SK1131 Physics: Waves and Particles 7.5 credits

Fysik: vågor och partiklar

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Physics, Technology

Specific prerequisites

SF1600, SF1601 Calculus.

Language of instruction

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

Intended learning outcomes

The course gives an introduction to university physics with electromagnetism, quantum-, atomic-, nuclear- and material physics alignment. After completing the course the student should be able to:

- explain the most important characteristics of electromagnetic waves like interference, diffraction and optical imaging
- explain the structure of atoms and the atomic nucleus, radiactivity and its technical applications
- solve technical problems, relevant to the educational program, that has connection to electromagnetic waves, material physics and quantum-, atomic- and nuclear physics
- estimate plausibility in physical questions at issue within the area
- understand limitations in physical measurement methods and estimate uncertainties of measurements
- evaluate and present physical measurements within the area using text and diagrams

Course contents

Lecture course:

Mathematical description of electromagnetic waves.

The materials impact on an electromagnetic wave.

Basic geometrical optics and imaging.

Interference and superposition. The concept of coherence and polarization.

Diffraction of waves. The concept of resolution.

The photon, the photo-electrical effect, the Schrödinger equation and the uncertainty principle

The Bohr model, spin, angular momentum and dipoles

The periodic system, functioning of the laser and the characteristics of laser radiation

Insulators, semiconductors and metals, p-n transition, ligth emmitting diods and the photo detector

Nuclear physics and radioactivity.

Overview of quarks, leptons and big bang

(34h F, 18h Ö)

Laboratory course:

Three laboratory experiments, relevant for the area, are done and presented by written reports.

(12h L)

Course literature

Halliday, Resnick and Walker, Fundamentals of Physics, extended ed. kap. 1-44, John Wiley & Sons (the edition used will be announced on the course homepage at least four weeks prior to start of the course).

Laboratory instructions.

Hand out material.

Examination

- INL1 - Home Assignments, 1.0 credits, grading scale: P, F
- TEN1 - Examination, 5.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Exercises, 1.5 credits, grading scale: P, F

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.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

The course is examined by written examination (TEN1; 5 credits, grade scale A/B/C/D/E/Fx/F), hand-in assignments (INL1; 1 credits, grade scale P/F) and approved laboratory experiments (LAB1; 1,5 credits, grade scale P/F).

Grade for complete course requires a Pass in all parts of the course and is decided on the basis of the written examination grade.

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.