

CORNELL UNIVERSITY  
AEP 4500/Phys 4454  
Solid State Physics  
Fall 2022

Instructor: David Muller [dm24@cornell.edu](mailto:dm24@cornell.edu)  
Office hours: to be arranged

Teaching Assistant: TBD  
Office hours: to be arranged

Grader: TBD  
Office hours: to be arranged

Lectures: 9:40am - 10:55am TR Clark 294D  
Section: 3:45pm - 4:35pm R Rock 112

We will also use Discord, for students who prefer an online forum to ask and answer questions

Texts: The primary text for the class is *Solid State Physics* by Ashcroft and Mermin. It is very rigorous with footnotes to footnotes in an appendix to an appendix. A scanned version of this book should be available electronically through the campus store program. For quicker explanations, a shorter, more handway book is *Solid State Physics* by Kittel. For a Cliff Notes version (and a more modern notation) you can supplement your reading with *The Oxford Solid State Basics* by Steve Simon (\$43 paperback on Amazon). PDF version (with more errors) from Steve's website at

<http://www-thphys.physics.ox.ac.uk/people/SteveSimon/condmat2012/LectureNotes2012.pdf>

This book can be very brief in some of its derivations.

Problem Sets: Problem sets will be assigned each week (generally on Fridays), and will be due one week later. Problem sets should be turned in through the Canvas website.

Later homeworks will include a project in simulating materials properties using Density Function Theory

Exams: There a midterm exam and a final exam

Approximate weighting for the course grade:	Problem sets	40%
	Midterm exam	30%
	Final exam	30%

#### Goals of the Course

- basic understanding of electron states and vibrational modes in solids
- understanding of physical properties that arise from those states
- introduction to some subjects that are in current research

Subject	Chapter in Simon	Chapter in Kittel	Chapter in A&M
Crystal structures	12	1	4
Diffraction, reciprocal lattice	13,14	2,3	5,6
Lattice vibrations, phonons	1,8-10	4,5	22,23
Free-electron models	3,4	6,7	1,2,3
Energy bands, Fermi surfaces	15,16	7,9	8,9
Electron dynamics	17	6	12
Semiconductors	16,17	8	28,29
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Dielectric, optical properties	16	10,11,13	27
Magnetism	19-21	14,15	31,33
Defects	21	18,20	30

### Academic Policy and Code of Conduct

This instructor respects and upholds University policies and regulations pertaining to the observation of religious holidays; assistance available to the physically handicapped, visually and/or hearing impaired student; plagiarism; sexual harassment; and racial or ethnic discrimination. All students are advised to become familiar with the respective University regulations and are encouraged to bring any questions or concerns to the attention of the instructor.

*Students with disabilities:* In compliance with the Cornell University policy and equal access laws, I am available to discuss appropriate academic accommodations that may be required for students with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except in unusual circumstances, so that arrangements can be made. Students are encouraged to register with Student Disability Services to verify their eligibility for appropriate accommodations.

*Academic Integrity:* All the work you submit in this course must have been written for this course and not another and must originate with you in form and content with all contributory sources *fully and specifically acknowledged*. Make yourself familiar with Cornell's Academic Integrity Code, available online at: <http://cuinfo.cornell.edu/Academic/AIC.html>. The code, together with a guide to *Acknowledging the Work of Others*, can be downloaded from: [http://theuniversityfaculty.cornell.edu/policies/pol\\_main.html](http://theuniversityfaculty.cornell.edu/policies/pol_main.html). In this course, the normal penalty for a violation of the code is an "F" for the term.