Programs of the courses – Roma Tor Vergata – academic year 2017-2018

semester S3 Edition 7

compulsory courses

**Astrophysics Laboratory** *(Dr. L. Giovannelli)*
*Compulsory, 8 ECTS*

**Relativity and Cosmology 2** *(Prof. N. Vittorio)*
*Compulsory, 6 ECTS*
optional courses

**Astrobiology (Prof. A. Balbi, Prof. D. Billi)**
*Optional, 6 ECTS*

**Gravitational Lensing (Prof. P. Mazzotta)**
*Optional, 6 ECTS*

**Gravitational Waves (Prof. V. Fafone)**
*Optional, 6 ECTS*

**High Energy Astrophysics (Prof. G. Tavani – Prof. G. Israel)**
Introduction: history of X-ray and Gamma-ray astronomy; collimated vs. imaging instruments, angular, spectral and time resolution. Basics: emission mechanisms; degenerate stars (white dwarfs and neutron stars); black holes; accretion theory. Compact X-ray and Gamma ray sources: radio pulsars, X-ray binaries, isolated compact objects, magnetars. Brief introduction to high energy emission from non-degenerate stars, supernova remnants and galaxies of the local group. Gamma ray bursts.
*Optional, 6 ECTS*
Stellar Populations  (Prof. G. Bono)
I. THE DISCOVERY OF STELLAR POPULATIONS  1.1 Baade and the discovery of Galactic stellar populations 1.2 Kinematic and spectroscopic evidence  1.3 Oort’s Constants, and the Rotation of the Galaxy  2. FORMATION AND EVOLUTION OF THE GALAXY  2.1 Galaxy formation: semi-analytic models  2.2 Galaxy formation: numerical simulations  2.3 Dark matter and baryonic components  3. THE COSMOLOGICAL ABUNDANCES OF THE ELEMENTS 3.1 The Big Bang nucleosynthesis 3.2 Primordial helium content 3.3 Primordial lithium content 4. STAR FORMATION  4.1 Theory and observations 4.2 Population III stars  4.3 Initial mass function 4.4 Mass luminosity relation  5. GALACTIC COMPONENTS 5.1 The halo 5.2 The thin and the thick disk 5.3 The bulge 5.4 The center 6. STELLAR SYSTEMS 6.1 Open clusters and associations 6.2 Globular clusters 6.3 Abundance patterns and anticorrelations 7. STELLAR POPULATIONS IN LOCAL GROUP GALAXIES 7.1 Andromeda group 7.2 Dwarf irregulars 7.3 Dwarf spheroidals 8. STELLAR POPULATIONS IN LOCAL VOLUME GALAXIES 8.1 Virgo cluster 8.2 Ultra compact dwarfs 8.3 Dwarf ellipticals 8.4 Ellipticals 8.5 Galaxy bulges 9. UNRESOLVED STELLAR POPULATIONS 9.1 Population synthesis 9.2 Integrated spectra and colours  10. GALACTIC CHEMICAL EVOLUTION 10.1 Star Formation rate and SN rate 10.2 Stellar abundance gradients 10.3 Gas abundance gradients 10.4 alpha-element abundances 10.5 s and r-process elements 10.6 neutron capture elements Optional, 6 ECTS

Radiative Processes in Astrophysics  (Prof. P. Mazzotta)

Optional, 6 ECTS

Extragalactic Astrophysics (Prof. F. Vagnetti)

Compulsory, 6 ECTS

Italian as a foreign language

Optional, 3 ECTS