COURSE DESCRIPTION CARD - SYLLABUS

Course name
Game theory fundamentals [S2TIIZM1E>PTG]

Course

Field of study
Information Technology for Smart and Sustainable Mobility

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
32

Laboratory classes
0

Other
0

Tutorials
16

Projects/seminars
0

Number of credit points

3,00

Coordinators

Lecturers

Prerequisites

Knowledge: Mathematics: Linear algebra - understanding matrices, vectors, and basic operations, basic calculus and probability theory, logic and set theory. Basics of optimization and operational research Skills: Analytical thinking and abstraction. Problem-solving skills.

Course objective

To provide the fundamental concepts and tools related to operational research and game theory which will be applied to different transport domains. Important issues such incentivation and rewarding play a key role in biasing user behaviour aiming at optimizing system operation.

Course-related learning outcomes

Knowledge:
The student has advanced, detailed knowledge of selected issues related to the application of IT tools in transport systems, in particular game theory, incentive and reward systems, as well as two-player and multiplayer game models

Skills:
The student is able to apply game theory-based methods to formulate and solve engineering tasks and

simple research problems

Social competences:
The student is prepared to critically assess their knowledge and understands that in computer science, knowledge and skills quickly become outdated

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written exam
Practical work

Programme content

Foundations of game theory. Incentivation and rewarding. Two-Person and Multi-Person game models. Applications in operational research.

Course topics

- Extensive form and normal form games.
- Two-person zero-sum games.
- Rectangular/matrix games.
- The minimax/Von Neumann Theorem.
- Two-person non-cooperative, non-zero sum games.
- Two-person cooperative, non-zero sum games.
- N-person games.
- Shapley theory for N-person games.
- Aumann-Maschler theory for N-person games.

Teaching methods

The course is conducted remotely (online) in a synchronous format. Classes may also be held in person.

Bibliography

Basic:
Binmore, K. (2007), Playing for Real, A text on Game Theory, Oxford University Press
Davis, M. (1969), Game Theory, A Nontechnical Introduction, Dover Publications.

Additional:
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Breakdown of average student's workload

	Hours	ECTS
Total workload	78	3,00
Classes requiring direct contact with the teacher	48	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00