ASTR 404
Introduction to Stellar Astrophysics
Spring 2018 Lectures
Elliott 161
Tuesdays, Wednesdays,
and Fridays 1:30pm-2:20pm

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This is a one-semester undergraduate course in stellar astrophysics. It will cover the following topics:

- Stars in the Universe: a general description
- Mechanical and thermal equilibria of stars: the virial theorem and main timescales
- The polytrope and zero-temperature model of white dwarfs
- Physical conditions in stellar interiors and the equation of state for stars
- Energy transport in stars by radiation, conduction, and convection
- Thermonuclear reactions in stars
- The major nuclear burning stages in stellar evolution
- The main evolutionary phases of stars
- Stellar nucleosynthesis
- On the importance of rotation, magnetic fields and binarity in the evolution of stars
- Novae and supernovae
- Asteroseismology

Making notes and participating in discussions in the class will be enough for successful completion of both homework assignments and computational work.

For additional reading on the stellar structure and evolution, the following textbooks are recommended, but not required:

"Evolution of Stars and Stellar Populations" by Maurizio Salaris and Santi Cassisi
"An Introduction to Stellar Astrophysics" by Francis LeBlanc
"Stellar Structure and Evolution" by R. Kippenhahn and A. Weigert
"Stellar Interiors - Physical Principles, Structure, and Evolution" by Carl J. Hansen, Steven D. Kawaler, and Virginia Trimble
"Principles of Stellar Structure" by Cox & Giuli
"Principles of Stellar Evolution and Nucleosynthesis" by D. D. Clayton

Assesment

The final assessment will be based on results of homework assignments (4-5 assignments per course with one- or two-week deadlines), midterm and final exams. Each assignment will contain a few problems intended to test how well the material from previous lectures is understood. The midterm and final exams will consist of a larger number of problems similar to those given in the homework assignments. The contributions to the final assessment will be 40% from the homework assignments and 30% for each of the exams.

Some computational work will be required in the homework assignments. Its details will be explained in the class. For computations of stellar evolution, the MESA stellar evolution code will be used. It can be found at `http://mesa.sourceforge.net/`.