Course Unit Descriptor

Study Programme: Physics, Professor of Physics

Course Unit Title: Statistical physics

Course Unit Code: F18SF

Name of Lecturer(s): Full Professor Milan Pantić

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: 5

Prerequisites: Quantum mechanics

Course Aims: Statistical physics aims to introduce the students to the principles of equilibrium statistical physics and how they enable the formulation of macroscopic thermodynamical laws using microscopic structure of the system.

Learning Outcomes: After taking the course, the student should have developed:

General abilities: basic knowledge of this field, following the literature, analysis of various solutions and the choice of the most adequate solution, application in practice and other subjects.

Subject-specific abilities: application of methods of statistical physics in the analysis of simple model systems (condensed matter systems, plasma, ionized gases). Knowledge acquired in this course presents the necessary base for the student to follow the more advanced courses (theory of magnetism, liquid crystals, superconductivity, phase transitions etc.).

Syllabus:

Theory

Elements of classical statistical physics: phase space, distribution function, Liouville's theorem. Gibbs' definition of entropy. Equilibrium Gibbs' ensembles and the statement on the thermodynamical equivalence. Quasistationary processes and laws of thermodynamics. Ideal classical gasses. Maxwell-Boltzman's distribution. Theorem on equal energy distribution over degrees of freedom. Classical oscillator and specific heat of solids. Quantum statistical operator and entropy operator. Quantum Gibbs' ensembles. Quantum oscillator. Einstein and Debye tehory of specific heat of solids. Photon gas. Planck's, Wien and Stefan-Boltzman law of blackbody radiation. Quantum ideal gasses. Bose-Einstein and Fermi-Dirac distribution.

Practice

Problem solving.

Required Reading:

1. L. D. Landau, E. M. Lifshitz, Statisticheskaya Fizika 1, Moscow, Nauka, 1976.
2. F. Schwabl, Statistical mechanics, 2nd ed. Springer-Verlag, 2006.
3. R. Patria, Statistical mechanics, 2nd ed. Butterworth-Heinemann, 1996.

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

Teaching Methods: Lectures

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class	5	written exam	20

participation			
Practical work		oral exam	50
Preliminary exam(s)	20	…….	
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.			