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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Digitalna integrirana vezja in sistemi | | | | | | | | | | | | | | |
| **Course title:** | | | Digital Integrated Circuits and Systems | | | | | | | | | | | | | | |
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| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| Podiplomski magistrski študijski program druge stopnje Elektrotehnika | | | | | Elektronika | | | | | | | | 2 | | 1 | | |
| 2nd cycle masters study programme in Electrical Engineering | | | | | Electronics | | | | | | | | 2 | | 1 | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Obvezni-strokovni / Compulsory professional | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64287 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| 45 |  | | | 30 | | |  | | | |  | | | 75 | |  | 6 |
|  | | | | | | | | | | | | | | | | | |
| **Nosilec predmeta / Lecturer:** | | | | | Andrej Žemva | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | |
| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | slovenski / Slovenian  angleški / English | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | slovenski / Slovenian  angleški / English | | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | | |  | **Prerequisits:** | | | | | | | |
| Vpis letnik predmeta | | | | | | | | |  | Enrolment in the year of the course | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| Tehnološke izvedbe kompleksnih digitalnih integriranih vezij in sistemov: standardne celice, polja vrat, vezja FPGA.  CMOS inverter: zasnova, izvedba, prenosna karakteristika, šumne meje, zakasnitve, poraba moči.  Zasnova kombinacijskih vezij CMOS v različnih tehnologijah.  Zasnova sekvenčnih vezij CMOS v različnih tehnologijah.  Zasnova osnovnih aritmetično logičnih gradnikov: seštevalniki, množilniki, pomikalni registri.  Zasnova in izvedba pomnilniških vezij SRAM, DRAM, DDRAM, SDRAM in drugih.  Zasnova in izvedba mikroprocesorskega sistema v tehnologiji ASIC. | | | | | | | |  | | Technology implementation of complex digital integrated circuits and systems: standard cells, gate arrays, FPGA devices.  CMOS inverter: design, implementation, transfer function, noise margins, delay, power consumption.  Design of combinational circuits CMOS in different target technologies.  Design of sequential circuits CMOS in different target technologies.  Design of arithmetic logic blocks: adders, multipliers, shift registers.  Design and implementation of memory circuits SRAM, DDRAM, SDRAM and others.  Design and implementation of microprocessor system in ASIC technology. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. TOKHEIM, Roger. Digital Electronics: Principles and Applications, McGraw-Hill, 2014. 2. NEAMEN, Donald A. Microelectronics: Circuit Analysis and Design, 4th Edition, McGraw-Hill, 2011. | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Predmet podaja temeljna znanja s področja digitalnih integriranih vezij in sistemov. Pridobljena znanja so temelj za snovanje digitalnih integriranih vezij od najnižjega tranzistoskega nivoja do sistemskega opisa v jezikih za opis delovanje vezij. | |  | | Solid knowledge of digital integrated circuits and systems. Gained knowledge forms the firm basis for designing integrated circuits from the transistor-level description up to the high-level description in hardware description lanaguage. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Študent bo osvojil analizo in sintezo digitalnih integriranih vezij in sistemov. Na različnih načrtovalskih nivojih bo sposoben zasnovati integrirano vezje v izbrani ciljni tehnologiji. | | |  | Student will master analysis and synthesis of digital integrated circuits and systems. They will be able to design integrated circuit at different design levels in various target technology. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja in laboratorijske vaje. | | |  | Lectures and tutorials. | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Način: laboratorijske vaje, pisni izpit, ustni izpit.  Ocene od 1 do vključno 5 so negativne, ocene od vključno 6 do 10 so pozitivne.  Pozitivna ocena laboratorijskih vaj je pogoj za pristop k izpitu.  Prispevki k oceni:  laboratorijske vaje  pisni izpit  ustni izpit | 50%  25%  25% | | | | Type: laboratory exercises, written exam, oral exam.  Negative grades: from 1 to 5, positive grades: from 6 to 10.  Positive evaluation of laboratory exercises is a prerequisite for the exam.  Contributions to final grade:  laboratory exercises  written exam  oral examination |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. MOČNIK, Jure, ŽEMVA, Andrej. Controlling voltage profile in smart grids with remotely controlled switches. IET generation, transmission & distribution, 2014, vol. 8 , no. 8, str. 1499-1508. 2. TOMAŽIČ Jure, ŽEMVA, Andrej., Efficient and lightweight battery management system contributes to victory in the Green Flight Challenge 2011. *Electric power systems research*, 2013, vol. 98, no. 5, str. 70-76. 3. TAVČAR, Rok, DEDIČ, Jože, BOKAL, Drago, ŽEMVA, Andrej. Transforming the LSTM training algorithm for efficient FPGA-based adaptive control of nonlinear dynamic systems, *Informacije MIDEM*, 2013, vol. 43, no. 2, str. 131-138. 4. SLUGA, Janez, ZALETELJ, Viktor, ŽEMVA, Andrej. Agent control for reconfigurable open kinematic chain manipulators. *International journal of advanced robotic systems*, 2013, vol. 10, no. 353, str. 1-13.5. BAŠA, Kristjan, ŽEMVA, Andrej.Simulation and verification of a dynamic model of the electric forklift truck. *Intelligent automation and soft computing*, 2011, vol. 17, no. 1, str. 13-30. 5. BAŠA, Kristjan, ŽEMVA, Andrej. Simulation and verification of a dynamic model of the electric forklift truck. *Intelligent automation and soft computing*, 2011, vol. 17, no. 1, str. 13-30. | | | | | |