assess the results

Concrete goals

- analyze the polarization state of an electromagnetic wave
- analyze refraction and interference of electromagnetic waves by reflection from interfaces
- explain the basic concepts of transmission lines and calculate currents and voltages along a transmission line
- use the Smith chart for solving matching problems
- analyze mode decomposition in rectangular and circular hollow waveguides, and in planar dielectric waveguides
- determine resonance frequencies and losses in cavity resonators
- distinguish between near-field and far-field properties
- calculate the radiation field from straight wire antennas with given current distributions
- calculate the radiation field from antenna arrays without coupling between the elements
- explain the concepts of radiation pattern and radiation resistance
- describe the concepts of directivity, antenna gain and beamwidth

Course contents

- plane waves: reflection and transmission at oblique incidence; critical angle; Brewsterangle
- transmission line theory: distributed parameters, characteristic impedance; matching; Smith chart
- rectangular and circular waveguides; dielectric waveguides; cavity resonators
- fields from general source distributions
- basics of antenna arrays and wire antennas; radiation pattern; radiation resistance; antenna demonstration

Disposition

Lectures, tutorial exercises and labs.

Specific prerequisites

Electromagnetic theory, corresponding to EI220 or EI1240.
Course literature
D. K. Cheng, Field and Wave Electromagnetics, 2nd ed

Equipment
Matlab and lab equipment.

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.

Other requirements for final grade
Passed in all examination moments.

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.