SYLLABUS: ASTRONOMY 8100

STELLAR STRUCTURE AND EVOLUTION

SPRING 2006

Prof. Paul J. Wiita

Timings: Tuesdays and Thursdays, 1:00PM–2:50 PM, including a 10 minute break.

The first class meets THURSDAY 12 January 2006. I will be at the AAS meeting on 10 January and will also not be able to cover the two classes the following week (1/17 and 1/19) because I will be lecturing in Korea. We will make up at least two of those three missed classes on the rare Fridays I will be in Atlanta – most likely Friday mornings from 10:10 to noon.

Room: 732 One Park Place (not GCB 521 as listed in GoSOLAR)

My Contacts: **Office:** Rm. 715 One Park Place

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Office Hours: Mondays 10:30 – 11:30 AM, Tuesdays 11:00 AM – noon, Wednesdays 10:00–11:00 and **by appointment.** Usually I will be available at other times when I'm not teaching (note that I have an Astr 1020 class from 9:30 to 10:45 on Tuesdays and Thursdays), but if my office door is closed it means that either I'm out or I do not want to be disturbed.

Required Text: R. Kippenhahn & A. Weigert, **Stellar Structure and Evolution**

Supplementary texts: Martin Schwarzschild, **The Structure and Evolution of the Stars**; Stuart Shapiro & Saul Teukolsky, **Black Holes, White Dwarfs & Neutron Stars**

Other Useful Books: Meadows, A., **Stellar Evolution**; Chandrasekhar, S., **Stellar Structure**; Clayton, Donald D., **Principles of Stellar Evolution and Nucleosynthesis**

As of the time I write this, it appears that all full-time supported students can get this book given (or at least loaned) to them by the Department as part of our "core course" text program. So, don't buy the book unless you hear otherwise. If you can borrow one from a more senior student before the official copies arrive, I would suggest you do so. If necessary, I'll copy some of the material in the interim.

This main text is very nice, and rather comprehensive, despite being relatively thin. Its major drawback is a lack of problems. While Schwarzschild's book is not absolutely required, it is a classic which all astronomers should have in their libraries; it has the added attraction of being quite inexpensive. The lectures will not usually follow the main text, nor will we be able to cover all of the material in the text. You are expected to read the relevant portions of the text in conjunction with the lectures. Some specific readings of material that will not be covered in class will be given as parts of your assignments.

Note that this is a 4 Semester Hour course and combines what had previously been taught as two separate quarter courses on Stellar Structure (Astr 800) and Stellar Evolution (Astr 815). You should therefore expect to work somewhat harder in this course than you would in a 3 SH 8000-level Astronomy course.

TOPIC	**$\approx$ # of Lectures**
Review of Stellar Classification & Binary Stars	1
Review of Thermodynamics & Equations of State	2
Basic Equations and Numerical Techniques	2
Review of Hydrostatic Equilibrium & Polytropic Models	1
Nuclear Energy Generation	2
Energy Transport	2
Homology Relations and the Main Sequences	1
Pulsating Stars	1
Midterm Examination	**March 2nd**
NO CLASSES, 7 & 9 March	SPRING BREAK
During qualifying exams a class may be cancelled or postponed.	.
Rotating Stars	1
Pre-Main Sequence Evolution	2
Main-Sequence Evolution & Hyashi tracks	2
Post-MS Evolution to Red Giants	2
Physics of White Dwarfs	1
Basic General Relativity	1
Dense Nuclear Matter	1
Neutron Stars and Pulsars	2
Student Reports; **Term Papers due, April 18th**	2
Black Holes	2
Take Home Final Exam Due	**Monday, May 1st, at 10:00 AM**

March 3rd is the last day to withdraw and still receive a grade of W.

Of course, **the above syllabus may be modified if necessary.**

GRADES will be based on performance on examinations, assignments, and projects.

The take-home comprehensive final will count for 35% of your grade, while the in-class midterm (closed book and closed-notes) will comprise 20% of it. Several assignments will together account for 30%.

A talk (if we have time) and a paper (definitely required, and due the beginning of the next-to-last week of class) on a special topic will contribute the remaining 15%. Assuming no more than 8 people finally register (currently there are 5, plus one Auditor and I expect at least one more) there will be one ~12 page observational paper (and, we hope, ~20 minute talk) on each of the four following topics, and one theoretical paper (& talk) on most of them: 1) rotating stars; 2) pulsating starts; 3) the upper mass limit for main sequence stars; 4) the lower mass limit for the MS and brown dwarfs. If more than 8 people register, [an] additional topic(s) will be added. Class participation will be taken into (marginal) consideration. Note that the penultimate week of class has been reserved for these student presentations, but if we fall too far behind schedule we may have to shorten or even eliminate them.

Students are expected to understand and abide by the Policy on Academic Honesty. In particular, this means no collaboration on assignments is allowed with current or former students unless specifically authorized in a specific situation. Questions should be addressed to me in the first instance. Obviously, collaboration is never allowed on exams.