**Ph 135 – introduction to Condensed matter physics.**

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**Class meeting times:** TR 1-2:30pm 107 Downs.

**Topics by week (roughly):**

1. Free electrons review: Fermi sea, DOS, Sommerfeld expansion, susceptibility and heat capacity.

2. Transport: Boltzmann theory, Drude law, linear response (AM chapter 1), Kubo formula

3. Phonons and phonon scattering

4. Quantum mechanics of electrons on a lattice: Bloch Theorem, tight binding models (Wannier functions), lattice symmetries.

5. Landauer-Buttiker formalism.

6. Semiconductors: Doping, diodes, and maybe transistors.

7. Spin-orbit coupling.

8. Berry phase.

9. Semi-classical transport.

10. Topological insulators.

**Textbook:**

I will partially follow Ashcroft and Mermin, Solid State Physics. Class notes will be provided.

**Grading:**

50% homework, 50% final.

**Learning results expectations:**

Students will acquire tools for predicting the transport and thermal behavior of non-interacting fermionic systems. Also, students will obtain a grasp of topological phases of non-interacting electrons.