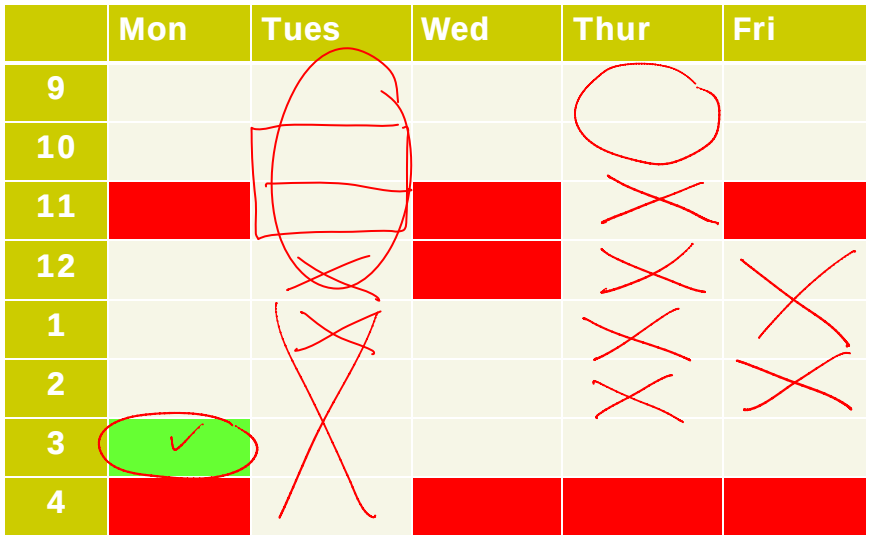
Correlations and Fluctuations in Condensed Matter

- Instructor: Young-June Kim (yjkim@physics.utoronto.ca; phone: 978-7868)
- Lectures: TBD
- Office Hours: TBD
- These information will be emailed later.
- Please leave your email address (Sign-up sheet)
- And.. Course homepage on Blackboard

Scheduling

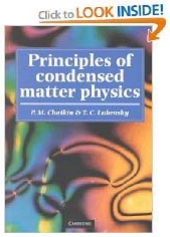


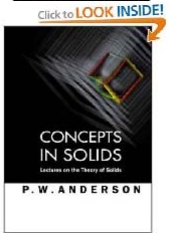
Evaluation

- Evaluation will be based on three homework assignments (60%) and a final exam (40%). The final exam will be arranged (most likely) before the A+S final exam period, and will be a take-home style.
- Homework will include both problem sets and reading assignments (reading original articles and writing a critique)

References

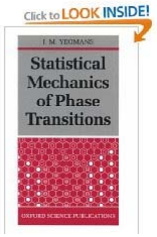
- P. Chaikin and T. C. Lubensky, “Principles of Condensed Matter Physics” (Cambridge, 1995)
- P. W. Anderson, “Basic Notions of Condensed Matter Physics” (Westview Press, 1997)
- P. W. Anderson, “Concepts in Solids” (World Scientific, 1998)

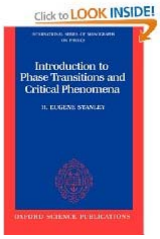




References: Phase transition

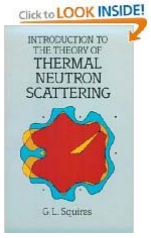
- J. M. Yeomans, “Statistical Mechanics of Phase Transitions” (Oxford 1992)
- H. E. Stanley, “Introduction to Phase Transitions and Critical Phenomena” (Oxford, 1971)

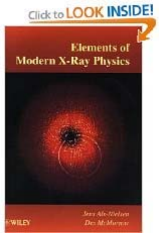




References: Scattering

- G. L. Squires, “Introduction to the theory of Thermal Neutron Scattering” (Dover, 1997)
- J. Als-Nielsen and D. McMorrow, “Elements of Modern X-ray Physics” (Wiley, 2001)

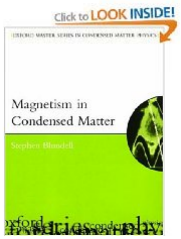




References: Magnetism / Supercon.

- M. Tinkham, "Introduction to Superconductivity" (Dover, 2004)

- S. Blundell, "Magnetism in condensed matter" (Oxford, 2001)



Who is this course for?

- Mostly advanced grad students
- Recommended background:
  - Quantum Theory of Solids I (Aschcroft+Mermin, Kittel)
  - Stat. Mech. (4th year or above)
  - Quant. Mech. (time-dependent perturbation, scattering)
- Less formal than Adv. Stat. Mech. (PHY2315F)
  - E.g. no field theory, no renormalization group
- More experimental connection
  - Energy scale discussion
  - Formal treatment of scattering technique
  - Experimental references

What is this course about?

- To become familiarize with many concepts in modern condensed matter physics
- Tentative topics
  - Broken symmetry and Goldstone mode (1.2)
  - Energy scales in condensed matter (1.3)
  - Scattering theory (2.1-2.3)
  - Crystals structure and liquid crystals (2.5-2.7)
  - Magnetic order parameter (3.5-3.6)
  - Ising model and Landau theory (4.1-4.2)
  - 1st order transition in liquid crystals (4.5)
  - XY-model (6.1)
  - Elasticity of Solids (6.4)
  - Fluctuation-dissipation theorem (7.6)
  - Dynamic structure factor and inelastic neutron scattering (7.7)

- Correlations
- Fluctuations
- Ising model example: