Master Imag2E : module "Relativistic astrophysics and cosmology"

■ Relativistic gravitation

Introduction to tensorial calculous. Space-times and gravitation. General relativity and geometrical gravity theories. The linearized theory and gravitational waves. The Schwarzschild's solution. Black holes.

■ Relativistic astrophysics and gravitational wave sources

Compact objects (white dwarfs, neutron stars, black holes, compact binaries,....). Gravitational emission. Sources and detectors. The future of GW astronomy

■ Emission mechanisms of cosmological sources

Thermal bremsstrahlung radiation. Blackbody radiation. Synchrotron radiation. Compton Scattering. Astrophysical examples: multi-wavelength emission of galaxies and galaxy clusters

■ Cosmological models

The homogeneous cosmological model : general framework and observational constraints, curved space and the Robertson-Walker metric, the redshift and the Hubble constant, the Einstein equations and the Friedman models, the thermal history of the universe, the cosmic time, the scale factor, the Mattig relation, distances and K correction. Galaxies : morphologies and properties, morphological classifications. Distance ladder

■ The inhomogeneous universe and structure formation

Observational aspects of the spatial distribution of matter : local and distant universe, characterization of structures, galaxy clusters, inter galactic medium, radiation backgrounds. Theory and models of structure formation : spherical collapse, Jeans' theory, linear instabilities, cold dark matter models, non-linear perturbations, Press-Schechter mass function

■ Observational constraints to cosmological models