Introduction to Stellar Physics

This course will provide an introduction to the physics of stars, including the basic theoretical understanding of how stars form and evolve, how they create chemical elements, and how they die. We will also discuss how we can test these theories by observations of stars in our own galaxy, the Milky Way, and in other galaxies.

We will discuss the structure of stars in some detail, particularly during the phase of evolution in which the Sun is currently. This will involve discussing the equation of state of stellar material, the equilibrium state and the transfer of radiation from the central regions to the surface.

We will follow the textbook's development of the subject, so start with an overview of the important concepts before deriving a detailed understanding. Given that this will be the only astrophysics course for many of you, I will start with a powerpoint slide show of galaxies and their stars to motivate the class.

Detailed lecture schedule is on the next page. Note that we will cover the material in Chapters 1-6 only (not chapter 7). The pace will be approximately a chapter per 1.5 weeks. I will supplement Chapter 5 (structure of main sequence stars) with notes on the structure of post-main sequence phases. I will also present material on the observations of individual stars in galaxies. I will also discuss supernova explosions, including their use in the detection of the apparent acceleration of the expansion of the Universe, and thus Dark Energy.

Date	Chapter	Topics
Tue Feb 1	–	Introduction
Thu Feb 3	1	BBN, gravitational collapse, equilibrium
Tue Feb 8	1	Star formation, The Sun, nucleosynthesis
Thu Feb 10	1 & 2	HR Diagram; The ideal gas: classical, quantum
Tue Feb 15	2	Electrons in the Sun, BB radiation
Thu Feb 17	2	Stellar classification, ionization states, Saha equation
Tue Feb 22	3	Heat transfer, opacity laws, diffusive equilibrium
Thu Feb 24	3	Temperature gradients, Convection
Tue Mar 1	3 & 4	Cooling of WDs; Intro Nucleosynthesis
Thu Mar 3	4	Nucleosynthesis, H-burning
Tue Mar 8	4	Nucleosynthesis, Solar neutrino problem
Thu Mar 10	4	Nucleosynthesis, advanced stages
Tue Mar 15	-	Review
Thu Mar 17	–	In-class midterm
Tue Mar 22	Spring Break	
Thu Mar 24	Spring Break	
Tue Mar 29	5	Structure of main sequence stars
Thu Mar 31	5	The Sun. Max and min masses of stars
Tue Apr 5	–	Scaling relations along the main sequence
Thu Apr 7	–	Post main sequence stages, red giants
Tue Apr 12	–	Post main sequence stages, horizontal branch
Thu Apr 14	–	Color-magnitude diagrams: clusters, solar neighborhood
Tue Apr 19	–	Color-magnitude diagrams: galaxies
Thu Apr 21	6	Endpoints of low mass stars
Tue Apr 26	6	Endpoints of massive stars
Thu Apr 28	-	Supernovae – core collapse
Tue May 3	-	Supernovae – Type Ia
Thu May 5	–	Review