UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Teorija iger
Course title:	Game theory

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Univerzitetni študijski program Matematika	ni smeri	3	prvi
First cycle academic study programme Mathematics	none	3	first

Vrsta predmeta / Course type	izbirni

Univerzitetna koda predmeta / University course code: M0229

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		45			90	6

Nosilec predmeta / Lecturer: Matjaž Konvalinka, prof. Sergio Cabello Justo

Jeziki / Languages:	Predavanja / Lectures:	slovenski/Slovene
	Vaje / Tutorial:	slovenski/Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:

Vsebina:	Content (Syllabus outline):

• Strateške igre z funkcijami preferenc za več igralcev. Nashevo ravnovesje. Najboljši odgovor. Dominiranost. Modeli duopola.	• Strategic games with preference functions for several players. Nash equilibrium. Best response. Domination. Models of duopoly.
• Strateške igre s funkcijami koristnosti za več igralcev. Mešane strategije in loterije. Mešano Nashevo ravnovesje. Princip indiferentnosti. Dominiranost. Obstoj mešanega Nashevega ravnovesja.	• Strategic games with utility functions for several players. Mixed strategies and lotteries. Mixed Nash equilibrium. Principle of indifference. Domination. Existence of mixed Nash equilibrium.
• Bimatrične igre. Princip indiferentnosti. Iskanje Nashevega ravnovesja. Posebne bimatrične igre. Varnostni nivo.	• Bimatrix games. Principle of indifference. Search of Nash equilibrium. Special bimatrix games. Safety level.
• Matrične igre. Izrek o minimaksu. Reševanje preko linearnega programiranja in dualnosti. Posebne matrične igre.	• Matrix games. Minimax Theorem. Solution through linear programming and duality. Special matrix games.
• Bayesove igre. Bayes-Nashevo ravnovesje.	• Bayesian games. Bayesian Nash equilibrium.
• Ekstenzivne igre. Vgnezdeno popolno Nashevo ravnovesje. Stackelbergov model duopola.	• Extensive games. Subgame perfect Nash equilibrium. Stackelberg model of duopoly.
• Ekstenzivne igre z nepopolno informacijo. Strategije obnašanja. Kuhnov izrek.	• Extensive games with imperfect information. Behavioral strategy. Kuhn's theorem.
• Kooperativne igre. Nasheva sodniška procedura. Kooperativne igre v koalicijski obliki. Imputacije. Jedro. Shapleyjeve vrednosti.	• Cooperative games. Nash bargaining solution. Cooperative games in coalitional form. Imputations. Core. Shapley values
• Kombinatorne igre. Igra nim.	• Combinatorial games. Nim.

Temeljni literatura in viri / Readings:

T.S. Ferguson: Game Theory. Elektronska knjiga dostopna na http://www.math.ucla.edu/~tom/Game_Theory/Contents.html

M. J. Osborne: An Introduction to Game Theory, Oxford University Press, 2003.

M. J. Osborne, A. Rubinstein: A Course in Game Theory, 10. natis, MIT Press, 2004.

B. von Stengel: Game Theory Basics. Lecture Notes, 2011.

Cilji in kompetence:	**Objectives and competences:**

Študent spozna osnove teorije iger ter njeno uporabo pri modeliranju različnih situacij s poudarkom na primerih s področja ekonomije in financ. Teoretična razlaga je ilustrirana z mnogimi primeri.

The student gets acquainted with basic game theory and its use for modeling different situations, especially in the fields of economics and finance. The theoretic concepts are explained through several examples.

Predvideni študijski rezultati:

Znanje in razumevanje: Slušatelj pozna osnovne probleme, s katerimi se ukvarja teorija iger, in razume pomen posameznih predpostavk pri posameznih vrstah iger.
Uporaba: Modeliranje vsaj potencialno konfliktnih situacij, do katerih prihaja pri interakciji osebkov.

Refleksija: Uporabe in pomanjkljivosti opisovanja in raziskovanja pojavov iz vsakdanjega življenja s pomočjo formalnih modelov.

Prenosljive spretnosti – niso vezane le na en predmet: Sposobnost natančnega matematičnega opisa, zavedanje njegovih pomanjkljivosti.

Intended learning outcomes:

Knowledge and understanding: The student knows basic problems in Game Theory and understands the meaning of the assumptions in each type of game.
Application: Modeling of conflicting situations arising from the interaction of subjects.

Reflection: Use and weaknesses of the description and exploration of phenomena in everyday life with the help of formal models.

Transferable skills: Ability of precise mathematical description and awareness of its weaknesses.

Metode poučevanja in učenja:

Predavanja, vaje, domače naloge, konzultacije

Learning and teaching methods:

Lectures, exercises, homework, consultations

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

| Način (pisni izpit, ustno izpraševanje, naloge, projekt):
2 kolokvija namesto izpita iz vaj, izpit iz vaj,

izpit iz teorije

ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL) | 50%
50% | Type (examination, oral, coursework, project):
2 midterm exams instead of written exam, written exam

exam of theory

grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL) |

Reference nosilca / Lecturer's references:

Sergio Cabello Justo:

– CABELLO, Sergio, MOHAR, Bojan. Crossing and weighted crossing number of near-planar graphs. V: TOLLIS, Ioannis G. (ur.), PATRIGNANI, Maurizio (ur.). Graph drawing : 16th international symposium, GD 2008, Heraklion, Crete, Greece, September 21-24, 2008 : revised papers, (Lecture notes in computer science, ISSN 0302-9743, 5417). Berlin, Heidelberg: Springer, cop. 2009, str. 38-49 [COBISS.SI-ID 15099225]

– CABELLO, Sergio, DÍAZ-BÁÑEZ, José Miguel, LANGERMAN, Stefan, SEARA, Carlos, VENTURA, Inma. Facility location problems in the plane based on reverse nearest neighbor queries. European journal of operational research, ISSN 0377-2217. [Print ed.], 2010, vol. 202, iss. 1, str. 99-106 [COBISS.SI-ID 15160921]

– CABELLO, Sergio, JAKOVAC, Marko. On the b-chromatic number of regular graphs. Discrete applied mathematics, ISSN 0166-218X. [Print ed.], 2011, vol. 159, iss. 13, str. 1303-1310 [COBISS.SI-ID 15914329]

Matjaž Konvalinka:

– KONVALINKA, Matjaž, PAK, Igor. Geometry and complexity of O'Hara's algorithm. Advances in applied mathematics, ISSN 0196-8858, 2009, vol. 42, iss. 2, str. 157-175 [COBISS.SI-ID 15545945]

– KONVALINKA, Matjaž. Skew quantum Murnaghan-Nakayama rule. Journal of algebraic combinatorics, ISSN 0925-9899, 2012, vol. 35, no. 4, str. 519-545 [COBISS.SI-ID 16250713]

– KONVALINKA, Matjaž. On quantum immanants and the cycle basis of the quantum permutation space. Annals of combinatorics, ISSN 0218-0006, 2012, vol. 16, no. 2, str. 289-304 [COBISS.SI-ID 16310873]