Chapter 0

Introductory Information

`Instructor:`	Daniel Arovas
`Contact :`	Mayer Hall 5671 / 534-6323 / darovas@ucsd.edu
`Lectures:`	Tu Th / 9:30 am - 10:50 am / Mayer Hall 5301
`Office Hours:`	W 2:00 pm - 3:30 pm / Mayer Hall 5671

A strong emphasis of this class will be on learning how to calculate. I plan to cover the following topics this quarter:

Transport: Boltzmann equation, transport coefficients, cyclotron resonance, magnetoresistance, thermal transport, electron-phonon scattering
Mesoscopic Physics: Landauer formula, conductance fluctuations, Aharonov-Bohm effect, disorder, weak localization, Anderson localization
Magnetism: Weak vs. strong, local vs. itinerant, Hubbard and Heisenberg models, spin wave theory, magnetic ordering, Kondo effect
Other: Linear response theory, Fermi liquid theory (time permitting)

There will be about four assignments and a take-home final examination. I will be following my own notes, which are available from the course web site.

0.1 References

- D. Feng and G. Jin, Introduction to Condensed Matter Physics (I)
(World Scientific, Singapore, 2005)
New and with a distinctly modern flavor and set of topics. Looks good.

- N, Ashcroft and N. D. Mermin, *Solid State Physics*
(Saunders College Press, Philadelphia, 1976)
Beautifully written, this classic text is still one of the best comprehensive guides.

- M. Marder, *Condensed Matter Physics*
(John Wiley & Sons, New York, 2000)
A thorough and advanced level treatment of transport theory in gases, metals, semiconductors, insulators, and superconductors.

- D. Pines, *Elementary Excitations in Solids*
(Perseus, New York, 1999)
An advanced level text on the quantum theory of solids, treating phonons, electrons, plasmons, and photons.

- P. L. Taylor and O. Heinonen, *A Quantum Approach to Condensed Matter Physics*
(Cambridge University Press, New York, 2002)
A modern, intermediate level treatment of the quantum theory of solids.

- J. M. Ziman, Principles of the Theory of Solids
(Cambridge University Press, New York, 1979).
A classic text on solid state physics. Very readable.

- C. Kittel, *Quantum Theory of Solids*
  (John Wiley & Sons, New York, 1963)
  A graduate level text with several detailed derivations.

- H. Smith and H. H. Jensen, *Transport Phenomena*
  (Oxford University Press, New York, 1989).
  A detailed and lucid account of transport theory in gases, liquids, and solids, both classical and quantum.

- J. Imry, *Introduction to Mesoscopic Physics*
  (Oxford University Press, New York, 1997)

- D. Ferry and S. M. Goodnick, Transport in Nanostructures
  (Cambdridge University Press, New York, 1999)

- S. Datta, Electronic Transport in Mesoscopic Systems
  (Cambridge University Press, New York, 1997)

- M. Janssen, *Fluctuations and Localization*
  (World Scientific, Singapore, 2001)

- A. Auerbach, *Interacting Electrons and Quantum Magnetism*
  (Springer-Verlag, New York, 1994)

- N. Spaldin, *Magnetic Materials*
  (Cambridge University Press, New York, 2003)

- A. C. Hewson, *The Kondo Problem to Heavy Fermions*
  (Springer-Verlag, New York, 2001)