Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Matematične osnove računalniških omrežij**
Course title:	**Mathematical Foundations of Computer Networks**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Matematika, 2. stopnja		**1. ali 2.**	**1. ali 3.**
Mathematics, 2nd cycle		**1. or 2.**	**1. or 3.**

Vrsta predmeta / Course type	izbirni / elective
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45			**30**		**135**	**7**

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:**

Vsebina:	**Content (Syllabus outline):**
Matematične osnove in teorija računalniških omrežij: terija grafov, usmerjevalni postopki, dodeljevanje frekvenc. Omrežni račun. Omrežno upravljanje in varnost. Kriptografija in varnost v omrežjih: uporaba teorije števil, klasični kriptografski algoritmi, kriptografija z javnimi ključi, digitalni podpisi. Petrijeve mreže in uporaba pri analizi računalniških omrežij.	Mathematical principles and theory of computer networks: graph theory, routing algorithms, frequency assignment. Network calculus. Network menagement and security. Cryptography and network security: number theory, clasical encription algorithms, public-key cryptography, digital signatures. Application of Petri Nets to Communication Networks.

Modeliranje omrežnega prometa. Medomrežno povezovanje in zaščita: varnostni zid.	Network traffic modeling. Inter-network communications and security: firewall.

Temeljni literatura in viri / Readings:

T. Vidmar: Računalniška omrežja in storitve, Atlantis, 1997.
A. Kumar, D. Manjunath, and J. Kuri: Communication Networking: An Analytical Approach, Elsevier, 2004.
James D. McCabe: Practical Computer Network Analysis and Design. Morgan Kaufmann Publishers, 1998.
William Stallings: Cryptography and Network Security: Princpiles and Practice. Prentice Hall, 2003.
J. Billington, M. Diaz, G. Rozenberg: Application of Petri Nets to Communication Networks. Springer, 1999.
Thomas G. Robertazzi: Computer Networks and Systems. Springer-Verlag, 2000.
W. Mao: Modern cryptography : theory and practice, Upper Saddle River, Prentice-Hall, 2004.

Cilji in kompetence:	**Objectives and competences:**
Poglobiti znanje iz matematičnih osnove, teorije in temeljnih koncepte računalniških omrežij. Nadgraditi znanja pridobljena pri drugih predmetih (diskretne matematiki, algoritmih,...) za potrebe računalniških omrežij.	Deepen the knowledge of mathematical theory and fundamental concepts of computer networks. Upgrade the knowledge obtained with other subjects (algorithms, discrete mathematics, ...) for computer networks.
Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • Razumeti matematične principe in teorijo • Poglobiti znanje iz algoritmov za usmerjanje ter algoritmov za dodeljevanje frekvenc. • Poglobiti znanje iz osnov varnosti in zaščite podatkov v računalniških omrežjih Prenesljive/ključne spretnosti in drugi atributi: • Pridobljena znanja se prenašajo na druge z računalništvom povezane predmete.	Knowledge and Understanding: • To understand mathematical principles and theory • To deepen the knowledge of routing algorithms and frequency assignment algorithms. • To deepen the knowledge of basics of network security • To understand secure data transmission methods Transferable/Key Skills and other attributes: • The obtained knowledge is transferable to the other computer science oriented subjects.
Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja Računalniške vaje	Lectures Computer exercises

Načini ocenjevanja:		**Assessment:**
	Delež (v %) / Weight (in %)	
Sprotno preverjanje: Pisni testi – teorija (3 do 5 pisnih testov na semester)	50%	Mid-term testing: Written tests – theory (from 3 to 5 written tests during the semester)
Izpit: Pisni izpit – praktični del	50%	Exams: Written exam – practical part
Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno. Opravljene sprotne obveznosti so pogoj za pristop k izpitu.		Each of the mentioned commitments must be assessed with a passing grade. Passing grades of all mid-term testings are required for taking the exam.

Reference nosilca / Lecturer's references:

1. BANIČ, Iztok, TARANENKO, Andrej. Span of a graph : keeping the safety distance. *Discrete mathematics & theoretical computer science*. 2023, vol. 25, no. 1, 19 str. ISSN 1365-8050. DOI: 10.46298/dmtcs.9859. [COBISS.SI-ID 148408835]

2. DRAVEC, Tanja, TARANENKO, Andrej. Daisy Hamming graphs. *Discussiones mathematicae. Graph theory*. 2023, vol. 43, no. 2, str. 421-436. ISSN 1234-3099. DOI: 10.7151/dmgt.2373. [COBISS.SI-ID 137313795]

3. TARANENKO, Andrej. Daisy cubes: a characterization and a generalization. *European journal of combinatorics*. March 2020, vol. 85, art. 103058 [10 str.]. ISSN 0195-6698. https://doi.org/10.1016/j.ejc.2019.103058, DOI: 10.1016/j.ejc.2019.103058. [COBISS.SI-ID 18934105]