Study Program: Physics

Type and level of studies: Bachelor studies

Course name: Statistical Physics

Lecturer: Branko Drljača

Status: Elective

ECTS: 7

Attendance Prerequisites: Physical Mechanics; Molecular Physics and Thermodynamics; Introduction to Theoretical Mechanics; Mathematical Physics

Course aims

Introduction to modern methods of statistical physics as well as their application to some selected chapters of condensed matter physics.

Course outcome

By the end of the course, the student should have developed:

- General abilities: basic knowledge of the field, monitoring and use of professional and scientific literature; analysis of different solutions and selection of an adequate solution, creativity, application in other areas of research
- Subject-specific abilities: By the end of the course, the student should have learned some modern methods of statistical physics (Green's functions, application of other quantization to systems of interacting particles)

Course content

Theoretical part

Liouville's equation and theorem. Equilibrium Statistical Physics: Gibbs Ensembles. Thermodynamic potentials. Classical gases with interaction. Quantum statistical operators and ensembles. Information theory and statistical physics. Ideal quantum particle systems. Bose-Einstein and Fermi-Dirac statistics. Nonequilibrium quantum systems. Linear system response and Green's function. Quantum systems with interaction. Applications in condensed matter physics. Quasiparticles: phonons, magnons, excitons. Boltzmann transport equation and H-theorem. Nonideal Bose gas: superfluidity of He. Electron-phonon interaction and superconductivity. Boltzmann transport equation and H-theorem. Irreversibility and kinetic coefficients. Basic kinetic equation.

Practical part

CALCULATION EXERCISES: Calculation exercises in the field of equilibrium and nonequilibrium in statistical physics.

Literature

1. М. Радовић: Увод у статистичку физику, Градина, Ниш 1996.
2. Б. С. Тошић, Статистичка физика, ПМФ, Институт за физику, 1978.
3. И. Живић, Статистичка механика, ПМФ, Крагујевац, 2006.
4. R. Kubo, Statistical Mechanics, North-Hiolland Publiching Company, Amsterdam, 1965.

Number of active classes				Other classes:
Lectures: 2	Practical classes: 3	Other forms of teaching: 0	Students' research work	

Teaching methods

Lectures (2 classes per week during the semester), computational exercises (3 classes per week).

Assessment (maximum 100 points)

Course assignments	**points**	Final exam	**points**
activity during lectures	15	written exam	35
practical classes	15	oral exam	35
Term test/s			
Total			70