Magnetism at finite temperature

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In these lectures I will present the basic concepts that determine the evolution of magnetic properties with temperature. The following aspects will be presented.

1- Mean field approximation
The concept of molecular field
Mean field approximation for different type of orderings (ferro-, antiferro-, ferri-, helimagnets..), and different crystal structures
Physical quantities in mean field approximation for localized spins (magnetization, susceptibility, specific heat). Curie-Weiss law
Mean field approximation for itinerant magnetic systems. Pauli susceptibility.
Landau expansion of free energy. 2^{nd} and 1^{st} order phase transitions. Ginzburg-Landau free energy

2- Phase transitions in magnetism
Phase transition in Landau theory
Critical behavior

3- Magnons
Magnons in ferromagnets in localized spin systems
Itinerant magnetic systems: spin waves vs Stoner excitations
Magnons in antiferromagnets
Contribution of magnons to the specific heat and magnetization

4- The role of dimensionality of the system: 1-, 2- and 3 dimensional systems
Mermin-Wagner theorem
Spin waves in 1- and 2 D systems

Some general reference books
S. Blundell: Magnetism in condensed Matter (Oxford University Press, 2001)
J.M.D. Coey: Magnetism and Magnetic materials (Cambridge University Press 2009)
R. Skomski: Simple models of Magnetism (Oxford University Press, 2008)

More advanced books
D.I. Khomskii: Basic aspects of the quantum theory of magnetism (Cambridge University Press 2010)
N. Majilis: The quantum theory of magnetism (World scientific 2007)
P. Mohn: Magnetism in the solid state (Springer, 2006)