Introduction to General Relativity
dr hab. Mikołaj Korzyński, prof CFT

Tuesday 9.00am-11.00am, zoom

COURSE SYLLABUS

1.	**Course title:** *Introduction to General Relativity*	
2.	**Lecturer:** *Mikołaj Korzyński (Center for Theoretical Physics, Polish Academy of Sciences)*	
3.	**Field, type and level of studies, year of study:** *graduate students of astrophysics, astronomy, theoretical physics*	
4.	**Course character:** *interdisciplinary lecture / monographic lecture*	
5.	**Teaching method:** *on-line, Zoom*	
6.	**Language:**	*English*
7.	**Course type and number of hours:** *lecture, 30 hours*	
8.	**Estimated load of student's independent work:**	*10 hours*
9.	**Total workload and number of ECTS points:**	*40 hours, 3 ECTS*
10.	**Short description and main focus of the course:** *This is an introductory level, graduate course of general relativity. After a summary of special relativity I will introduce the basics of GR and its mathematical apparatus, i.e. differential geometry and pseudo-Riemannian manifolds. Later I will focus on topics relevant for astrophysics: black holes, gravitational radiation and gravitational lensing.*	
11.	**References:** *Course webpage: https://korzynski.cft.edu.pl/gr-course.html* *There will be no "official" course textbook, but I can recommend the following books as additional reading:* *B. Schutz, "A First Course in General Relativity"* *R. Wald, "General relativity"* *C. Misner, K. Thorne, A. Wheeler, "Gravitation"*	

	J. Hartle, “Gravity: An Introduction to Einstein's General Relativity” *E. Poisson, “A Relativist's Toolkit”* + *many others*	
	Prerequisites:	
	special relativity, linear algebra, basic topics of theoretical physics: classical mechanics, Newtonian gravity. (Knowledge of Maxwell’s equations and wave equation in general would also be welcome) *Knowledge of Python and Jupyter notebooks will be useful*	
13.	**Educational outcomes:**	**PQF level 8 codes:**
	Knowledge: ● *general relativity: history, basic assumptions, main results* ● *differential geometry as language of theoretical physics* ● *black hole theory* ● *theory of gravitational waves*	*P8S_WG*
	Practical Skills: ● *tensor calculus* ● *knowledge of Riemannian and pseudo-Riemannian geometry* ● *simple calculations in general relativity*	*P8S_UW*
	Social Skills: ● *presenting solutions of mathematical and physical problems*	*P8S_KK*
14.	**Evaluation of the educational outcomes:**	
	attendance, problem sheets, exam	
15.	**Criteria to complete the course:**	
	80% attendance + problem sheets if you just need a pass, plus exam if you need a grade	
16.	**Contact with the lecturer:**	
	korzynski@cft.edu.pl *My office:* *Warsaw University of Technology (Politechnika Warszawska)* *Faculty of Electronics and Information Technology (Wydział Elektroniki i Technik Informacyjnych)* *ul. Nowowiejska 15/19* *00-665 Warszawa* *Room 459* *Contact hours: Thursday 14.00-16.00* *Contact also possible via zoom.*	