

**Influential papers in astrophysics & cosmology and their implications –
– COURSE SYLLABUS**



1.	Course title:
	<i>Influential papers in astrophysics & cosmology and their implications</i>
2.	Lecturers:
	<i>Prof. Marek Abramowicz, prof. Michał Bejger, dr hab. Maciej Bilicki, dr hab. Dorota Gondek-Rosinska, prof. Gerald Handler, prof. Wojciech Hellwing, dr Aleksandra Olejak, dr hab. Radek Poleski, dr hab. Rodolfo Smiljanic, prof. Andrzej Sołtan, prof. Igor Soszyński, prof. Leszek Zdunik, (course coordinator: prof. Radosław Smolec)</i>
3.	Field, type and level of studies, year of study:
	<i>Astrophysics, cosmology, all years</i>
4.	Course character:
	<i>Monographic lecture</i>
5.	Teaching method:
	<i>In-person, at CAMK PAN</i>
6.	Language:
	<i>English</i>
7.	Course type and number of hours:
	<i>lecture (30h)</i>
8.	Estimated load of student's independent work:
	<i>20 h</i>
9.	Total workload and number of ECTS points:
	<i>3 ECTS</i>
10.	Short description and main focus of the course:
	<i>The course explores landmark papers that have had a significant impact on the development of modern astrophysics and cosmology. For each selected paper, the lecturer discusses the scientific problem addressed, the key ideas and assumptions underlying the work, and its subsequent impact on the field. Particular attention is given to how individual theoretical and observational breakthroughs have shaped new research directions and changed our understanding of astrophysical phenomena and the Universe.</i> <i>The course will cover the following selected landmark papers, presented by invited lecturers:</i> • <i>Shakura & Sunyaev, 1973, A&A 24, 337, "Black holes in binary systems. Observational appearance"</i> Marek Abramowicz • <i>Li & Paczyński, 1998, ApJ, 507, L59, "Transient Events from Neutron Star Mergers"</i> Michał Bejger • <i>Hulse & Taylor, 1975, ApJ, 195, L51, "Discovery of a pulsar in a binary system"</i>

	Leszek Zdunik - Paczynski, 1986, ApJ, 304, 1, "Gravitational Microlensing by the Galactic Halo" (2 lectures) Radek Poleski, microlensing aspects Igor Soszyński, birth and development of time-domain astronomy - Sołtan, 1982, MNRAS, 200, 115, "Masses of quasars" Andrzej Sołtan - Alan Guth, 1981, Phys Rev D., 23, 347, "Inflationary universe: A possible solution to the horizon and flatness problems" Wojciech Hellwing - Schutz, 1986, Nature, 323, 310, "Determining the Hubble constant from gravitational wave observations" Maciej Bilicki - Abbott et al., 2017, Phys Rev. Lett., 119, id.161101, "GW170817: Observation of Gravitational Waves from a Binary Neutron Star Inspiral" Dorota Gondek-Rosinska - Helmi et al., 2018, Nature, 563, 85, "The merger that led to the formation of the Milky Way's inner stellar halo and thick disk" (paper related to the 2026 Kavli Prize in Astrophysics) Rodolfo Smiljanic - Elsworth et al., 1990, Nature, 347, 536, "Evidence from solar seismology against non-standard solar-core models" Gerald Handler - Paczynski, 1976, IAUS, 73, 75, "Common Envelope Binaries" Aleksandra Olejak	
11.	References: Papers given above, available e.g. on NASA ADS	
12.	Prerequisites none	
13.	Educational outcomes: Knowledge: - Student knows and understands the world scientific achievements in selected areas of astrophysics and cosmology, including the major concepts, methods, theories, and paradigms that have shaped the development of these fields. - Student knows and understands the historical, methodological, and scientific context of selected influential research papers and their implications for the development of astrophysics and cosmology.	PQF level 8 codes: P8S_WG P8S_WK

	Practical Skills: • Students are able to critically analyse and interpret influential scientific papers, identify the scientific problems they address, and assess the significance of their assumptions, methods, results, and impact on subsequent research. • Students are able to communicate and discuss the scientific significance of selected research results and their impact on the development of astrophysics and cosmology using appropriate scientific terminology. Social Skills: • Students understand the importance of a critical approach to scientific knowledge, including the ability to distinguish established results from assumptions, interpretations, and limitations of scientific works. • Students understand the role of major scientific discoveries and ideas in the development of the scientific community and the broader understanding of the Universe.	P8S_UW P8S_UK P8S_KK P8S_KO
14.	Evaluation of the educational outcomes: <i>Based on essay</i>	
15.	Criteria to complete the course: Minimum 80% of attendance, final grade depends on the evaluation of essay.	
16.	Contact with the course leader/lecturer: <i>Prof. dr hab. Radosław Smolec, smolec@camk.edu.pl – course coordinator</i>	