Level: bachelor				
Course title: Contemporary theoretical physics				
Status: obligatory				
ECTS: 7				
Requirements: Introduction to theoretical physics, Basis of mathematical physics				
Learning objectives Introduction to Quantum mechanics. Student are presented to the basic principles and postulates of Quantum mechanics, applied to simple systems, without broader abstract formalism. 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 students 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 capabilities:** knowledge of the basic principles and postulates of quantum mechanics and their relation to the laws of classical physics; knowledge of the basic principles of the equilibrium statistical physics and their relation to the laws of thermodynamics.				
Syllabus *Theoretical instruction* Historical development of quantum mechanics. Superposition principle. De Broglie hypothesis. Heisenberg uncertainty relations. Postulates of quantum mechanics. Hilbert space. Operators of physical quantities. Measurement problem in quantum mechanics. Schroedinger equation. One-dimensional problems: potential well, step and barrier. Linear harmonic oscillator. Hydrogen atom. Eigenproblem of orbital (angular) momentum operator. Spherical harmonics. Electron spin. Theory of stationary perturbations: nondegenerated and degenerated spectrum. Identical particles. Pauli's principle. Exchange interaction. Orto- and parahelium. 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. Seminar *Practical instruction* Problem solving. Homework.				
Weekly teaching load				Other:
Lectures: 4	Exercises: 3	Other forms of teaching:	Student research:	