Current subject area:
Physics

Status	Course code / number in the book: F.2 Bases of cosmomicrophysics			
Acad. cycle	**ECTS credits**	**Duration**	**Semester**	**Contact hours**
Master	3.5	1 semester	Autumn	32
Year of study	**Weekly lectures/seminars**		**Prerequisites**	
1st	1		Particle physics, general relativity, cosmology	
Languages	**Examination**		**Assessment**	
English	Written test		100-point scale	

Aims and objectives: provide with knowledge of matter and energy composition of the Universe, their main properties, origin and evolution. Main objectives are to analyze the fundamental components of the Universe in the light of inflation cosmology, astrophysics and high energy cosmic rays. These issues are of particular interest due to recent experimental achievements in this areas and current decade observational programs**.**

Intended capabilities: to know the foundations of standard model of particle physics in the light of standard Big Bang model, their problems, perspectives of inflation scenarios, acquaintance with observational evidence of existence and theoretical models of dark matter and dark energy, bases of astroparticle physics and physical mechanisms of generation of high energy cosmic rays in the astrophysical objects.

Description. The course covers the following topics: foundations of standard model of particle physics; foundations of standard model of Big Bang; problems of both standard models; inflation scenarios; cosmological baryogenesis; cosmological nucleosynthesis; relict neutrinos and cosmic microwave radiation; cosmological and astrophysical evidence for existence of dark matter; particle candidates for dark matter, current experiments for registrations of weakly interacting massive particles and their results; cosmological evidence for existence of dark energy; theoretical models of dark energy; cosmic rays: physical parameters, properties, sources; Fermi mechanisms of acceleration of cosmic rays; high energy and ultra high energy cosmic rays.

Reading list:

1. S. Dodelson. *Modern cosmology*, Academic Press, Amsterdam, 459 p. (2003).
2. A. Linde, *Particle Physics and Inflationary Cosmology*, (Harwood Academic, Chur,Switzerland 1990).
3. D.S. Gorbunov, V.A. Rubakov, *Introduction to the theory of the early universe*, Singapore; Hackensack, N.J.: World Scientific Pub. Co., 580 p. (2011).
4. B. Novosyadlyj, V. Pelykh, Yu. Shtanov, A. Zhuk,*Dark Energy: Observational Evidence and Theoretical Models.* 1st volume of three-volume book "Dark energy and dark matter in the Universe", ed. V. Shulga, Kyiv, Academperiodyka, 380 p. (2013).
5. K. A. Olive, *TASI lectures on astroparticles physics*, arXiv: astr-ph/0503065 (2005).
6. V. L. Ginzburg, *REVIEWS OF TOPICAL PROBLEMS: Astrophysical aspects of cosmic-ray research (first 75 years and outlook for the future), Soviet Physics Uspekhi* **31**, 491-510 (1988).