SYLLABUS: ASTRONOMY 8100

STELLAR STRUCTURE AND EVOLUTION

SPRING 2004

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Timings: Tuesdays and Thursdays, 11:00 AM–12:40 PM*

First class meets Tuesday 13 January 2004.

Room: 732 One Park Place

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**

Only Kippenhahn and Weigert has been ordered by the University Bookstore, but it is temporarily out of stock and should only arrive during the week of Jan 20th. As of now, 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.

*Even though this course is officially scheduled from 11 AM through 12:40 PM, I expect to give a 10 minute break roughly half way through, but then will usually extend the class until ~12:50.

TOPIC	≈ # 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**
Rotating Stars	1
NO CLASSES, 9 & 11 March	SPRING BREAK
PROBABLY NO CLASSES, 16 & 18 March	QUALIFYING EXAMS
Pre-Main Sequence Evolution	2
Main-Sequence Evolution & Hyashi tracks	1
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 20th**	2
Black Holes	2
Take Home Final Exam Due	**Tuesday, May 4th, at 9:00 AM**

March 5th 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 the current enrollment of 7 people is maintained, 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 all but one of them: 1) rotating stars; 2) pulsating starts; 3) the upper mass limit for main sequence stars; 4) the lower mass limit and brown dwarfs. 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 or is allowed unless specifically authorized in a specific situation. Obviously, collaboration is never allowed on exams.