# PHYS 122: Reading Assignment Cycle 2

**Monday, February 08, 2009**

**Reading assignment:**

Here are the associated reading for Cycle 2 from *Physics for Scientists and Engineers* Third Edition, Volume 2 by Ohanian and Markert. I've organized these by Week instead of lecture since I might re-arrange the order they are covered in class, slightly:

**I strongly recommend that you complete each reading assignment prior to the associated lecture.** The lectures will be presented under the assumption that you have already read the assigned text.

**Week 5: Starting Feb 9th:**

- Read **Chapter 23** as follows:
  - **Review Section 23.1**. This should be clear to you.
  - **Read carefully Section 23.2**. Be sure that you understand in particular the worked "Example 5" on pages 730 to 731 (quite handy for dealing with your homework!) Make sure you understand Example 6 (which we did in lecture). Make sure you understand Example 7.
  - **Review Section 23.3**. In particular, look carefully again at the field line diagrams on page 737-738 and make sure that you can "explain" them. Also be sure that you can correctly answer the "Checkup" questions at the bottom of page 739.
  - **Review Section 23.4** Be sure you understand Example 8.
  - **Skip Section 23.5** We'll come back for the dipole in Cycle 3.
- Read **Chapter 24** as follows:
  - **Read Carefully Section 24.1**. The concept of *flux* is perhaps the most important idea of the whole course. Note that although flux is *defined* as an integral, our conceptual idea of flux involves field lines and surfaces. Our aim always is to evaluate the flux without actually calculating any integrals. This is a *conceptual* point not a *technical* one.
  - **Read Carefully Section 24.2**. Gauss' Law only applies with regards to a *closed surface*. The surface is *imaginary* in the sense that it does not need to correspond to anything physical.
  - **Read Carefully Section 24.3**. Quite simply, this section is the heart of the entire course. The application of Gauss' Law is to Physics 122 as the application of Newton's Second Law was to Physics 121. You *must* be able to work problems applying Gauss' Law in each of three characteristic symmetries: (1) spherical, (2) cylindrical, and (3) planar.

  - **Review Section 24.4**. Cycle 1 was all about superposition. Cycle 2 is all about Gauss' Law.
  - **Read Section 24.5**. In particular concentrate on the application of Gauss' Law to conductors as in Examples 11 and 12.

- Read parts of **Chapter 25** as follows:
  - **Review Section 25.1** Don't forget: Voltage is not Force. Voltage is potential energy per unit charge.
  - **Read Carefully Section 25.2** Equation 25.25 is the "definition" of voltage, as far as I am concerned. If you can do Example 4 on page 799, you are in good shape. If you can do Example 5 on page 800 you are in great shape. Example 6 is "too hard".
  - **Read Section 25.3**. Key concept: the surface of a conductor is an equipotential. Make sure you understand Example 7. The field inside is zero but the voltage is *not* zero. It is *constant*. Right? Also make sure you understand the idea of "shielding".
  - **Read part of Section 25.4**. This will be helpful for the last homework problem. You will also want to use Gauss' Law. Stop reading at "Example 9".

**Week 6: Starting Feb 16th:**

- Read **Chapter 26** as follows:
  - **Read Section 26.1**. You need to know what a capacitor actually is. The example of an isolated sphere is not very practical. The example of the two plates is much more characteristic.
  - **Read Section 26.2**. These rules look like resistor rules but (surprisingly!) they go the other way: Capacitors in parallel add, capacitors in series "divide". Be sure you can explain why this is true.
  - **Skip Section 26.3**. We will do dielectrics in Cycle 3.
- Read **Chapter 27** as follows:
  - **Review sections 27.1, 27.2 and 27.4**. Skip Section 27.3 forever. Ohm does not really look like a happy guy on page 866, does he?
- Read **Chapter 28** as follows:
  - **Review Sections 28.1, and 28.2**. Please note that in class I will always use the term "Voltage" and I will never use the words "Electromotive Force" or "EMF" because this term gives the inaccurate impression that voltage is a kind of force.
  - **Read Carefully Sections 28.3 and 28.4**. You need to learn "KVL" and "KCL". These are two "general rules" that we can use to tackle even complicated circuits. I just wish the textbook would use the term "voltage" instead of "EMF". Together with specific rules for voltage sources, resistors, and capacitors, KVL and KCL allow you to determine the voltage and current in almost any "steady state" circuit diagram.

- **Review Section 28.5**. Power is current times voltage for any component.
- **Skim Section 28.7**. We will only "take a peek" at RC circuits this cycle. The key issue is that there is a "time constant" $\tau = RC$.
- **Read Section 28.8**. This information could save your life some day.

**Week 7: Starting Feb 23th:**

- Read **Chapter 29** as follows:
  - **Review Sections 29.1, 29.2 and also 29.5**. You need to know what Biot-Savart means, and how this is the magnetic analog to Coulomb's Law.
  - **Read Carefully Section 29.3**. Ampere's Law is to the magnetic field as Gauss' Law is to electric field. However, instead of a flux, we have a path integral on a loop. Be very sure you understand Example 5 on pages 940-941.
  - **Read Section 29.4**. Now you need to understand what a solenoid really is, and how we can use Ampere's Law to calculate the field inside a solenoid.
- Read **Chapter 30** as follows:
  - **Review Sections 30.1 and 30.2**.
- Read **Chapter 31** as follows:
  - **Review Section 31.1**. I say "induced voltage", not "EMF".
  - **Read Section 31.2**. Now you see more clearly what we mean by "Faraday's Law".
  - **Read Section 31.3**. Lenz' "little trick" is not really a "Law".
  - **Read Carefully Section 31.4**. You need to understand what an "inductor" is. Note that it is conceptually analogous to a capacitor.
  - **Read Section 31.5**. Power.
  - **Skim Section 31.6**. Key concept: the time constant of an RL circuit is $\tau = L/R$.