

Course title:

INTRODUCTION TO ASTROPHYSICS

Duration [number of hours]: **24**

PhD Program [MERC/MPS/SPACE]: **SPACE**

Name and Contact details of unit organizer(s):

Prof: Guido Risaliti
Affiliation: University of Florence, Italy
Email: guido.risaliti@unifi.it

Course Description [max 150 words]:

The course describes the physical processes determining the inner structure of stars, including hydrostatic equilibrium, the equation of state of stellar matter, nuclear fusion, radiative and convective transport, the main mechanisms of interaction between radiation and matter. We will then discuss the main aspects of stellar evolution with a final brief treatment of the main properties of white dwarfs and neutron stars. Also, we will describe the most common techniques for measuring cosmic distances.

Syllabus:

1. Review of the main non-relativistic radiative processes relevant in astrophysics: emission from a moving charge.
2. Thomson scattering, free-free emission and absorption, photoelectric effect, bound-free absorption.
3. Fundamental equations of stellar structure. Polytropic Model. Equation of state in stars. Radiative transport, opacity. Convective transport, Schwarzschild criterion, mixing length theory. Energy production in stars, Gamow model. Production of heavy elements.
4. Stellar evolution: interpretation of evolutionary paths in the HR diagram. Properties and dimensions of white dwarfs. Properties of neutron stars. Pulsars: observational properties, rotating dipole model.
5. Determination of distances in Astrophysics.

Assessment:

To be defined

Suggested reading and online resources:

1. Lectures slides
2. Proposed literature references