Level: bachelor

Course title: Contemporary experimental physics 1

Status: obligatory

ECTS: 7

Requirements: Electromagnetism, Optics, Basic electronics

Learning objectives

To introduce students to mastering the content of introduction to atomic physics.

Learning outcomes

After completion of the course, students should possess:

- General skills: experience in setting and carrying out non-classical experiment. The acquired knowledge is applicable in chemistry, molecular physics, gas discharges.
- Specific skills: Based on the application of classical physics to atoms and molecules, students gain an idea of world of atomic particles, dimensions and processes. Students are trained to follow the course in Atomic physics, which studies the phenomena that can only be described by quantum mechanics.

Syllabus

Theoretical instruction

The idea of atomic theory. Atomic and molecular masses. Molecular-kinetic theory. The atomic theory of electrical phenomena. Determination of specific and elementary charge. Isotopes. Mass spectrography. Scattering of α particles. Nuclear model of atom. The production and x rays diffraction. Spectra of x rays. The interaction of x rays with matter. The linear harmonic oscillator. Generalized coordinates and impulses. Electromagnetic radiation of electric dipoles. Thermal radiation and black body radiation laws. Photo effect. Spectral series of hydrogen atoms. Bohr's theory. Confirmation of the Bohr's theory. Sommerfeld's quantization. The boundaries of Bohr-Sommerfeld's theory. Equation of plane monochromatic waves. Superposition of plane waves. De Broglie's hypothesis. The statistical interpretation of de Broglie's waves. Heisenberg's uncertainty principle.

Practical instruction

Millikan experiment. Determination of e/m. Determination of Planck's constant. Determination of Rydberg's constant. Measuring the attenuation coefficient of x rays. Franck-Hertz experiment. Diffraction of electrons.

Weekly teaching load				Other:
Lectures: 3	Exercises: 1	Other forms of teaching: 2	Student research:	