Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Diskretne strukture
Course title:	Discrete structures

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj		**2**	**3**
Five-year master's degree program Subject Teacher			

Vrsta predmeta / Course type	Obvezni / Obligatory
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		**30**			**75**	**5**

Nosilec predmeta / Lecturer:	Andrej Taranenko

Jeziki / Languages:	**Predavanja / Lectures:**	**slovensko / slovene**
	Vaje / Tutorial:	**slovensko / slovene**

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Jih ni.	There are none.

Vsebina:	**Content (Syllabus outline):**
• Osnove matematične logike: izjave, resničnostne tabele, enakovrednost izjav, predikatni račun, kvantifikatorji, pravila sklepanja, formalni dokaz. • Množice in funkcije: operacije nad množicami, funkcije, injektivnost, surjektivnost, kardinalnost.Binarne relacije: operacije nad relacijami, tranzitivno zaprtje in Warshallov algoritem, ekvivalenčne	• Fundamentals of mathematical logic: statements, truth tables, equivalence of statements, predicat logic, quantifiers, rules of inference, formal proof. Sets and functions: set operations, functions, one-to-one and onto, cardinality. Binary relations: operations on relations, transitive closure and Warshall algorithm, equivalence relations, order relations

relacije, urejenosti. • Osnove kombinatorike: pravilo vsote in pravilo produkta, princip golobnjakov, variacije in kombinacije, princip vključitve-izključitve, linearne diferenčne enačbe. Osnove teorije grafov: osnovne definicije in lastnosti, dvodelni grafi, drevesa, povezanost, Eulerjevi grafi, Hamiltonovi grafi, algoritmični vidiki, barvanja grafov.	• Fundamentals of combinatorics: principle of sum and product, pigeon-hole principle, variations and combinations, inclusion-exclusion principle, linear recurrence relation. Fundamentals of graph theory: basic definitions and properties, bipartite graphs, trees, connectivity, Eulerian graphs, Hamiltonian graphs, algorithmic aspects, graph colorings.

Temeljni literatura in viri / Readings:

- V. Batagelj: Diskretne strukture - logika. Zapiski predavanj, 1. zvezek. Ljubljana: samozaložba, 1995.
- V. Batagelj, S. Klavžar: DS1, DMFA-založništvo, Ljubljana, 1997.
- V. Batagelj, S. Klavžar: DS2, DMFA-založništvo, Ljubljana, 2000.
- M. Juvan, P. Potočnik: Teorija grafov in kombinatorika, DMFA-založništvo, Ljubljana, 2000.
- R. J. Wilson, J. J. Watkins: Uvod v teorijo grafov, DMFA-založništvo, Ljubljana, 1997.
- K. H. Rosen: Discrete Mathematics and its Applications, McGraw-Hill, 1995.

Cilji in kompetence:	**Objectives and competences:**
Cilj predmeta je seznaniti študente z osnovami diskretne matematike in njene uporabe ter jih naučiti osnov matematičnega sklepanja.	The objective of this course is to acquaint students with basics of discrete mathematics and its applications, and to teach them basics of mathematical reasoning.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Po zaključku tega predmeta bo študent sposoben • izkazati znanje in razumevanje osnovnih principov diskretne matematike, • identificirati in reševati probleme z uporabo kombinatoričnih orodij, • razložiti postopek reševanja diferenčnih enačb in rešiti glavne tipe diferenčnih enačb, • načrtovati in sestaviti osnovne algoritme na relacijah in grafih ter analizirati njihovo časovno zahtevnost.	Knowledge and understanding: On completion of this course the student will be able to • demonstrate knowledge and understanding of basic principles of discrete mathematics, • identify and solve problems by using combinatorial tools, • explain the procedure of solving reccurence relations, and solve main types of reccurence relations design and construct basic algorithms on relations and graphs, and analyse their time complexity.

Prenesljive/ključne spretnosti in drugi atributi:	Transferable/Key Skills and other attributes:
• *Spretnosti komuniciranja:* ustno izražanje na ustnem izpitu, pisno izražanje pri pisnem izpitu. • *Spretnosti računanja:* izvajanje računskih operacij za reševanje diferenčnih enačb in pri reševanju kombinatoričnih problemov. • *Reševanje problemov:* sposobnost reševanja problemov z uporabo diskretnih struktur in kombinatoričnih principov	• *Communication skills:* oral exam, manner of expression at written exam. • *Calculation skills:* performing computing operations for solving reccurence relations and for solving combinatorial problems. • *Problem solving:* ability to solve problems by using discrete structures and combinatorial principles.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Seminarske vaje • Samostojno delo	• Lectures • Tutorial • Individual work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Izpit:		Exam:
Pisni izpit - naloge	50%	Written exam – problems
Ustni izpit - teorija	50%	Oral exam – theory
Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.		Each of the mentioned assessments must be assessed with a passing grade.
Pisni izpit - naloge se lahko nadomesti z dvema delnima testoma (sprotne obveznosti).		Written exam – problems can be substituted with two mid-term tests.
Opravljen pisni izpit je pogoj za pristop k ustnemu izpitu.		Passing grade of the written exam – problems is required for taking the oral exam.

Reference nosilca / Lecturer's references:

1. ZHU, Enqiang, TARANENKO, Andrej, SHAO, Zehui, XU, Jin. On graphs with the maximum edge metric dimension. Discrete applied mathematics, ISSN 0166-218X. [Print ed.], March 2019, vol. 257, str. 317-324. https://doi.org/10.1016/j.dam.2018.08.031, doi: 10.1016/j.dam.2018.08.031. [COBISS.SI-ID 18584665]

2. PETERIN, Iztok, SCHREYER, Jens, FECKOVÁ ŠKRABUL'ÁKOVÁ, Erika, TARANENKO, Andrej. A note on the Thue chromatic number of lexicographic produts of graphs. Discussiones mathematicae, Graph theory, ISSN 1234-3099, 2018, vol. 38, iss. 3, str. 635-643. http://www.discuss.wmie.uz.zgora.pl/php/discuss3.php?ip=&url=pdf&nIdA=25507&nIdSesji=-1,

doi: 10.7151/dmgt.2032.

3. KELENC, Aleksander, KUZIAK, Dorota, TARANENKO, Andrej, YERO, Ismael G. Mixed metric dimension of graphs. Applied mathematics and computation, ISSN 0096-3003. [Print ed.], 2017, vol. 314, str. 429-438, doi: 10.1016/j.amc.2017.07.027. [COBISS.SI-ID 23331080]

4. BANIČ, Iztok, TARANENKO, Andrej. Measuring closeness of graphs - the Hausdorff distance. Bulletin of the Malaysian Mathematical Society, ISSN 0126-6705, 2017, vol. 40, iss. 1, str. 75-95, doi: 10.1007/s40840-015-0259-1. [COBISS.SI-ID 21722376]

5. KELENC, Aleksander, TARANENKO, Andrej. On the Hausdorff distance between some families of chemical graph. MATCH Communications in Mathematical and in Computer Chemistry, ISSN 0340-6253, 2015, vol. 74, no. 2, str. 223-246. http://match.pmf.kg.ac.rs/electronic_versions/Match74/n2/match74n2_223-246.pdf. [COBISS.SI-ID 21391368]