ASTR 606 Stellar Structure & Evolution

Syllabus, Fall 2013

M-W 2:00-3:15 CSS 0201

Professor: Drake Deming (office: CSS 2331)

Office Hours: Tu-Th, 3:30-5:00, or by appointment

Required text: "Stellar Interiors: physical principles, structure and evolution" by Hansen, Kawaler, & Trimble, 2nd edition, Springer-Verlag.

There will be required reading of journal articles and review papers, to be assigned in class.

Other useful references:

"Stellar Structure & Evolution" by Kippenhahn & Weigert, 3rd edition, Springer-Verlag.

"Principles of Stellar Evolution & Nucleosynthesis" by Donald Clayton, 1983 edition, Univ. of Chicago Press.

"Radiative Processes in Astrophysics," by Rybicki & Lightman, 1979, John Wiley & Sons.

"Stellar Atmospheres," by Dimitri Mihalas, 1978, W. H. Freeman

"An Introduction to the Study of Stellar Structure," by S. Chandrasekhar, 1967, Dover.

Tentative Schedule of Topics

Sep 04 Review of radiative transfer
09 LTE and NLTE
11 Hydrostatic equilibrium & the gray atmosphere
16 Flux-constant model atmospheres; atmospheric opacities and emergent spectra
18 Equations of stellar structure; virial theorem
23 Simple interior models; homology
25 Polytropes and the Lane-Emden equation
30 Stellar evolution before and on the main sequence
Oct 02 Thermodynamics of stellar interiors
07 MID-TERM EXAM I
09 Degenerate & Non-degenerate equations of state
14 Energy transport by radiation
16 Energy transport by convection
21 Opacities
23 Nuclear reactions; p-p chain

28 CNO-cycle and subsequent reactions
30 Late Evolution of low- and intermediate-mass stars; S-process
Nov 04 Cooling of white dwarfs
06 Evolution of Massive stars
11 MID-TERM EXAM II
13 Supernovae
18 Helio- and Asteroseismology
20 Pulsating stars
25 Rotation and stellar activity
27 Mass transfer in binaries
Dec 02 Nuclear equation of state
04 Neutron stars and black holes
09 Special topic (TBD)
11 REVIEW

FINAL EXAM: Dec 19, 1:30-3:30

Grades in the course will be determined by this weighting: Mid-term exams each 20%, Final exam 30%, homework 20%, class participation 10%. I guarantee you will receive a grade *at least* this good, for the following percentages of total points:

> 90% A
> 75% B
> 60% C
> 50% D

There will be homework problem sets during the semester, handed out usually on mondays, due about one week later (the due date will be clearly marked on each problem set). If, for whatever reason, the University is officially closed (e.g., snowstorms) on the due date for an assignment, the due date will be moved to the next lecture. If a student has a planned absence for an academic or other valid reason (including religious holidays), homeworks must be handed in before the due date by the student, or brought to class on the due date on behalf of the absent student. In the case of absence due to illness on the date a homework assigment is due, it must be handed in as soon as the student returns to class. Per University policy, a self-signed note attesting to the date of illness must be submitted by the student following an absence from a single lecture. University policy requires that medically-necessary multiple (consecutive or non- consecutive) absences for a prolonged illness must be documented by the Health Center or an outside health care provider, verifying the dates of treatment and the time period during which the student was unable to meet academic responsibilities. Following any absences, students are responsible for obtaining class notes and any new assigments. Students who are unable to attend an exam due to illness must contact the instructor on or before the exam date, and supply written documentation from the Health Center or an outside health care

provider. At the discretion of the instructor, students who miss an exam due to illness must take either a written or oral make-up exam.

University regulations regarding academic integrity apply to all work performed for credit in this course. Particulars regarding the University policy on academic integrity, including the Honor Pledge, are provided at:

http://www.studentconduct.umd.edu/Info/Students/Default.aspx

The University's Code of Academic Integrity is administered by the Student Honor Council, and as a student you are responsible for upholding these standards for this course. The rules regarding academic integrity apply to homeworks as well as to exams. As a part of these rules, you must give credit to any book (including the course textbook), published article, or web page that you use in completing a particular assignment (except for the case of the biography questions). These rules also apply to unpublished sources of information. In particular, students are encouraged to discuss assignments and other class material with each other and with more senior students, but copying or paraphrasing from other students' written solutions is not permitted; all written work must be a student's own.