Astronomy 16 – Modern Astrophysics
Fall 2014
Week 8

We'll keep this short this week; but refer back to last week's reading assignment for specific topics to focus on as you read/review.

Topics:

The Hertzprung-Russell diagram (HRD)
The magnitude system, include the color index
Binary stars and stellar masses

Reading:

For much of Tuesday's class, we'll be discussing the Hertzsprung-Russell diagram (14.4). You'll want to review the line-broadening and luminosity class relationship in sec. 14.3, too. And we'll be discussing the magnitude system, which is simply a particular way of discussing flux and luminosity (and thus distance). Note that two of your three homework problems involve magnitudes. That material is near the beginning of Ch. 13.

> *From last week*: You've already read 13.1 (parallax) and the first part of 13.2 (inverse square law). You can review this material and then start reading new material at the bottom of p. 310 (the magnitude system) and continue on through the end of sec. 13.4 (p. 321).

For the rest of this week, read through the end of Ch. 13, which is about binary stars and stellar masses.

Important concepts and related facts to keep in mind as you re-read, and make sure you can answer while/after you've done the reading. We will discuss all of these in class this week.

From last week:

Once again, can you explain the physics behind the trends of hydrogen Balmer absorption line strength vs. stellar surface temperature based on basic LTE physics?

Can you explain the physics behind the luminosity class designation? All else being equal, will a star with a bigger radius have broader or narrower absorption lines in its spectrum?

Looking at the HR diagram (HRD), how can you figure out the radius of a star that's plotted on it? Where in the HRD are the super-giants? And where are the smallest stars (white dwarfs)?

What information, aside from the measured flux, do you need to figure out the apparent magnitude of a star? What about the absolute magnitude? Do you see how the distance modulus (eq. 13.22) is really just an expression of the inverse square law?

The color index, such as B – V, is really the ratio function for the Planck function problem on the last homework. Can you explain how the *difference* between two measured magnitudes in two different filters corresponds to the *ratio* of the Planck function evaluated at two different wavelengths?

New for this week: What different types of binary stars are there? What can and can't we observe for each type? And what trends are found among the major observable properties of (most) stars?