TCIS, Hyderabad

Course: Magnetism

Start Date: Wednesday, August 2, 2017

Coordinates (Space-time): Fret-B, Mondays and Wednesdays, 9.30 a.m.

Instructor: M. Barma

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Syllabus:

Moments and Susceptibility
Local moments; Curie Law; Pauli paramagnetism; General formula for susceptibility

Magnetic Moment of a Single Atom or Ion
Spin and Orbital effects; (A) Hund's Rules; (B) Spin-orbit coupling; (C) Crystal fields
Transition Metals (C>B); Rare Earths (B>C)

Exchange Interactions in Insulators
Direct (potential) exchange; Kinetic exchange; Superexchange; Dzyaloshinski-Moriya interactions

Local Moments in Metals and their Interactions
Anderson impurity Hamiltonian; Kondo limit and the Kondo effect; RKKY interactions; Kondo Lattices

The Hubbard Model
The atomic limit; Half-filling → the spin 1/2 Heisenberg model; Single hole: the Nagaoka result

Magnetic States
Ferromagnets; Antiferromagnets: Neel and Resonating valence bond (RVB) states; Ferrimagnets; Helimagnets; Spin glasses

Magnetism in Metals
Itinerant magnetism

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Primary Text / Reference Books:

"Lecture Notes on Electron Correlation and Magnetism" by P. Fazekas (World Scientific)

Evaluation

Homework: 30

Mid Term: 30

Final: 40