Special course for Masters and PhD students: phase transitions, Landau theory, 1D Ising model, the dimension of the space and Cosmology[1] VLADIMIR UDODOV, Moscow State Univ, KATANOV KHAKAS STATE UNIV TEAM — Symmetry breaking transitions. The phenomenological (L.D.Landau, USSR, 1937) way to describe phase transitions (PT's). Order parameter and loss of the symmetry. The second derivative of the free energy changes jump wise at the transition, i.e. we have a mathematical singularity and second order PT (T_C>0). Extremes of free energy. A point of loss of stability of the symmetrical phase. The eigenfrequency of PT and soft mode behavior. The conditions of applicability of the Landau theory (A.Levanyuk, 1959, V.Ginzburg, 1960). 1D Ising model and exact solution by a transfer matrix method. Critical exponents in the L.Landau PT's theory and for 1D Ising model. Scaling hypothesis (1965) for 1D Ising model with zero critical temperature. The order of PT in 1D Ising model in the framework of the R.Baxter approach. The anthropic principle and the dimension of the space. Why do we have a three-dimensional space? Big bang, the cosmic vacuum, inflation and PT's. Higgs boson and symmetry breaking transitions.

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