SK180N Introductory Modern Physics 9.0 credits

Inledande modern fysik

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

Establishment

The course plan is valid from VT 2024

Grading scale

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

Education cycle

First cycle

Main field of study

Physics, Technology

Specific prerequisites

Basic qualification as well as Mathematics D/ Mathematics 3c and Physics B/ Physics 2 with the lowest grade passed.

Language of instruction

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

Intended learning outcomes

The course will provide basic knowledge about the rules and laws that governs micro cosmos, i.e. about electrons, atoms, nuclei, and their interaction with electromagnetic radiation. The course will also show how these rules and laws can be used within technology and medicine.

The student will after the course know how to:

- solve problems about the hydrogen atom concerning energies and wavelengths between obtained between energy levels
- explain and perform calculations on the Photoelectric effect and the Compton effect
- discuss quantum mechanical problems dealing with the Heisenberg uncertainty principle
- perform calculations on frequency conditions, mode structure of a laser and the laser medium
- perform simpler calculations with the Schrödinger equation
- do estimates of the Fermi function regarding energies in solids and explain the band model
- explain the phenomenon of nuclear decay and to perform calculations on half lifes
- explain and perform calculations on the Einstein's energy relations and how to calculate fusion and fission energy production
- discuss the build-up of the elementary particles.

Course contents

Waves and Photons. Electrons and material waves. Quantum mechanics. Heisenberg uncertainty relation. Schrödinger equation. Pauli principle and the Periodical system. Tunnelling microscope. Hydrogen atom. Electronic spin. Atomic structure. Magnetic resonance with applications. X-rays and elemental analysis. Laser radiation. Conductors, semi-conductors and isolators, p-n transitions. The fotodiode and LED. Nuclear structure and binding energy. Nuclear decay. Nuclear energy. Fission and fusion. Elementary particles and the forces between them. The latest Nobel Price.

Examination

- TEN3 - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN2 - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, 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.

Exams on the internet

Other requirements for final grade

Three written examinations.

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.