



# El2410 Field Theory for Guided Waves 7.5 credits

Fältteori för vågledare

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

On 2019-10-15, the Head of School of EECS has decided to establish this official course syllabus to apply from the spring semester 2020 (registration number J-2019-0623).

## Grading scale

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

## Education cycle

Second cycle

## Main field of study

Electrical Engineering

## Language of instruction

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

## Intended learning outcomes

Having passed the course, the student should be able to

- demonstrate conceptual understanding and prove general principles of electromagnetic fields in waveguides

in order to be able to use the electromagnetic laws combined with mathematical methods to solve electromagnetic field problems.

To obtain higher grades, the student shall be able to

- with progression in both completeness and width demonstrate skills in solving specific guided wave problems.

## Course contents

- decomposition of the fields and Maxwell's equations in isotropic media
- analysis of propagating and evanescent TM-, TE- & TEM-modes in metallic hollow waveguides
- hollow waveguides with rectangular and circular cross-sections
- application of mode orthogonality at excitation from sources and at energy transport
- the mode matching method to analyse scattering at discontinuities
- analysis of attenuation of and coupling between waveguide modes
- analysis of resonance cavities, orthogonality relations, losses and bandwidth
- planar dielectric waveguides and optical fibres
- analysis of the quasi-TEM modes in multiconductor systems

## Specific prerequisites

- Completed course at first cycle level in electromagnetic theory equivalent to one of EI1220 and EI1320.
- Completed course in mathematical methods in physics, containing vector calculus, separation of variables and orthogonal functions equivalent to SI1200 Mathematical Methods of Physics.

## Examination

- PROA - Project, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- TENA - 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.

## Transitional regulations

Students course registered with the item TEN1 follow the new the course structure and the result on TEN1 corresponds then corresponds to the weighted result of PROA and TENA.

## **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.