Introduction to Cosmology
- COURSE SYLLABUS

1.	**Course title:** *Introduction to Cosmology*	
2.	**Lecturer:** *Prof. dr hab. Marek Demiański*	
3.	**Field, type and level of studies, year of study:** *astrophysics, all years of study*	
4.	**Course character:** *monographic lecture*	
5.	**Teaching method:** *traditional and on-line*	
6.	**Language:**	*English*
7.	**Course type and number of hours:** *lecture, 30h*	
8.	**Estimated load of student's independent work:**	*15h*
9.	**Total workload and number of ECTS points:**	*45 h, 3 ECTS*
10.	**Short description and main focus of the course:** *Contents of the course:* 1. The celestial sphere, basic astronomical observations 2. Nature of light, black body radiation, luminosity distance 3. Basics of stellar structure and evolution 4. The Milky Way, basics 5. The Milky Way as seen by Gaia 6. Edwin Hubble – the realm of galaxies 7. Expansion of the universe, Hubble's law 8. The Friedman-Lemaitre cosmological model 9. Propagation of light in the evolving universe, redshift, luminosity distance 10. The problem of initial singularity 11. The Big Bang model and primordial nucleosynthesis 12. Basic cosmological parameters 13. Dark Matter 14. Dark Energy, the ΛCDM cosmological model 15. The cosmic microwave background radiation 16. Very early evolution of the universe, the inflation epoch 17. Evolution of the primordial density perturbations 18. Formation of structure in the universe, numerical models 19. Supermassive black holes	

	20. Quasars and Active Galactic Nuclei 21. *Observational tests of the ΛCDM model*	
11.	**References:** *Barbara Ryden, Introduction to Cosmology, Cambridge University Press, 2016* *Scott Dodelson and Fabian Schmidt, Modern Cosmology, Academic Press, 2021* *Steven Weinberg, The first three minutes, Basic Books, 1993*	
12.	**Prerequisites:** *Basic physics, calculus, basic astronomy*	
13.	**Educational outcomes:**	**PQF level 8 codes:**
	***Knowledge:** The student can explain the theoretical basis of modern cosmological view of the Universe, including the beginning in the Big Bang and the development up to the early formation of galaxies. Student knows the latest observational results in cosmological research and insights into current issues.*	*P8S_WG*
	***Practical Skills:** The student can apply knowledge of core concepts in physics and astrophysics to understand cosmology. The student can make use of detailed information on current topics in cosmology in the research literature.*	*P8S_UW*
	***Social Skills:** Students understand the importance of cosmology in a broad astrophysical and social context and are able to discuss cosmological topics with experts, colleagues and laymen. Students are able to critically evaluate arguments presented in scientific discussions and articles.*	*P8S_KK*
14.	**Evaluation of the educational outcomes:** *essay, homework assignments*	
15.	**Criteria to complete the course:** *at least 80% attendance, final grade depends on the evaluation of the essay*	
16.	**Contact with the lecturer:** *Email: Marek.Demianski@fuw.edu.pl*	