Level: bachelor

Course title: Statistical physics

Status: obligatory

ECTS: 5

Requirements: Quantum mechanics

Learning objectives

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

Theoretical instruction

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.

Practical instruction

Problem solving, homework.

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