Study programmes: BACHELOR STUDIES – Astronomy and Astrophysics

Course name: Statistical Physics 1

Lecturers: Milan Knežević and other lecturers

Status: Optional

ECTS: 6

Attendance prerequisites: Mathematics 4

Course aims: Learn the main concepts, laws and methods of phenomenological thermodynamics and stochastic processes.

Course outcome: Students will be able to apply the acquired knowledge and methods in studies of simple equilibrium and out of equilibrium many-body systems.

Course content:

Fundamental concepts and laws of equilibrium phenomenological thermodynamics; applications to simple physical systems. Legendre transformations and thermodynamic potentials. Equilibrium and stability conditions; response functions. Phases and phase transitions; Ehrenfest's clasification. Critical phenomena, critical exponents, scaling hypothesis. Mean-field theory. Landau theory. Random walks on lattices; diffusion equation. Langevin theory of Brownian motion. General stochastic processes. Markov processes; Chapman-Kolmogorov equation. Diffusive Markov processes; Fokker-Planck equation. Gaussian processes. Wiener-Hinchin theorem. Discrete Markovian processes; Master equations.

Literature:

1. H. Callen, Thermodynamics and introduction to thermostatistics 2nd ed. John Wiley (1985)
2. S. Milošević, Osnovi fenomenološke termodinamike, PFV (1979)
3. R. Kubo, Thermodynamics, North-Holland (1968)
4. N.G. Van Kampen, Stochastic processes in physics and chemistry, 3rd ed. Elsevier (2007)
5. P.A. Martin, Physique statistique des processus irreversibles, ENS Lyon (2004)

Number of hours: 4	**Lectures**: 2	**Tutorials**: 2	**Laboratory**: -	**Research**: -

Teaching and learning methods:

Lectures, example exercises, consultations, homework assignments.

Assessment (maximal 100 points)

Course assignments	points	Final exam	points
Lectures	-	Written exam	30
Exercises / Tutorials	10	Oral exam	50
Colloquia	-	Written-oral exam	-
Essay / Project	10		