

# Physics 518, Spring 2007

**Instructor:** Prof. A.T. Charlie Johnson, Jr.

**Office:** 2N13D, DRL

**Telephone:** 898-9325

**Email:** cjohnson@physics.upenn.edu. Email is a great way to contact me.

**Office Hours:** Tuesday/Thursday 9.30-11 or by appointment. Thursday is also my office hour for Undergraduate Chair issues, so Tuesday is preferred for Phys 518 issues. (But you can still come Thursday!)

**Textbook:** **Solid State Physics**. Ashcroft and Mermin. (Saunders College, 1976). A standard reference written at moderately high level. Lectures will draw from here but also Kittel (see below).

## Other Texts:

**Introduction to Solid State Physics**, Kittel, 8<sup>TH</sup> Edition (Wiley, 2005). Another standard text that is sometimes terse in its discussion. Good presentation of experimental data. If you are planning to continue in Condensed Matter Physics, this is an excellent book to buy and keep as general reference.

**Principles of the Theory of Solids**, Ziman (Cambridge 1972). A very nice book with clear explanations of many topics, some not found in other introductory texts. Slightly more advanced than Ashcroft and Mermin. Also worth buying (and available in paperback).

**It is definitely useful to consult multiple texts.** A different presentation of the same topic can be very helpful in clearing up confusion.

**Homework:** There will be homework assignments roughly every 2 weeks. They will be difficult in order to help you master the material. You should get started early!! You can work together if you like but everyone must hand in their own HW solutions. You must learn how to do all the problems because the midterm and final exams will consist of problems that are related to the homework.

**Grades:** Problem Sets 50%. Midterm 25%. Final exam 25%.

**WWW:** The course has a BlackBoard web site. You will find general course information, this handout, and homework assignments and solutions.

## Tentative Course Outline

- I. **Atoms and Crystal Binding (A&M 19,20; Kittel Ch 3)**
- II. **Crystal lattices, Reciprocal lattice and Diffraction. (A&M 4 – 7, Kittel Ch 2, 3)**
- III. **Lattice Vibrations (A&M 21 – 24 Kittel Ch 4, 5)**
- IV. **Somerfeld and Drude Theory of Metals (A&M 1 -3, Kittel Ch 6)**
- V. **Band Theory of Metals and Insulators (A&M 8 – 13, Kittel Ch 7)**
- VI. **Semiconductors (A&M 28- 30, Kittel)**
- VII. **Superconductivity (A&M 34, Kittel)**
- VIII. **Magnetism & Nanostructures (A&M 31 – 33, Kittel )**