UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Napredne računalniške strukture in sistemi
Course title:	Advanced Computer Structures and Systems

Študijski program in stopnja Study programme and level	Modul Module	Letnik Academic year	Semester Semester
Informacijske in komunikacijske tehnologije, 3. stopnja	Računalniške strukture in sistemi	1	1
Information and Communication Technologies, 3rd cycle	Computer Structures and Systems	1	1

Vrsta predmeta / Course type	Izbirni / Elective
Univerzitetna koda predmeta / University course code:	IKT3-703

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Druge oblike	Samost. delo Individ. work	ECTS
30	**30**			**30**	**210**	**10**

**Navedena porazdelitev ur velja, če je vpisanih vsaj 15 študentov. Drugače se obseg izvedbe kontaktnih ur sorazmerno zmanjša in prenese v samostojno delo. / This distribution of hours is valid if at least 15 students are enrolled. Otherwise the contact hours are linearly reduced and transfered to individual work.*

Nosilec predmeta / Lecturer:	Prof. dr. Gregor Papa Prof. dr. Peter Korošec

Jeziki / Languages:	**Predavanja / Lectures:**	Slovenščina, angleščina / Slovenian, English
	Vaje / Tutorial:	

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Zaključen študij druge stopnje s področja informacijskih ali komunikacijskih tehnologij ali zaključen študij druge stopnje na drugih področjih z znanjem osnov s področja predmeta. Potrebna so tudi osnovna znanja matematike, računalništva in informatike.	Completed second cycle studies in information or communication technologies or completed second cycle studies in other fields with knowledge of fundamentals in the field of this course. Basic knowledge of mathematics, computer science and informatics is also requested.

Vsebina:	**Content (Syllabus outline):**
Rekonfigurabilno računalništvo: Komponente, arhitekture, upravljanje rekonfiguriranja, sinteza rekonfigurabilnih sistemov Zanesljivost rekonfigurabilnih sistemov: Izvedba sprotnega samodejnega testiranja, samopopravljivi sistemi Vzporedne računalniške arhitekture:	Reconfigurable computing: Devices, architectures, reconfiguration management, reconfigurable system synthesis. Reliability of reconfigurable computing systems: On-line built-in self-test implementation, self-repairable systems Parallel computer architectures: Topologies, shared and distributed processing,

Topologije, deljen in porazdeljen način procesiranja, večjedrni procesorji, gruče, omrežja. Grafične procesne enote: Namen uporabe, izvedbe, specifičnost programske opreme Večprocesorski sistemi v čipu: Arhitekture, snovanje energijsko varčnih sistemov, visokonivojsko snovanje, analiza zmogljivosti, načrtovalska okolja	multi-core processors, clusters, grids. Graphics Processor Units Usage, implementation variations, software specifics Multiprocessor systems-on-chips: Architectures, energy aware design techniques, high-level system synthesis, performance analysis, design environments

Temeljna literatura in viri / Readings:

Izbrana poglavja iz naslednjih knjig: / Selected chapters from the following books:

- P.R. Schaumont, *A Practical Introduction to Hardware/Software Codesign*. Springer, 2013, ISBN: 978-1-4614-3736-9
- W. Stallings, *Computer Organization and Architecture: Designing for Performance, 9 edition*. Prentice Hall, 2012. ISBN: 978-0132936330
- M. Wolf, *Computers as Components*. Academic Press, 2012. ISBN 978-0123884367
- P. Marwedel, *Embedded System Design*. Springer, 2011. ISBN: 978-94-007-0257-8
- L. Null, and J. Lobur, *The Essentials of Computer Organization and Architecture*. Jones & Bartlett Learning. 2010. ISBN: 978-1449600068

Cilji in kompetence:	**Objectives and competences:**
Cilj tega predmeta je poglobiti znanje o rekonfigurabilnih in večprocesorskih računalniških sistemih. Študenti se seznanijo in so sposobni uporabljati v raziskovalnem delu sintezo rekonfigurabilnih sistemov in večprocesorskih sistemov ter z njimi povezane optimizacijske probleme.	The goal of the course is to improve the knowledge on reconfigurable and multiprocessor computing systems. Students get acquainted with and are able to use in their research work reconfigurable and multiprocessor system synthesis and associated optimization problems.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študenti bodo z uspešno opravljenimi obveznostmi tega predmeta pridobili: • znanstveno védenje o formuliranju in analizi rekonfigurabilnih ter večprocesorskih sistemov • znanstvene aktivnosti, kot je zmožnost optimiziranja programske opreme ob upoštevanju značilnosti dane računalniške arhitekture • sposobnost uporabe obstoječih metod na drugih področjih, kjer so potrebni pristopi načrtovanja in analize sistemov	Students successfully completing this course will acquire: • Scientific knowledge on formulating and analysing reconfigurable and multiprocessor systems • Scientific activities, such as ability to optimize programs by considering specifics of given computer architecture • The ability to apply existing methods to other fields that require efficient system synthesis and analysis approaches

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminar, konzultacije, individualno delo	Lectures, seminar, consultancy, individual work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Seminarska naloga	50 %	Seminar work
Ustni zagovor seminarske naloge	50 %	Oral defense of seminar work

Reference nosilca / Lecturer's references:

- **G. Papa**, "Parameter-less algorithm for evolutionary-based optimization: for continuous and combinatorial problems," *Computational Optimization and Applications,* vol. 56, no. 1, pp. 209-229, 2013.
- A. Biasizzo, F. Novak, and **P. Korošec**, "A multi-alphabet arithmetic coding hardware implementation for small FPGA devices," *Journal of Electrical Engineering*, vol. 64, no. 1, pp. 44-49, 2013.
- **P. Korošec**, M. Vajteršic, J. Šilc, and R. Kutil, "Multi-core implementation of the differential ant-stigmergy algorithm for numerical optimization," *Journal of Supercomputing*, vol. 63, no. 3, pp. 757–772, 2013.
- K. Tashkova, **P. Korošec**, and J. Šilc, "A Distributed Multilevel Ant-Colony Algorithm for the Multi-Way Graph Partitioning," *International Journal of Bio-Inspired Computation*, vol. 3, no. 5, pp. 286-296, 2011.
- T. Garbolino, and **G. Papa**, "Genetic algorithm for test pattern generator design, Automatic evolution of circuits," *Applied Intelligence*, vol. 32, no. 2, pp. 193-204, 2010.