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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Načrtovanje digitalnih vezij | | | | | | | | | | | | | |
| **Course title:** | | | Digital design | | | | | | | | | | | | | |
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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 | | | | | | | 1 | | 1 | | |
| 2nd cycle masters study programme in Electrical Engineering | | | | | Electronics | | | | | | | 1 | | 1 | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | Obvezni-strokovni / Compulsory professional | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | 64223 | | | | | |
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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** |
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| **Nosilec predmeta / Lecturer:** | | | | | Matej Možek | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | slovenski / Slovene | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | slovenski, angleški / Slovene, English | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | |  | **Prerequisits:** | | | | | | | |
| Vpis v letnik. | | | | | | | |  | Enrolment in the year of the course. | | | | | | | |

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| **Vsebina:** |  | **Content (Syllabus outline):** |
| [VHDL](http://en.wikipedia.org/wiki/Vhdl): vedenjsko in strukturno modeliranje. Načrtovanje na algoritemskem in registrskem nivoju ([RTL](http://en.wikipedia.org/wiki/Register-transfer_level)). Metode simulacije in "[Testbench](http://opencores.org/project,vhld_tb)". Modeliranje za sintezo. Programabilna vezja [PLD](http://en.wikipedia.org/wiki/Programmable_logic_device). Osnove programabilnih vezij [FPGA](http://en.wikipedia.org/wiki/Field-programmable_gate_array). Kompleksna kombinacijska aritmetična vezja v VHDL: paralelni števniki, množilniki. Načrtovanje končnih avtomatov z VHDL. Različni načini implementacije končnih avtomatov - upoštevanje specifičnih lastnosti avtomatov. Implementacija kompleksnega digitalnega sistema v jeziku VHDL. [Asinhronska sekvenčna vezja](http://en.wikipedia.org/wiki/Asynchronous_circuit): sinteza, uporaba. [CORDIC](http://en.wikipedia.org/wiki/CORDIC) algoritmi. Mikroprocesor. |  | [VHDL](http://en.wikipedia.org/wiki/Vhdl): behavioral and structural modeling Design of digital circuits on algorithmic level and [RTL](http://en.wikipedia.org/wiki/Register-transfer_level) (register transfer level). Simulation methods and "[Testbench](http://opencores.org/project,vhld_tb)". Synthesis modeling. Programmable [PLD](http://en.wikipedia.org/wiki/Programmable_logic_device) circuits. Fundamentals of programmable circuits [FPGA](http://en.wikipedia.org/wiki/Field-programmable_gate_array). Complex combinatorial arithmetic circuit in VHDL: Parallel counters, multipliers. Design of finite state automata in VHDL. Different implementations of finite state automata considering their specific properties. Implementation of a complex digital system in VHDL. [Asynchronous circuits](http://en.wikipedia.org/wiki/Asynchronous_circuit): Synthesis, Implementation. [CORDIC](http://en.wikipedia.org/wiki/CORDIC) algorithms. Microprocessor. |

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| **Temeljni literatura in viri / Readings:** | | |
| 1. Brown, Stephen D. Vranesic, Zvonko G. "*Fundamentals of digital logic with VHDL design*", 2005 McGraw-Hill, ISBN 007-246085-7 2. Katz, Randy H., Borriello, Gaetano "*Contemporary logic design*", 2005,  Upper Saddle River: Pearson Prentice Hall, ISBN 0-201-30857-6 3. Mano, M. Morris, Kime, Charles R. "*Logic and computer design fundamentals*", 2008 Upper Saddle River : Pearson Prentice Hall, 978-0-13-206711-9 4. Parhami, Behrooz "*Computer architecture : from microprocessors to supercomputers*", 2005, Oxford University Press, ISBN 0-19-515455-X 5. [Branko Šter, Ljubo Pipan: Digitalne strukture, Zapiski predavanj](http://ds.fe.uni-lj.si/predmet/predavanja/Zapiski%20predavanj.pdf), 2008 6. Domača stran predmeta / Course homepage: [http://ndv.fe.uni-lj.si](http://ndv.fe.uni-lj.si/) | | |
| **Cilji in kompetence:** |  | **Objectives and competences:** |
| Načrtovanje kompleksnih digitalnih vezij s naprednimi načrtovalskimi orodji.  RTL opis sistema in načrtovanje digitalnih sistemov s HDL pristopom. |  | Design of complex digital circuits using advanced design tools.  RTL system description and digital system design using HDL approach. |

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| **Predvideni študijski rezultati:** | |  | **Intended learning outcomes:** | |
| Znanje in razumevanje:  Načrtovanje kompleksnih digitalnih vezij s naprednimi načrtovalskimi orodji na višjem nivoju. Razumevanje postopkov in pristopov za načrtovanje digitalnih vezij. | |  | Knowledge and understanding:  Design of complex digital circuits using advanced design tools on an advanced level.  Understanding of digital circuits design procedures and approaches. | |
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| **Metode poučevanja in učenja:** | |  | **Learning and teaching methods:** | |
| Predavanja, laboratorijske vaje, naloge. | |  | Lectures, lab. course, coursework. | |
| **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:   * pisni izpit * ustni izpit | 50%  50% | | | 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 the final grade:   * written exam * oral examination |
| **Reference nosilca / Lecturer's references:** | | | | |
| 1. MOŽEK, Matej, VRTAČNIK, Danilo, RESNIK, Drago, PEČAR, Borut, AMON, Slavko. Adaptive calibration and quality control of smart sensors. V: IVANOV, Ognyan (ur.). Applications and experiences of qulity control. Rijeka: Intech, cop. 2011, str. 645-662 2. MOŽEK, Matej, VRTAČNIK, Danilo, RESNIK, Drago, PEČAR, Borut, AMON, Slavko. Digital temperature compensation of capacitive pressure sensors = Digitalna temperaturna kompenzacija kapacitivnih senzorjev tlaka. *Informacije MIDEM*, ISSN 0352-9045, mar. 2010, letn. 40, št. 1, str. 38-44 3. SANTO-ZARNIK, Marina, MOŽEK, Matej, MAČEK, Srečo, BELAVIČ, Darko. An LTCC-based capacitive pressure sensor with a digital output = Kapacitivni senzor tlaka z digitalnim izhodom izdelan v LTCC tehnologiji. *Informacije MIDEM*, ISSN 0352-9045, 2010, vol. 40, no. 1, str. 74-81 4. RESNIK, Drago, VRTAČNIK, Danilo, ALJANČIČ, Uroš, MOŽEK, Matej, AMON, Slavko. Experimental study of Ti/Pt thin film heater and temperature sensors on Si platform. V: IEEE Sensors 2009 Conference, 25-28 October 2009, Christchurch, New Zealand. *Sensors 2009*. [S. l.]: IEEE, cop. 2009, str. 635-638 5. 5. RESNIK, Drago, HOČEVAR, Stanko, BATISTA, Jurka, VRTAČNIK, Danilo, MOŽEK, Matej, AMON, Slavko. Si based methanol catalytic micro combustor for integrated steam reformer applications. *Sensors and actuators. A, Physical*, ISSN 0924-4247, Jun. 2012, vol. 180, no. 1, str. 127-136 | | | | |