

General Information			
Course name	Structure and evolution of the Universe	ECTS Credits	4
		Semester	S
Aims			
Become acquainted with basic knowledge about the structure and evolution of the Universe.			
Content			
<p><i>Basic stellar parameters and methods of their determination:</i> Flux, apparent and absolute magnitude, distances of stars. Temperature of stars, black body radiation, spectra of atoms and molecules. Spectral classifications, luminosity classes, HR diagram. Masses, diameters of stars and methods of their determination.</p> <p><i>Structure and evolution of stars:</i> Basic equations of stellar structure, production and transfer of energy in stars, thermonuclear reactions. Star formation, interstellar matter, Jeans' critical mass, proto-stars, main sequence stars, post-MS evolution, giants and super-giants. Final stages of stellar evolution – white dwarfs, neutron stars and black holes.</p> <p><i>Distribution of matter in the Universe:</i> Galaxy, its structure, dynamics, and evolution. Types of galaxies, quasars, intergalactic matter. Local group of galaxies. Clusters and super-clusters of galaxies. Large-scale structure of the Universe: Dark matter and dark energy.</p> <p><i>Introduction to cosmology:</i> Historical development of views on the Universe, Olbers's paradox, gravitational paradox. Cosmological principle: Isotropy and homogeneity of the Universe, cosmic microwave background, expansion of the Universe.</p> <p><i>Relativistic cosmology:</i> Cosmological solutions of Einstein' field equations, models of the Universe and their behaviour. Theory of the expanding Universe, Big Bang, age of the Universe.</p> <p><i>Formation of the Universe:</i> Early stages of expansion of the Universe, inflation expansion and nucleogenesis. Formation of galaxies and clusters of galaxies. Time arrow, future of the Universe.</p>			
Assessment Methods and Criteria			
1 test (end of semester) 1 semester essay (end of semester)			
<p><b>Grading Scale (in %):</b>            A: 91% - 100%            B: 81% - 90%            C: 71% - 80%            D: 61% - 70%            E: 51% - 60%            F: 0% - 50%</p> <p><b>Grading System:</b></p>			

The University recognizes the following six degrees for the evaluation of the study results:

- a) A – excellent (excellent results) (numerical value 1)
- b) B – very good (above average results) (1.5)
- c) C – good (average results) (2)
- d) D – satisfactory (acceptable results) (2.5)
- e) E – sufficient (results meet the minimum criteria) (3)
- f) FX – failed (requires further work) (4)

### Bibliography

1. Carroll B.W., Ostlie D.A. - *An Introduction to Modern Astrophysics*, Addison-Westley Publ. Comp., New York, 1996 (2nd edition 2006)
2. Böhm-Vitense, E., *Introduction to stellar astrophysics, I - III*, Cambridge University Press, Cambridge, 1997
3. Pasachoff, J. M., Filippenko, A. - *The Cosmos: Astronomy in the New Millennium*, Cambridge University Press, Cambridge, 2013 (4th edition)

