



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Lasrar **Lasers**

FAFN01, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED N

Date of Decision: 2023-04-17

General Information

Main field: Photonics.

Compulsory for: MFOT1

Elective for: BME4-bf, E4-fh, F4, F4-f, N4

Language of instruction: The course will be given in English

Aim

The course aims at providing knowledge about the physical principles of lasers as well as to give an orientation of the different laser types and laser techniques.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- know how a laser works.
- understand important concepts such as stimulated absorption and emission, homogeneous and inhomogeneous broadening, diffraction, electromagnetic propagation in a cavity, dispersion, amplification, mode-locking.
- be able to orient himself /herself among the different lasers for a given application.

Competences and skills

For a passing grade the student must

- be able to perform alignments and measurements with lasers.
- be able to calculate conditions for lasing and amplification as well as propagation of a laser beam through optical components.
- be able to solve problems in Optics and Lasers.

- be able to search, acquire and assess knowledge from a references within the field.
- have an increased competence for presenting in writing an accomplished project.

Judgement and approach

For a passing grade the student must

have an increased experience for working in groups of two or four persons towards a common goal.

Contents

- Gaussian beams, propagation through optical components.
- Resonator optics
- Photons and atoms
- Amplifiers
- Lasers

Laboratory exercises: Helium Neon laser, Neodym laser. Project with a ray tracing programme.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Written exam. Two mandatory laboratory exercises with report. A small project using a ray tracing program.

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.

Parts

Code: 0114. **Name:** Written Examination.

Credits: 4,5. **Grading scale:** TH. **Assessment:** Written exam.

Code: 0214. **Name:** Project.

Credits: 1. **Grading scale:** UG. **Assessment:** Passed project.

Code: 0314. **Name:** Laboratory Works.

Credits: 2. **Grading scale:** UG. **Assessment:** Passed laboratory works.

Admission

Assumed prior knowledge: Basic Physics, Mathematics and Optics.

The number of participants is limited to: No

The course overlaps following course/s: FAF073, FAF112

Reading list

- B. E. A. Saleh and M. C. Teich: Fundamentals of Photonics. Wiley Series in Pure and Applied Optics, John Wiley & sons, inc., 3rd edition, 2019, ISBN: 9781119506874. Chapters 3,11,14,15,16.

Contact and other information

Teacher: Jörgen Larsson, jorgen.larsson@fysik.lth.se

Course coordinator: Olle Lundh, olle.lundh@fysik.lth.se

Further information: It is mandatory to attend the first lecture in order to be admitted to the course.