



LUND
UNIVERSITY

Faculty of Science

FYST21, Physics: Light-Matter Interaction, 7.5 credits

Fysik: Ljus-materia växelverkan, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2007-06-14 to be valid from 2007-07-01, autumn semester 2007.

General Information

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

Language of instruction: English

Main field of studies

Physics

Depth of study relative to the degree requirements

A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

Knowledge and understanding

To pass the course, the student should:

- be able to describe the interaction between matter and light by means of quantum mechanics
- orientate oneself among some research issues at an advanced level just under third-cycle courses and study programmes

Skills and abilities

To pass the course, the student should:

- independently make realistic quantum mechanical calculations on existing systems both numerical and analytical
- formulate and solve some simple physical problems within atomic physics, particularly the interaction between a two level atom and radiation

Judgement and approach

To pass the course, the student should:

- have increased ability to orally and in writing present project that they have carried out.
- have increased experience to work in groups towards a common goal.
- find, evaluate and integrate knowledge from literature for second-cycle studies

The aim of the course

The course gives the students an advanced knowledge of the interaction between light and matter described by means of quantum mechanics and its the applications within current research. Several exciting fields of current research, e. g laser cooling and trapping of atoms, atto-second physics, nano-optics and quantum computers will be described.

Course content

- The interaction between atoms and light
- Laser cooling and trapping and radiation forces
- Atoms in strong laser fields. Application to extreme optics: atto-second pulses
- Manipulation of atoms, molecules, larger systems with lights and nano-optics
- Optics and interferometry using atoms
- Quantum communication and quantum computers

Course design

The teaching consists of lectures/laboratory sessions/group work/written assignment. Participation in laboratory sessions and connected teaching is compulsory.

Assessment

Written examination at the end of the course. Students who do not pass the regular exam are offered a new possibility shortly after the regular exam.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.

To pass the entire course, approved examination is required/approved laboratory reports/passed written assignment and participation in all compulsory parts.

Entry requirements

For admission to the course is required:

English B, FYSA31, Physics 3 and Modern physics, 30 credits, or the equivalent.

Subcourses in FYST21, Physics: Light-Matter Interaction

Applies from V08

0701 Light-matter Interaction, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction