Course Unit Descriptor

Study Programme: Physics

Course Unit Title: Fundaments of Atomic and Molecular Physics

Course Unit Code: F18OFAM

Name of Lecturer(s): Full Professor Stevica Đurović

Type and Level of Studies: Bachelor Academic Degree

Course Status (compulsory/elective): Compulsory

Semester (winter/summer): Winter

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 7

Prerequisites: Electromagnetism, Optics, Fundaments of electronics

Course Aims:

To introduce students to mastering the content which is an 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, where the study of phenomena can only be described by quantum mechanics

Syllabus:

Theory

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 momenta. 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.

Practice

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.

Required Reading:

1. W. Demtröder, Atoms, Molecules and Photons, Springer 2006.

Weekly Contact Hours:	**Lectures:** 3	**Practical work:** 3

Teaching Methods:

Lectures and students group work

Knowledge Assessment (maximum of 100 points): 100

Pre-exam obligations	points	**Final exam**	points
Active class participation	5	written exam	20
Test I and Test II	10	oral exam	50
Preliminary exam(s)	10	…….	
Seminar(s)	5		
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			