DESCRIPTION OF THE COURSE OF STUDY
FOR EXCHANGE STUDENTS

Name of the course in	English	**Statistical Physics**
	Polish	**Fizyka statystyczna**

1. LOCATION OF THE COURSE OF STUDY WITHIN THE SYSTEM OF STUDIES

1.1 Field of study	Physics
1.2 Level of study	2nd degree

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

2.1 Language of instruction	English
2.2 Semesters in which the course of study is offered	1
2.3 ECTS credits	2

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Form of classes	traditional lecture
3.2. Form of assessment	oral exam

4. OBJECTIVES, SYLLABUS CONTENT

4.1. Course objectives

C1. to acquaint students with the basic ideas of statistical physics;
C2. prepare students to independently study statistical physics.

4.2. Detailed syllabus

1) Thermodynamics
- a) basic notions of thermodynamics
- b) the first and second laws of thermodynamics
- c) heat capacity and Mayer equation
- d) adiabatic processes of an ideal gas
- e) the third law of thermodynamics and its consequences
- f) free energy, free enthalpy and their properties

2) Classical Gibbs mechanics
- a) fundamentals of classical Gibbs mechanics: ergodic hypothesis, microcanonical ensemble
- b) classical ideal gas in microcanonical ensemble, Gibbs paradox
- c) canonical ensemble, energy fluctuations
- d) real classical gases and classical model of a crystal
- e) grand canonical ensemble, example of ideal gas, energy and particle number fluctuations

3) Quantum Gibbs mechanics
- a) fundamentals of quantum Gibbs mechanics, quantum ensembles
- b) quantum model of a crystal
- c) thermodynamic functions of quantum ideal gases
- d) quantum ideal gases in classical limit
- e) degenerated gas of fermions
- f) Bose-Einstein condensation
- g) photon gas

4) Kinetic theory of gases
- a) basic notions of kinetic theory of gases
- b) collisionless transport equation, Boltzmann collision term
- c) H theorem
- d) collisional invariants and definition of thermodynamic equilibrium
- e) molecular chaos, Ehrenfests' model of dogs and fleas
- f) hydrodynamics of ideal fluid
- g) collision term in relaxation time approximation
- h) quasiequilibrium solutions of transport equation
- i) matching conditions and macroscopic quantities in quasiequilibrium
- j) dissipative energy flow and heat conductivity
- k) dissipative momentum flow and viscosity
- l) hydrodynamics of viscous fluid

5) Stochastic processes
- a) Einstein approach to Brownian motion
- b) Langevin formalism