Faculty of Science

FYST94, Physics: Optics and Optical Design, 7.5 credits

Fysik: Optik och optisk design, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2024-12-03. The syllabus comes into effect 2024-12-03 and is valid from the autumn semester 2025.

General information

The course is an elective course for second-cycle studies for a scientific candidate - or Master's degree (120 credits) in physics.

Language of instruction: English

Main field of study	*Specialisation*
Physics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The overall goal of the course is for students to acquire knowledge of fundamental and advanced concepts in optics and a general understanding of when and how these concepts are possible and appropriate to use. The course deals with optical devices and their operation and aims to provide students with practical knowledge in optical design using a ray-tracing programme.

Knowledge and understanding

On completion of the course the student shall be able to:

- explain the differences between important optical concepts such as ray optics, wave optics or electromagnetic optics
- explain important concepts such as polarisation, diffraction, interferometry, holography.

Competence and skills

On completion of the course the student shall be able to:

- design and build industrial optical applications
- solve an optical problem using beam optics, wave optics or electromagnetic optics
- independently perform adjustments and measurements in optics
- calculate the propagation of light through different optical components
- perform simple optical design tasks
- search and integrate knowledge from English literature in the field
- present a project orally and in writing
- carry out a project work in a group.

Judgement and approach

On completion of the course the student shall be able to:

- argue for which optical concepts are appropriate to use to solve an optical problem.

Course content

The course has the following content. Every topic is coupled to a chapter or parts of a chapter in the course book.

- Ray optics, matrix formulation
- Wave optics, interference
- Fourier optics, diffraction
- Electromagnetic optics
- Anisotropic media
- Polarization, Jones matrix formalism
- Optics of layered media and photonic crystals

Course design

The teaching consists of lectures, laboratory sessions in interferometry, Fourier optics and polarisation, group exercises and ray-tracing projects. Participation in labs, projects and thus integrated teaching is mandatory.

Assessment

Examination is in the form of a written exam at the end of the course and in the form of: approved laboratory reports, approved ray-tracing project and participation in all mandatory parts.

Students who do not pass the regular exam are offered additional exam possibilities during the scheduled re-exam period.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
A passing grade on the course requires a passed exam, passed laboratory reports, passed ray-tracing project and participation in all mandatory parts.

The grading scale for laboratory work and ray-tracing projects is Fail, Pass while the exam is graded Fail, Pass, Pass with distinction. The final grade is determined by the grade on the exam.

Entry requirements

For admission to the course, knowledge is required equivalent 90 credits in natural sciences, including knowledge equivalent to FYSB24, Physics: Atomic and Molecular Physics, 7.5 credits. General entry requirments and English 6/B.

Further information

The course is the first of a series of four courses within photonics that uses the same book.

The course replaces ??016, Optics and optical design, 7.5 credits, and credits from that course cannot count towards a degree together with this course

The course is studied together with FAFN45, Optics and optical design, 7.5 credits, which is a course at Lund University's Faculty of Engineering, LTH.

The course is assessed according to the LTH exam schedule.

The course is offered at the department of Physics, Lund University.