



Univerza v Mariboru



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, 2 nd degree		1. or 2.	1. or 3.

Vrsta predmeta / Course type

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:

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

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

Prerequisites:

Vsebina:

Content (Syllabus outline):

Matematične osnove in teorija računalniških omrežij: teorija 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.
Modeliranje omrežnega prometa.

Mathematical principles and theory of computer networks: graph theory, routing algorithms, frequency assignment.
Network calculus.
Network management and security.
Cryptography and network security: number theory, classical encryption algorithms, public-key cryptography, digital signatures.
Application of Petri Nets to Communication Networks.
Network traffic modeling.

Medomrežno povezovanje in zaščita: varnostni zid.

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: Principles 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:

Poglobiti znanje iz matematičnih osnove, teorije in temeljnih koncepte računalniških omrežij. Nadgraditi znanja pridobljena pri drugih predmetih (diskretne matematiki, algoritmih,...) za potrebe računalniških omrežij.

Objectives and competences:

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:

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.

Intended learning outcomes:

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:

Predavanja
Računalniške vaje

Learning and teaching methods:

Lectures
Computer exercises

Načini ocenjevanja:**Assessment:**

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

1. BREŠAR, Boštjan, JAKOVAC, Marko, KATRENIČ, Ján, SEMANIŠIN, Gabriel, TARANENKO, Andrej. On the vertex k-path cover. *Discrete appl. math.*. [Print ed.], 2013, vol. 161, iss. 13/14, str. 1943-1949, doi: [10.1016/j.dam.2013.02.024](https://doi.org/10.1016/j.dam.2013.02.024). [COBISS.SI-ID [19859464](#)]
2. JAKOVAC, Marko, TARANENKO, Andrej. On the k-path vertex cover of some graph products. *Discrete math.*. [Print ed.], 2013, vol. 313, iss. 1, str. 94-100. <http://dx.doi.org/10.1016/j.disc.2012.09.010>, doi: [10.1016/j.disc.2012.09.010](https://doi.org/10.1016/j.disc.2012.09.010). [COBISS.SI-ID [19464968](#)]
3. TARANENKO, Andrej, VESEL, Aleksander. 1-factors and characterization of reducible faces of plane elementary bipartite graphs. *Discuss. Math., Graph Theory*, 2012, vol. 32, no. 2, str. 289-297, doi: [10.7151/dmgt.1607](https://doi.org/10.7151/dmgt.1607). [COBISS.SI-ID [19104264](#)]
4. TARANENKO, Andrej, ŽIGERT PLETERŠEK, Petra. Resonant sets of benzenoid graphs and hypercubes of their resonance graphs. *MATCH Commun. Math. Comput. Chem. (Krag.)*, 2012, vol. 68, no. 1, str. 65-77. <http://www.pmf.kg.ac.rs/match/content68n1.htm>. [COBISS.SI-ID [16051990](#)]
5. KLAVŽAR, Sandi, SALEM, Khaled, TARANENKO, Andrej. Maximum cardinality resonant sets and maximal alternating sets of hexagonal systems. *Comput. math. appl. (1987)*. [Print ed.], 2010, vol. 59, no. 1, str. 506-513. <http://dx.doi.org/10.1016/j.camwa.2009.06.011>. [COBISS.SI-ID [15383641](#)]