AST 252/352: Stellar Astrophysics Fall 2009

MWF 2:10-3pm
Stevenson 6638
August 26 – December 9

Professor Andreas Berlind
Office: Stevenson 6916
Phone: 615-343-2184
Email: a.berlind@vanderbilt.edu
Office hours: TTh 1-2pm

Course website: http://people.vanderbilt.edu/~a.berlind/teaching/252_fa09/

Textbooks

The main textbook for this course is:
"Stellar Interiors" by Hansen, Kawaler, & Trimble (Springer - second edition)

Other classic textbooks:
"Stellar Structure and Evolution" by Kippenhahn & Weigert (Springer).
"Principles of Stellar Evolution and Nucleosynthesis" by Clayton (Chicago Press)

Topics Covered

(not a complete list and in no particular order):
Equations of stellar structure
Observations of stellar properties
Virial Theorem and timescales
Equations of state
Nuclear reactions
Heat transfer by radiation, conduction, and convection
Opacity sources
Stellar evolution
Stellar models

Course Reqirements

Reading

There will be weekly reading from the main textbook and occasionally from journal review articles. The assigned readings will be posted on the website.

Problem Sets

There will be occasional (roughly bi-weekly) problem sets. These will contain both pencil and paper problems, and sometimes assignments that require using a computer. I will assume that you can program in your favorite language and that you are or can become familiar with a basic plotting package. This course is not meant to be

competitive; you are welcome to collaborate with other students on any problems, as long as the final presentation is your own.

Final Project
There will be a final project in place of an exam. The project will involve building your own stellar structure computer model from scratch. The model will compute the density, temperature, luminosity, etc. as a function of radius within stars of various masses. This project will teach you how the various physical processes we will learn about during the course affect the physical characteristics of a star like the sun. As an aside, the project will also teach you how to numerically solve differential equations.

Undergraduates only: Exam option
Undergraduate students have the option of taking a take-home final exam in place of the final project if they so choose.

Grading

Grading will be 50% based on the problem sets and 50% on the final project or exam. The lowest problem set grade will be dropped.