



# ED2210 Electromagnetic Processes in Dispersive Media

## 6.0 credits

Elektromagnetiska vågor i dispersiva media

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 ED2210 valid from Spring 2010

### Grading scale

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

### Education cycle

Second cycle

### Main field of study

Electrical Engineering, Engineering Physics

### Specific prerequisites

Introductory courses in electromagnetic theory, including vector analysis.

# Language of instruction

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

## Intended learning outcomes

The objective is to give a deeper understanding and knowledge of treating electromagnetic processes in the areas of plasma physics, astrophysics, radio astronomy and physical optics. After finishing this course the students should be able to treat problems of wave propagation, absorption and emission of electromagnetic waves in anisotropic media.

## Course contents

Vektorpotential, Gauge conditions, Maxwell's equations on tensor form och Maxwell's tension tensor, multipole expansion, Fourier transforms, generalised functions, Green functions, Laplace transforms, contour integration, response tensors, Kramers-Kronig relations, the Onsager relation, dispersive media, crystals, cold plasma, isotropic warm plasma, wave equation, dispersion relation, polarisation, polarisation of transverse waves, geometric optic, resonances, cut-off, damping of waves, energy flows also in spatial dispersive media, waves in anisotropic crystals, waves in plasma (MHD waves and Langmuir waves), energy of waves, absorption, spontaneous and stimulated emission, Larmor formula, the Einstein's coefficients, Landau damping, cyclotron damping, Lienard-Wiechert potentials.

## Course literature

Electromagnetic processes in dispersive media, D. B. Melrose and R. C. McPhedran, Cambridge University Press 1991.

## Examination

- TEN1 - Examination, 6.0 credits, grading scale: A, B, C, D, E, FX, F
- ÖVN1 - Exercises, - 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

Satisfactory results on the assignments during the course and on the written examination. The final mark is weighted from the result of the assignments and the written examination.

## 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.