Physics 155 2007 Winter Quarter
Solid State Physics (aka Condensed Matter Physics)
ISB 231, MW 2:00-3:45pm

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Course website: http://physics.ucsc.edu/~gweon/teaching/07q1-phys155/

Text: Solid State Physics, by J. R. Hook and H. E. Hall

References (NOT recommended for purchase):
Introduction to Solid State Physics, by C. Kittel
Principles of Condensed Matter Physics, by P. M. Chaikin, T. C. Lubensky
Solid State Physics, by Ashcroft and Mermin

Solid state physics concerns quantum mechanics realized in our ordinary world, and is built on two fundamental theoretical frameworks. On one hand, a large part of solid state physics is built on a quantum mechanical description of a particle in a periodic potential. Formulating and understanding this beautiful problem made one of the main contributions to the foundation of quantum mechanics, and underlies most of our understanding of modern solid state devices. On the other hand, a solid contains a collection of very many particles, and novel and exotic states, e.g. magnetism and superconductivity, occur due to interactions between particles. Thus understanding these "emergent phenomena" is also of crucial importance in solid state physics, as well as for present and future technology. Furthermore, many researchers see that this understanding has far-reaching influences to our general understanding of the world, ranging from fundamental particles to sociology. This course will cover very basic concepts of solid state physics from these two important perspectives, with an emphasis made, when possible, on simple connections to contemporary activities, which will be particularly emphasized in lectures near the end. A tentative plan for the course is the following.

Week	Lecture #	Date	Topic	Reading
1	1	Jan 8	Crystal Structure	1.1-1.3
	2	Jan 10	Crystal Structure	1.4-1.6
2	3	Jan 17	Crystal Dynamics	2.1-2.5
3	4	Jan 22	Crystal Dynamics	2.6-2.8
	5	Jan 24	Electrons in Uniform Potential	3.1-3.3
4	6	Jan 29	Electrons in Periodic Potential	4.1-4.2
	7	Jan 31	Electrons in Periodic Potential	4.3-4.4
5	8	Feb 5	Semiconductors	5.1-5.3
	9	Feb 7	Semiconductors	5.4-5.6
6	10	Feb 12	Midterm Exam	
	11	Feb 14	Waves in Crystal	11.1-11.4
7	12	Feb 21	Waves in Crystal	12.1-12.6
8	13	Feb 26	Magnetism	7.1-7.3
	14	Feb 28	Magnetism	8.1-8.4,8.7
9	15	Mar 5	Superconductivity	10.1-10.3
	16	Mar 7	Superconductivity	10.4-10.6
10	17	Mar 12	Nano-scale phenomena	
	18	Mar 14	Non-crystalline Matters, Liquid Crystals	

Hours:

Lecture 2:00 – 3:45 pm, M/W
Office hours 3:45 – 4:45 pm, M/W, or any time by appointment

Exam dates:

Midterm – Feb 12; hours to be determined
Final – Mar 19-22; to be determined

Grading Policy:

- Homework, 30 %
- Midterm, 30 %
- Final (Presentation and its summary submitted), 30 %
- Quiz, 10 %

Classroom excellence, but not the lack thereof, may be considered for bumping up the grade for borderline cases, should it be necessary.

Homework:

Handed out every two lectures or so (i.e. total of about 8), and due in one week thereafter.
Will accept late homework, but homework score will be multiplied by 0.8 for up to one week late homework, 0.6 for up to two week late homework, and 0.4 afterwards.
No homework will be accepted after Mar 18.

Absenteeism:

Absence from class will not affect the grade, as long as it is notified by email before class. For every second absence without prior notification, a global scale-down factor of 0.9 will be accumulated. For example, if 4 or 5 classes are missed without notification, then the total score will be multiplied by 0.81=0.9x0.9, before assigning the grade.

Active Learning Policy:

Learning comes mostly from discussions, hard thinking and "getting it," not from listening to boring or demanding lectures. Finally, talking about one's knowledge and presenting it really solidify/test it.
In this spirit, lectures in this class will be structured as follows.

- Formulation of questions – 10 minutes
- Student group discussions with instructor help – 30 minutes
- 5 minute break
- Presentation by a group, plus discussions – 30 minutes
- Closing lecture by the instructor – 30 minutes

The emphasis in this format is **discussions and really "getting it."** Also, it should be fun and memorable!
It is not to test you. There will be no performance measurement in class.
As you can see, it would be ideal if you read chapters before each class. You can also continue to "group-read" in the 2nd part (student group discussion) of the class.

Lecture Notes:

The instructor's lecture notes will be available.

Final Words:

Wonder out-loud. While this is an introductory course, the subject is very contemporary, lively, and therefore advanced. There is a very short distance between what we know and what we do not know. Therefore, don't be afraid to ask any questions and question any answers.
Also, I am all for giving everyone a good grade. *My goal is to help everyone **be successful** in this class!*