ASTROPHYSICS 514 Syllabus Spring 2023

Instructor: Adam Burrows; Text: No assigned text, but notes, lectures, and class supplements are provided

H ≡ homework due
Green: Makeup or Extra dates.

Date	Topic	Notes
Jan. 31	Overview of Stellar Structure and Evolution	Start learning MESA
Feb. 2	Stellar Timescales	
7	Equations of Stellar Structure	Generate evolutionary models with MESA
9	Scaling Relations	
14	Basic Energetics of Stars	
16 **H**	Polytropes	Next homework will in part use MESA
21	Basics of Radiative Transfer	
23	Thermodynamics	
28	Equations of State	
Mar. 2 **H**	Opacity	Homework uses MESA
7	Convection	
9	Hayashi Track	**MID-TERM PAPER due March 10**
11-19	*****Spring Recess*****	
21	Ignition Masses	
23 (**March 22?**)	Nuclear Masses and Energies	
28 **H**	Nuclear Reactions	
30	Nuclear Reactions II	
Apr. 4	Shell Burning	
6	Stages of Stellar Evolution	
11	Stages of Stellar Evolution II	
13 **H**	White Dwarfs	
18	Stellar Endpoints	
20	Nucleosynthesis (s-process)	
25	Nucleosynthesis II (r-process)	
27 **H**	Supernovae	
May 1	**—Reading Period Begins—**	
9	**—Reading Period Ends—**	
XXX?	**FINAL EXAM (Exam period May 12-18)**	

Some Recommended Supplementary texts (see also course webpage):

* **Principles of Stellar Evolution and Nucleosynthesis,** by D. Clayton (1983)
* **Supernovae and Nucleosynthesis,** by D. Arnett, Princeton University Press, 1996.
* **An Introduction to the Theory of Stellar Structure and Evolution,** by D. Prialnik, CUP 2000.
* **Stellar Interiors: Physical Principles, Structure, and Evolution,** by Hansen, C.J., Kawaler, S.D., and Trimble, V., Springer-Verlag 1994.
* **Stellar Structure and Evolution,** by Kippenhahn, R. and Weigert, A., Springer-Verlag 1990.
* **Structure and Evolution of the Stars,** by Schwarzschild, M., Dover paperback 1965; first published 1958.
* **An Introduction to the Study of Stellar Structure,** by S. Chandrasekar, Dover (1960).
* **Internal Constitution of the Stars,** by Eddington, A.S., Dover paperback 1950; first published 1926; re-issued by CUP in 1988.
* **Introduction to Stellar Astrophysics** (3 volumes), by E. Boehm Vitense, i.e.: Vol. 1. Basic Stellar Observations, and Vol. 3. Stellar Structure and Evolution, CUP 1989, 1992.
* **Black holes, white dwarfs, neutron stars,** by S.L. Shapiro, S. A. Teukolsky, 1983