Five Lectures on Renormalization Group

Lecture 1 Diverging correlation lengths, Scaling, Universality Basic idea of RG : Rescaling lengths moves away from criticality Significance of fixed points and flows Degree of instability ... Multicriticality

Lecture 2

Implementing RG ... Real space approach 1-d models by decimation: Ising, Percolation 2-d: Neimeijer and van Leeuween's calculation Bond moving ... Migdal-Kadanoff

Lecture 3 Bond moving ... Migdal-Kadanoff (continued) Around the lower critical dimension: 1+epsilon From the Ising model to the Landau-Ginzburg-Wilson Hamiltonian RG in momentum space Gaussian model

Lecture 4

Hunt for small parameter ... how to justify perturbation theory Fixed points, flows, exponents in 4-epsilon dimensions (to first order in epsilon)

Lecture 5 The 2D XY model

References:

 Wilson and Kogut, Physics Reports 12, 75 (1974)
M E Fisher, "Scaling, Universality and Renormalization Group Theory", vol 186 of Lecture Notes in Physics (Springer)

Books:

1) " Statistical Physics of Fields" by M. Kardar

2) "Statistical Physics -- Statics, Dynamics and Renormalization" by L. Kadanoff

3) "The Theory of Critical Phenomena" by Binney, Dowrick, Fisher and Newman

4) "Scaling and Renormalization in Statistical Physics" by J. Cardy