# FSK3340 Fourier Optics 6.0 credits

## Fourieroptik

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 FSK3340 valid from Spring 2015

## Grading scale

## Education cycle

Third cycle

## Specific prerequisites

Admitted to PhD studies in Physics, Biological Physics, or related fields of study.

## Language of instruction

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

## Intended learning outcomes

The overall aim of the course is that you should be able to analyze optical problems with the help of the approximations made in Fourier optics and develop simple numerical simulations

for your systems.
This means that you should be able to:

- Describe the mathematical characteristics of the two dimensional Fourier transform and explain their relevance for the analysis of linear optical systems
- Explain the basics of scalar diffraction theory
- Analyze different solution methods for the Helmholtz equation
- Apply the Fresnel and Fraunhofer approximation to calculate the diffraction patterns of standard optical components
- Reflect on the physical implications of diffraction and their influence on the resolution in optical imaging systems
- Develop and implement algorithms for numerical wavefield propagation

## Course contents

- Analysis of two-dimensional signals and systems
- Foundations of scalar diffraction theory
- Fresnel and Fraunhofer diffraction
- Frequency analysis of optical imaging systems
- Numerical methods for wave-field propagation

## Disposition

10 lectures, 5 computer labs

Language of instruction: English

## Course literature

Joseph W. Goodman, Introduction to Fourier Optics, Third edition (2005), Roberts and Company publishers.

One of the best books in optical physics, suitable both for self-study and reference.

## Examination

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.

LAB1 – computer-based lab, 2,0 hp, grading: P/F
REDA – written examination, 4,0 hp, grading: P/F

## Other requirements for final grade

To pass the course you have to pass the written examination and present a simulation of an optical system based on Fourier optics.

## 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.