RECRUITMENT

ASTRONOMY

Doctoral School of Exact and Natural Sciences

SCOPE OF THE QUALIFICATION EXAMINATION

1. Messengers of astronomical information (EM radiation/neutrinos/GW/etc.).
2. Observational parameters of stars. The Hertzsprung-Russell diagram.
3. Stellar structure equations.
4. Equations of state of stellar matter.
5. Energy production and nuclear reactions in stellar interiors.
6. Energy transport in stars.
7. The formation of stars.
8. Properties of main sequence stars.
9. Stellar evolution and its dependence on stellar mass.
10. Final products of stellar evolution.
11. The solar neutrino problem and its solution.
12. The internal structure of stars at the most important phases of stellar evolution:
main sequence, red giant branch, horizontal branch, asymptotic giant branch.
13. The most important parameters and factors for stellar evolution.
14. Stellar rotation.
15. Stellar evolution in binary systems, main differences in comparison to single stars.
16. Black holes and neutron stars - observational evidence.
17. The most important radiative processes in astrophysical objects and their characteristic spectra.
18. Binary systems of compact objects as sources of gravitational waves.
19. Dark matter in galaxies and galaxy clusters - observational constraints.
20. Active galactic nuclei.
21. Isotropy, uniformity, and expansion of the Universe. The Hubble law.
22. The standard Big Bang model of the Universe. Primordial nucleosynthesis and cosmic microwave background.
23. Kepler's laws.
24. The two body problem.
25. Examples of perturbations in the Solar System.
26. Lagrange points in the restricted circular three body problem.
27. Basic properties of stellar systems: stellar clusters and galaxies.
28. Properties of stellar populations in the Galaxy.
29. Gravitational microlensing and its applications to astrophysical problems.
30. Gamma ray bursts.
31. Variability of astronomical sources.