



## Subject card

Subject name and code	Cooperation Security in Autonomous System, PG_00048040						
Field of study	Informatics, Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Computer Communications -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jerzy Konorski					
	Teachers	dr hab. inż. Jerzy Konorski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	15.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours		Self-study		SUM
	Number of study hours	30	4.0		16.0		50
Subject objectives	Familiarize student with the mechanisms, effects and defenses against selfish attacks in computer communication environments. Both game-theoretic background and heuristic incentiviation of cooperation are considered, including reputation building and trust management. Basic notions are illustrated using scenarios characteristic of wireless networks and multiagent systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W03] Knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum.	Student understands decision and game theory supported principles of design and operation of cooperation enforcement and incentivizing mechanisms in computer communication systems, as well as reputation systems and outcomes of interactions of rational entities along with prediction of achieved utilities.			[SW3] Assessment of knowledge contained in written work and projects		
	[K7_W08] Knows and understands, to an increased extent, the fundamental dilemmas of modern civilisation, the main development trends of scientific disciplines relevant to the field of education.	Student understands notions and formal aspects relevant to solving security and reputation games among autonomous agents in computer communication systems.			[SW3] Assessment of knowledge contained in written work and projects		
	[K7_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems	Student can discuss appropriate modeling and evaluation methods related to cooperation security in computer communication systems.			[SK1] Assessment of group work skills [SK4] Assessment of communication skills, including language correctness		
Subject contents	Communication mechanisms in cooperative and noncooperative computer communication systems. Fair exchange protocols in multiagent systems at the user to network interface. Elements of noncooperative game theory in cooperation security problems: strategy dominance, equilibrium, price of anarchy, Braess paradoxes, role of players' information. Multistage and stochastic games., learning strategies, evolutionary mechanisms. Incentive mechanisms in communication protocols: defense by responding in kind, micropayments, auctions. Moral hazard and elements of contract design. Trust building in autonomous environments. Reputation systems: design, incentive compatibility, types of attacks and defenses.						

Prerequisites and co-requisites	Computer networks, Artificial intelligence		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	semina presentation	50.0%	50.0%
	test covering lecture stuff	50.0%	50.0%
Recommended reading	Basic literature	Course handouts and presentations.	
	Supplementary literature	D. Fudenberg, J. Tirole: Game Theory, MIT Press 2002  L. Buttyan, J.-P. Hubaux: Security and Cooperation in Wireless Networks, Cambridge University Press 2007  Y. Zhang, M. Guizani: Game Theory for Wireless Communications and Networking, CRC Press 2011	
	eResources addresses	Adresy na platformie eNauczenie: Bezpieczeństwo kooperacji w systemach autonomicznych 2023 - Moodle ID: 30797 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=30797">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=30797</a>	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		