Solid State Physics 3715 Fall 2024 David Snoke

Office: G-10 Allen Hall
Class times: Monday and Wednesday 11:00 AM to 12:15 PM
Office hours: Wednesday and Friday, 12:30 to 2:00 PM. It is best to make an appointment: email is the best way to contact me.
Email: snoke@pitt.edu

Textbook: Snoke, *Solid State Physics,* 2nd edition (Cambridge University Press).
Errata are posted at www.phyast.pitt.edu/~snoke and on the Canvas site.

Other resources:
Many homework problems will use Mathematica. You should get this program and install it on your own computer and learn it. If you prefer, you can use another equivalent program, but solutions will be given in Mathematica code.

I often will use Zoom to share multimedia, so bringing a laptop to class is a recommended.
The Zoom address for the class is https://pitt.zoom.us/j/6932782570

Schedule:

Aug 26, 28	Sections 1.1-1.5 Electron bands, Kronig-Penny model, Bloch theorem
Sept 4	Sections 1.7-1.8, 1.9.1, 1.9.2 Density of states, tight-binding model
Sept 9, 11	Section 1.9.3, 1.9.4 Nearly-free electron model, k·p model
Sept 16, 18	Sections 1.11, 1.12, 1.13 Chemical bonds, surface states, spin-orbit effects in bands
Sept 23, 25	Sections 2.1-1.4, 2.5.1-2.5.3 Carriers in metal and semiconductors, doping
Sept 30, Oct 2	Sections 2.6-2.9 Band bending, transistors, quantum Hall effects
Oct 7, 9	Sections 3.1, 3.3-3.4, 3.6-3.7 Classical anisotropic waves, electro-optics, piezoelectrics
Oct 16	MIDTERM on chapters 1 and 2
Oct 21, 23	Sections 4.1-4.7 Second quantization: phonons and photons
Oct 28, 30	Sections 4.9-4.10 Heat capacity, Sommerfeld expansion, thermal motion
Nov 4, 6	Sections 5.1.1, 5.1.4, 5.2.1 Quasiparticle interactions
Nov 11, 13	Sections 5.4, 5.6-5.8 Thermal expansion, heat flow, resistivity, diffusion
Nov 18, 20	Sections 7.1, 7.5.1, 7.5.2, 7.6, 7.8 Elements of light-matter interaction
Nov 25, 27	*THANKSGIVING BREAK

Dec 2, 4	Sections 11.1-11.4, 11.7 Introduction to superfluids and superconductors
Dec 9	Sections 11.8-11.11 Elements of superconductivity
Dec 11-13	Final Exam

Grade distribution:
Homework: 40%
Special topic paper: 15%
Midterm exam: 20%
Final exam: 25%

A special topic paper (~5 pages, 3000 words) will be assigned toward the end of the semester; instructions on this paper will be given at that time. If you have a preferred topic to write about, please clear this with me well in advance.