



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

OPIS PREDMETA / SUBJECT SPECIFICATION

Predmet:	Diskretna matematika I
Subject Title:	Discrete Mathematics I

Študijski program Study programme	Študijska smer Study field	Letnik Year	Semester Semester
Matematika / Mathematics		2.	3.

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Lab. work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45		45			120	7

Nosilec predmeta / Lecturer:

Jeziki / Languages:	Predavanja / Lecture:	SLOVENSKO/SLOVENE
	Vaje / Tutorial:	SLOVENSKO/SLOVENE

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

Vsebina:

Kombinatorično preštevanje: osnovna pravila preštevanja; urejene in neurejene izbire; binomska in multinomska števila; pravilo vključitev in izključitev; porazdelitve; linearna rekurzija; Stilingova števila prve in druge vrste; trdnjavski polinomi.

Teorija grafov: osnovni pojmi; sprehodi, poti in cikli; usmerjeni grafi; drevesa in razdalje; vpeta drevesa; Eulerjevi in Hamiltonovi grafi; ravninski grafi; barvanje grafov; povezanost; 2-povezani grafi; dvodelni grafi in prirejanja.

Teorija načrtov: načrti in t -načrti; ciklične konstrukcije načrtov; končne projektivne ravnine; Latinski kvadrati; ortogonalni Latinski kvadrati.

Prerequisites:

Contents (Syllabus outline):

Combinatorial counting: basic counting rules; ordered and unordered selections; binomial and multinomial numbers; inclusion-exclusion principle; distributions; linear recursion; Stirling numbers of the first and the second kind; rook polynomials.

Graph theory: basic concepts; walk, paths and cycles; digraphs; trees and distances; spanning trees; Euler and Hamilton graphs; planar graphs; graph colorings; connectedness; 2-connected graphs; bipartite graphs and matchings.

Design theory: designs and t -designs; cyclic constructions for designs; finite projective planes; Latin squares; orthogonal Latin squares.

Temeljni študijski viri / Textbooks:

N. L. Biggs, Discrete Mathematics. Second Edition. The Clarendon Press, Oxford University Press, New York, 1989.
M. Juvan, P. Potočnik, Teorija grafov in kombinatorika, DMFA, Ljubljana, 2000.
S. Klavžar, P. Žigert, Izbrana poglavja uporabne matematike, Pedagoška fakulteta, Maribor, 2002.
J. Matoušek, J. Nešetřil, Invitation to Discrete Mathematics, Oxford University Press, Oxford, 1998.
D. B. West, Introduction to Graph Theory. Second Edition. Prentice Hall, Inc., Upper Saddle River, NJ, 2001.
R. J. Wilson, J. J. Watkins, Uvod v teorijo grafov, DMFA, Ljubljana, 1997.

Cilji:

Spoznati temeljne koncepte in rezultate s področja diskretne matematike - kombinatorike, teorije grafov ter teorije načrtov.

Objectives:

Know fundamental concepts and results from discrete mathematics – combinatorics, graph theory and design theory.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Razumevanje zahtevnejših principov diskretne matematike.
- Spoznati različne uporabe diskretne matematike.
- Prepoznati praktične probleme in njihovo modeliranje z orodji diskretne matematike.

Prenesljive/ključne spretnosti in drugi atributi:

- Prenos znanja metod diskretne matematike na druga področja (računalništvo, kemija, biologija, optimizacija, ...)

Intended learning outcomes:

Knowledge and Understanding:

- Be able to understand more demanding principals of discrete mathematics.
- To know a variety of applications of discrete mathematics.
- To recognize practical problems and their modeling with discrete mathematics tools.

Transferable/Key Skills and other attributes:

- Knowledge transfer of methods of discrete mathematics into other fields (computer science, chemistry, biology, optimization, ...)

Metode poučevanja in učenja:

- Predavanja
- Teoretične vaje

Learning and teaching methods:

- Lectures
- Theoretical exercises

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
Pisni test – praktični del Izpit (ustni) – teoretični del	50%	Written test – practical part Exam (oral) – theoretical part
Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.	50%	Each of the mentioned commitments must be assessed with a passing grade.
Pozitivna ocena pri pisnem testu je pogoj za pristop k izpitu.		Passing grade of the written test is required for taking the exam.

Reference nosilca / Lecturer's references:

1. BOKAL, Drago, BREŠAR, Boštjan, JEREBIĆ, Janja. A generalization of Hungarian method and Hall's theorem with applications in wireless sensor networks. *Discrete appl. math.* [Print ed.], 2012, vol. 160, iss. 4-5, str. 460-470. <http://dx.doi.org/10.1016/j.dam.2011.11.007>. [COBISS.SI-ID 16191577]
2. BREŠAR, Boštjan, CHALOPIN, Jérémie, CHEPOI, Victor, GOLOGRANC, Tanja, OSAJDA, Damian. Bucolic complexes. *Preprint series*, 2012, vol. 50, št. 1171, str. 1-24. <http://www.imfm.si/preprinti/PDF/01171.pdf>. [COBISS.SI-ID 16207961]
3. BALAKRISHNAN, Kannan, BREŠAR, Boštjan, CHANGAT, Manoj, KLAVŽAR, Sandi, PETERIN, Iztok, SUBHAMATHI, Ajitha R. Almost self-centered median and chordal graphs. *Taiwan. j. math.*, 2012, vol. 16, no. 5, str. 1911-1922. <http://journal.taiwanmathsoc.org.tw/index.php/TJM/article/view/2393/1403>. [COBISS.SI-ID 16376409]
4. BREŠAR, Boštjan, KARDOŠ, František, KATRENIČ, Ján, SEMANIŠIN, Gabriel. Minimum kpath vertex cover. *Discrete appl. math.* [Print ed.], 2011, vol. 159, iss. 12, str. 1189-1195. <http://dx.doi.org/10.1016/j.dam.2011.04.008>. [COBISS.SI-ID 15929689]
5. BREŠAR, Boštjan, KRANER ŠUMENJAK, Tadeja, TEPEH, Aleksandra. The geodetic number of the lexicographic product of graphs. *Discrete math.* [Print ed.], 2011, vol. 311, iss. 16, str. 1693-1698. <http://dx.doi.org/10.1016/j.disc.2011.04.004>. [COBISS.SI-ID 15929945]