GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00070179		
Field of study	Mechanizmy decyzyjne w kooperacji systemów autonomicznych		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish Polish or English
Semester of study	3	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Computer Communications -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jerzy Konorski	
	Teachers	dr hab. inż. Jerzy Konorski	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	45.0	0.0	0.0	0.0	0.0	45

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	45	0.0	0.0	45

Subject objectives

Familiarize the student with mechanisms, effects and defenses against selfish behavior in distributed systems, in particular computer communication environments. Both game-theoretic background and heuristic incentiviation of cooperation are considered, including reputation building and trust management. Basic notions are illustrated with scenarios characteristic of wireless networks and systems with autonomous agents.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W10] knows and understands, to an increased extent, the basic processes occurring in the life cycle of equipment, objects and technical systems, as well as methods of supporting processes and functions, specific to the field of study	Student understands notions and formal aspects relevant to solving security and reputation games among autonomous agents in in distributed communication systems	[SW2] Ocena wiedzy zawartej w prezentacji [SW1] Ocena wiedzy faktograficznej
[K7_W02] knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	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.	[SW2] Ocena wiedzy zawartej w prezentacji [SW1] Ocena wiedzy faktograficznej

Subject contents

Course content – lecture
Communication mechanisms in cooperative and noncooperative distributed 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 networking, AI, computer systems security

<table>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Final test</td><td>50.0%</td><td>60.0%</td></tr>
<tr><td>Presentation of selected topic</td><td>50.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">Course handouts and presentations.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">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</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3"></td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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