

Condensed Matter Physics 171.405 and 171.621

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Textbook: N.W. Ashcroft and N.D. Mermin, *Solid State Physics*, Thomson Learning (1976).

Class meets on Thursdays and Fridays 10:30–12 in 361 Bloomberg.

Office hours: Thursday 1–3 or by appointment.

Grade: 66% homework, 33% oral presentation.

Homework is handed out on Friday in class and is due in class the next Friday. Homeworks turned in t days after the deadline are given partial credit with the weight $\exp(-t/T)$, where $T = 7$ days.

Oral presentations: At the end of the semester each student will make a 20-minute presentation on a topic in contemporary physics of condensed matter. The main subject of your presentation must be a recent (within the last 10 years) experimental work in condensed matter. A good starting point is the *News and views* section of the journal *Nature*, which is available online.

Prerequisites: undergraduate Quantum Mechanics (171.304).

Covered topics:

Crystalline solids. Crystal lattices. Reciprocal lattice. Scattering of waves in crystals. Crystal symmetries. Classification of crystalline solids. Vibrations in crystals.

Metals. Drude and Sommerfeld models of electron motion. Bloch's theorem. Electronic energy bands. Semiclassical dynamics of electrons and transport phenomena. Fermi surfaces in metals.

Semiconductors. Intrinsic semiconductors. Doped semiconductors. $p - n$ junctions.

Magnets. Paramagnetics and diamagnetics. Ferromagnetics. Phase transitions and critical phenomena in magnets.