GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Decision Making in Competitive Environments, PG_00068325		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Optional subject group Specialty 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	English
Semester of study	1	ECTS credits	2.0
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	15.0	15.0	0.0	0.0	0.0	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

Presentation of the basics of rational decision making by autonomous agents in a competitive environment Rusing noncooperative game theory.

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 knows the principles of rational decision making adopted by rational agents interacting with other rational agents.	[SW1] Assessment of factual knowledge
[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 knows selected notions and methods of noncooperative game theory and understands their implications for multi-agent systems.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>Course content – lecture
Introduction to the course, competitive situation, decision making under uncertainty. Rationality, decision problems versus games. Cooperative and noncooperative games. Payoffs and social utility functions. One-shot games in normal form. Examples of zero- and nonzero-sum noncooperative games. Solution concepts, their compelling power and precision, common knowledge. Best-reply, dominant and overwhelming strategies. Iterative elimination of dominated strategies. The Nash equilibrium concept. Multiple Nash equilibria, payoff and risk dominance, focal points. The price of anarchy, prisoners' dilemma and the tragedy of commons, duopoly and oligopoly. Pure and mixed strategies, the principle of indifference, civic duty paradox, Nash's theorem. The Stackelberg and correlated equilibria. Dynamic game scenarios, the importance of move order, games in extensive form, sequential games with terminal payoffs.
Course content – exercises
Examples of of game-theoretic model formulation based on descriptions of systems containing multiple rational agenrs. Numerical determination of pure and mixed Nash equilibria in two- and multi-person games. Analysis of selected normal- and extensive-form games. Examples of strategy dominance, Bayesian, Stackelberg and correlated equilibria.Numerical examples illustrating selected solution concepts applied to resource-sharing models.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>mathematics, random processes</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>final exam</td><td>50.0%</td><td>100.0%</td></tr>
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<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>E. Rasmusen: Games and information, Blackwell 2001</td></tr>
<tr><td>Supplementary literature</td><td>D. Fudenberg, J. Tirole: Game Theory, MIT Press 2002</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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