



LUND
UNIVERSITY

Joint Faculties of Humanities and Theology

ÄFYA01, Physics: Light and Matter, 7.5 credits

Fysik: Ljus och materia, 7,5 högskolepoäng

First Cycle / Grundnivå

Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2025-12-10. The syllabus comes into effect 2025-12-10 and is valid from the autumn semester 2026.

General information

The course is part of the subject teacher education programme at Lund University.

Language of instruction: English

The language of instruction is English. Summaries in Swedish will be provided and the students have the option for Swedish examination.

Main field of study *Specialisation*

Physics G1F, First cycle, has less than 60 credits in first-cycle course/s as entry requirements

Learning outcomes

The overall aim of the course is that the student acquires knowledge of central concepts in physics, which form the foundation for further studies in the subject.

Knowledge and understanding

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

- account for the properties of the solid, liquid and gaseous phase and their relation to atomic constituents;
- explain the equations of motion and the relevance of energy conservation for one-dimensional mechanical problems;
- describe and apply the ideal gas law;
- reproduce different applications of the Boltzmann factor;

- explain the relevance of atomic levels for the interaction with light;
- cursory describe the operation of a laser;
- describe the refraction and reflection of light, including Snell's law.

Competence and skills

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

- conduct experiments under guidance, observe them diligently and extract measurement data;
- carry out dimensional analysis with physical units;
- formulate exponential decay mathematically and identify it in experimental data;
- perform simple tasks, such as plotting data, with Python;
- apply the laws of geometric optic for instruments and specific experimental setups.

Judgement and approach

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

- evaluate the importance of safety procedures in laboratory work;
- reflect on the progress of learning;
- interpret experiments and physical reality in the form of mathematical models, analogies, and images.

Course content

This course provides a first introduction to the following topics:

- experimental methodology and dimensional analysis;
- the discreteness of matter and the phases of solids, liquids and gases;
- one-dimensional mechanics and energy conservation;
- ideal gases with temperature and pressure;
- Boltzmann distribution;
- geometrical optics;
- light and its interaction with atoms;
- quantization of light and energy levels;
- applications of physical concepts in different fields including the big research facilities in Lund;
- learning processes, academic honesty and integrity;
- laboratory safety.

The course focuses on students activities such as problem solving, allocation of information, performing and analyzing experiments, as well as presenting data.

Course design

The course is divided into the following modules

1. a series of teaching sessions including problem-solving exercises, hand-ins, and quizzes with a final examination consisting of a short written exam and an oral interview;
2. laboratory work, including safety training;
3. a seminar on applications of physics;
4. a workshop on learning and plagiarism.

The participation in all laboratories, the seminar, and the workshop is mandatory.

Assessment

The various modules (numbered according to the course schedule) are assessed through:

1. quizzes, hand-ins, and a written exam that ensures the tasks have been completed independently. A student who has passed the quizzes, hand-ins, and the exam is offered an optional oral interview, providing them with the opportunity to demonstrate a deep understanding of the course content;
2. active participation in laboratory sessions, a safety quiz, and a written laboratory report;
3. active participation in the seminar and a group presentation;
4. active participation in the workshop, a plagiarism quiz, and a written self-reflection.

Students who do not pass the regular examination are offered an additional examination opportunity shortly thereafter.

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

Module 1: The grading scale is Fail / Pass / Pass with distinction.

- To obtain the grade Pass, students must pass the quiz, assignments and written exam.
- To obtain the grade Pass with distinction, students must demonstrate a high level of understanding of the course material during the optional oral interview.

Modules 2–4: The grading scale is Fail/Pass.

- To obtain the grade Pass, students must pass the laboratory work, seminar and workshop.

For a pass grade on the whole course, students must have pass grades on all four modules.

The final grade is determined by the grade on Module 1.

Entry requirements

General entry requirements and studies equivalent of courses Physics 2, Mathematics 4 and English 6 from Swedish upper secondary school, as well as 15 credits in university-level mathematics.

Further information

The course is identical to the course FYSA30, which is included in the Bachelor's programmes in Physics, Theoretical Physics, Astronomy and Astrophysics, as well as in the Medical Physics programme.

The course may not be included in a degree together with FYSA13 Physics: Introduction to University Physics, including Optics, Wave Physics and Quantum Physics (7.5 credits), ÄFYD11 Physics 1: Introductory Physics and Physics Education (30 credits), or equivalent earlier courses.

The course is offered by the Department of Physics, Lund University.