SH2008 Introductory Modern Physics 6.0 credits

Grundläggande modern fysik

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

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

Establishment

The course syllabus is valid from spring 2022 according to the principal's decision: S-2022-0529 Decision date: 2022-02-24

Grading scale

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

Education cycle

Second cycle

Main field of study

Engineering Physics

Specific prerequisites

Basic integral and diffential calculus, basic algebra and basic mechanics.

English B / English 6

Language of instruction

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

Intended learning outcomes

After completing the course, the student should:

- Be able to explain the scientific basis of modern physics as defiened by the course content.
- Be able to contruct and perform quantum mechanical calculations of simple systems.
- Be able to apply quantum mechanical principles within the natural sciences and technology.
- Have aquired practical experience of experimental methods within modern physics.

Course contents

The experimental background of Modern Physics and Quantum Mechanics

The experimentel background of modern Physics. Material waves (“de Broglie waves”). Wave packets and the Heisenberg uncertainty relation. Wave-particle duality. Atomic structure. The Bohr model of the atom. Atomic energy levels. The foundations of quantum mechanics. Applications of the Schrödinger equation to simple potentials. Interpretations of wave functions. Plane wave solutions. The harmonic oscillator. Angular momentum and spin. The hydrogen atom and the periodic table. The Pauli principle. Planck’s radiation law. X-ray emission and spectra. The strucure of the nucleus. Radioactive decay. Application of phenomena such as the photoelectric effect. Quantum mechanical phenomena in the natural sciences and technology, such as tunneling, scannng microscope, the Stern-Gerlach experiment, atomic nuclei, simple molecules. Insulators, conductors and semiconductors.

Examination

- INLA - Home Assignments, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- LABA - Laboration, 1.0 credits, grading scale: A, B, C, D, E, FX, F
- PROA - Project, 2.0 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.

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.