
AST 252/352: Stellar Astrophysics

Fall 2010

MWF 2:10-3pm
Stevenson 6638
August 25 – December 8

Professor Andreas Berlind
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Office hours: by appointment

Course website: http://people.vanderbilt.edu/~a.berlind/teaching/252_fa10/

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 Requirements

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.

Attendance

Attendance is required because much of the course material is not covered in the textbook so you cannot just miss a class and learn the material on your own. You can miss up to three classes without penalty. After that, missed classes will affect your course grade.

Grading

Grading will be 50% based on the problem sets and 50% on the final project or exam (assuming the attendance requirement is met). The lowest problem set grade will be dropped.