

Course title: Introduction to game theory

ECTS credit allocation (and other scores): 2.00

Semester: spring

Level of study: ISCED-7 - second-cycle programmes (EQF-7)

Branch of science: Engineering and technology

Language: English/Polish

Number of hours per semester: 15

Course coordinator/ Department and e-mail:

Type of classes: classes and lectures

Substantive content

CLASSES: Different types of games with examples. Two-player zero-sum games. Games in matrix form. Determination of dominant and dominated strategies. Determination of saddle points. Mixed strategies. Calculating the value of a game by the minimax and graphical methods. Games in extensive form. Creating game trees. Solving the game by backward induction (pruning) technique. Bringing a game into matrix form. Two-player games with non-zero sum. Solving the game. Nash equilibria. Polygon payoffs. Safe and counter safe strategies. The prisoner's dilemma. Strategic moves. Evolutionarily stable strategies. Cooperative games - finding Nash arbitrage solutions. N-player games. Calculating expected payoff values. Finding dominant strategies. Determining characteristic functions of games. N-person prisoner's dilemma. Finding imputation, dominance and stable sets. Finding core and Shapley values. Shapley-Shubik and Banzhaf power index. Finding the bargaining sets of a game. Examples of applications.

LECTURES: Basic definitions and assumptions. Examples of games. Games in strategic form. Zero-sum games. Value of the game. Saddle point. Pure and mixed strategies. Non-zero-sum games. Nash equilibrium. Theorems on the existence of Nash Equilibrium. Optimality in the Pareto sense. Prisoner's dilemma. Games in developed form (extensive games). N-person games: Shapley's vector, nucleolus, Gately's point. Weighted voting games: Shapley-Shubik and Banzhaf power indices. Combinatorial games.

Learning purpose: Familiarize students with the elements of game theory and models of decision-making under conflict and uncertainty.

On completion of the study programme the graduate will gain:

Knowledge: basic knowledge of game theory

Skills: The student is able to appropriately select the strategies used in game theory.

Social Competencies: Understanding the need for continuing education.

Basic literature: G. Owen, Game Theory, 4th Edition, Wyd. Emerald, R. 2013

Philip D. Straffin, Game Theory and Strategy, Wyd. MAA, R. 1993

Supplementary literature: Martin J. Osborne, Ariel Rubinstein, A Course in Game Theory, Wyd. MIT Press, R. 1994

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 1,5 ECTS points

Student's independent work: 0,5 ECTS points



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