

BELGRADE

S3

Spectroscopy of Astrophysical Plasmas

Content:

Plasma in different celestial objects - physical background. Collective process in plasma. Different radiation mechanisms of astrophysical plasma. Stellar and interstellar plasma. Plasma in extragalactic objects. Spectroscopical methods and tools for investigation of astrophysical plasma.

Compulsory, 6 ECTS

Physics of Gaseous Nebulae and Active Galactic Nuclei

Content:

Photoionization and thermal equilibrium in gaseous nebulae, calculation of emitted spectrum, comparison of theory with observations - plasma diagnostics, active galactic nuclei – classification, properties, physics of the continuum and line emission, structure and unification model, implications to cosmology

Compulsory, 6 ECTS

Physics of Interstellar Matter

Content:

Physics of different phases and forms of interstellar matter and theory of shock waves

Optional, 5 ECTS

Astrobiology

Content:

Cosmological models, results of the WMAP, Big Bang, detection of cosmic dust, dust grain, pre-solar nebula, formation and evolution of solar planets, physical and orbital characteristics of comets, solar and extrasolar planetary atmospheres, NEO, Earth/NEO collision probability, life form extinction, abiogenesis, origin of organic molecules, from organic molecules to protocells

Optional, 4 ECTS

Line Shapes in Astrophysics

Content:

Atomic spectra and their description – physical background. Broadening mechanism of spectral lines. Spectral line broadening and astrophysical plasmas. Influence of collisions with charged particles on spectral lines in stellar atmospheres. Broadening of Radio recombination lines. Calculation and estimation of the spectral line broadening parameters

Optional, 4 ECTS

Introduction to Nucleosynthesis and Particle Astrophysics

Content:

Review of thermonuclear reactions and rates. Measuring abundances. Big bang nucleosynthesis, cosmic origin of lightest elements. Cosmic abundances – observations and problems. Review of stellar evolution and stellar nucleosynthesis. Neutron capture processes. Cosmic ray nucleosynthesis.

Introduction to galactic chemical evolution

Optional, 5 ECTS

Numerical Astrophysics - Modelling Stellar Atmospheres

Content:

Introduction to numerical astrophysics. Solving equations describing stellar atmospheres. Static and dynamic case. Stellar atmosphere codes in public domain - how to use and improve. Application to particular problems - analysis of spectral lines in stellar atmospheres, stellar population synthesis, atmospheres of AGN's etc.

Optional, 5 ECTS

Gravitational Lenses

Content:

Brief introduction to cosmology - standard model, basic parameters and cosmological distances. Gravitational lensing theory – lens equation, strong, weak and microlensing. Gravitational lenses and Active Galactic Nuclei - ray-tracing simulations of microlensing influence on radiation from relativistic accretion disks around supermassive black holes. Gravitational lenses and cosmological constraints - lensing time delays, optical depth and statistics

Optional, 4 ECTS

Supernovae and Their Remnants

Content:

Classification of supernovae and their rates. Physics of supernova explosions. Classification of supernova remnants (SNRs). Shock waves. Cosmic rays, magnetic fields and synchrotron radiation from SNRs. Hydrodynamic evolution of SNRs. Radio evolution of SNRs.

Optional, 4 ECTS

Serbian as a Foreign Language

Optional, 5 ECTS

S4

Master Thesis + Presentation

Compulsory, 30 ECTS