

Spin waves, magnons

Similarities to phonons, differences
Dispersion, density of states, specific heat

Mean field, Landau theory of phase transitions

Graphs of free energy vs. order parameter above, at, and below T_c
What does it do correctly? What wrong?
Critical exponents and amplitude ratios

Roughening

Superconductivity

What superconductivity implies; Meissner effect, critical H
London equations, characteristic lengths, types I & II
BCS theory, equation for gap
What's different in exotic, high- T_c superconductors

Beyond independent electrons

Change in energy dispersion according to Hartree-Fock, effective mass
Screening in 3D

Universal curve for elastic mean free path of electrons in materials

Implications for probes of surfaces
Implications for EXAFS

Density functional theory

Basic assumptions; Kohn-Sham procedure
Application to surfaces, workfunction from exchange-correlation & surface dipole

Graphene & Nanotubes

Dispersion relation, conditions for metallic tubes

Quantum Hall

What happens to ρ_{xx} and ρ_{xy} ?
Simple explanation of plateaus etc. of IQHE in terms of Landau levels
Composite fermions and how they explain FQHE