

Syllabus for FRI Astronomy Stream: Exploring the Physics of the Universe with White Dwarf Stars

(<http://rocky.as.utexas.edu/~mikemon/FRI/ast2.html>)

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Class meetings:

Lecture: F 4–5pm, RLM 15.216A

Lab: Th 11am–5pm, RLM 16.234

The Course:

You will participate in an active and ongoing research project using white dwarf stars to study the nature of dark matter, cosmochronology, and measure physical constants to unprecedented precision. In this course we will go from the foundations of astronomy to the cutting edge of scientific research in astrophysics.

We will begin with an orientation to the field. We will explore time and build on our ability to measure it more accurately than any other physical quantity. We will work on developing a grasp of the major components of scientific investigation as applied to astrophysics: analytical theory, numerical and physical experiment, instrumentation, observation, data acquisition, reduction, analysis and interpretation. We will spiral through these areas as we go, developing skills and abilities as we deepen our understanding. Together we will identify your areas of interest and strengths in scientific investigation and build on these. Your paths through the course will be similar, but each path will be individually tailored to meet your needs and focus your strengths, filling in gaps in your understanding as we go.

Grades:

25% — participation and interaction

25% — notes and logbooks

50% — individual projects

Techniques:

time series observations and analysis, CCD data reduction, frequency and fourier analysis, plotting and analysis of data, mathematical modeling of pulsations, numerical simulations of crystallization and convection