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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Digitalni elektronski sistemi | | | | | | | | | | | | | | |
| **Course title:** | | | Digital Electronic Systems | | | | | | | | | | | | | | |
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| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| Univerzitetni študijski program prve stopnje Elektrotehnika | | | | | **Ni smeri** | | | | | | | | 2. | | letni | | |
| 1st cycle academic study programme Electrical Engineering | | | | | **/** | | | | | | | | **2.** | | **summer** | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Izbirni – strokovni/elective professional | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64120 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| **30** |  | | | **30** | | |  | | | |  | | | **65** | |  | **5** |
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| **Nosilec predmeta / Lecturer:** | | | | | Andrej Trost | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | slovenski | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | slovenski | | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | | |  | **Prerequisits:** | | | | | | | |
| Vpis v letnik. | | | | | | | | |  | Enrolment in the year of the course. | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| Postopek zasnove digitalnega elektronskega sistema. Predstavitev možnih tehnoloških izvedb in ocena posamezne ciljne tehnologije s stališča porabe moči, velikosti, zmogljivosti, cene, časa zasnove in izdelave.  Predstavitev delovanja digitalnega sistema na nivoju RTL (angl.: Register-Transfer Level). Delitev digitalnega sistema na krmilni in podatkovni del. Primer zasnove preprostega digitalnega elektronskega sistema: od algoritma do izvedbe v ciljni tehnologiji.  Zasnova in izvedba mikroračunalnika: arhitektura in specifikacija delovanja, opis ukazov in razlaga časovnega poteka operacij v posameznem urnem ciklu, zasnova in opis gradnikov (pomnilnik, procesorski del, krmilna logika, vodila) s strojno opisnim jezikom, izdelava gradnikov in njihova integracija v digitalni sistem. Priprava testnih programov za preizkus delovanja izdelanega mikroračunalnika. | | | | | | | |  | | Design of a digital electronic system. Overview of digital technologies according to power consumption, size, performance, price, development and implementation time.  Register transfer level (RTL) description of a digital system. Partitioning into control and data subsystem. An example of small digital system design from algorithm specification to hardware implementation.  Design of a microcomputer: architecture, specification, instructions description and cycle based instructions execution. Specification, description and integration of building blocks (memory, processor, control logic, bus) in a hardware description language. Development of test benches for verification of the microcomputer system. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. A. Trost, Načrtovanje digitalnih vezij v jeziku VHDL, Založba FE/FRI, 2011.  2. M. Ercegovac, T. Lang, J. H. Moreno, Introduction do Digital Systems, John Wiley & Sons, 1999.  3. M. M. Mano, Logic and Computer Design Fundamentals, Prentice Hall, 2007. | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Osvojiti načrtovalske postopke pri zasnovi digitalnih elektronskih sistemov za različne ciljne tehnologije. Pridobiti znanje za praktično izdelavo poljubnega digitalnega elektronskega sistema na podlagi načrtovalskih zahtev. | |  | | Acquire knowledge of digital electronic systems design using various technologies. Practical implementation of a digital electronic system based on design requirements. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Študent bo razumel in osvojil celoten postopek zasnove in izvedbe digitalnih elektronskih sistemov. Spoznal bo različne ciljne tehnologije in se znal glede na načrtovalske specifikacije argumentirano odločiti za posamezno tehnološko izvedbo. Digitalni sistem bo znal razdeliti na krmilni in podatkovni del. Osvojil bo delovanje mikroračunalniških sistemov in jih znal samostojno zasnovati, izdelati in preveriti njihovo delovanje. | | |  | Understanding digital electronic systems development process. Knowing various target technologies and selecting the best technology based on the design specifications. Partitioning of the system into control and data subsystem. Comprehend the design, implementation and verification of microcomputer systems. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja in laboratorijske vaje za utrditev teoretičnih osnov in praktično izvedbo digitalnih sistemov. | | |  | Lectures and laboratory practice for learning basic theory and practical implementation of the digital systems. | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Poročilo projekta z laboratorijskih vaj.  Ustno preverjanje znanja.  Ocenjevalna lestvica:  nezadostno (od 1 do 5), zadostno (6), dobro (7), prav dobro (8), prav dobro (9), odlično (10). | 30%  70% | | | | Laboratory project report.  Oral examination.  Grading:  not sufficient (1-5), sufficient (6), satisfactory (7), good (8), very good (9), excellent (10) |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. TROST, Andrej, ŽEMVA, Andrej. Design of custom processors for the FPGA devices. Elektrotehniški vestnik, ISSN 2232-3228, 2012, vol. 79, no. 1/2, str. 55-60  2. TROST, Andrej, ZAJC, Baldomir. Logic emulators in digital systems education. V: International Conference on Computer as a Tool, April, 27., 28., 29. 2011, Lisbon, Portugal. EUROCON 2011  3. TROST, Andrej, ŽEMVA, Andrej. Teaching design of video processing circuits. International journal of electrical engineering education, ISSN 0020-7209, Apr. 2012, vol. 49, no. 2, str. 170-178  4. PAVLIHA, Denis, TROST, Andrej. MPEG-2 multiplexer in FPGA technology = Podatkovni multiplekser MPEG-2 TS v vezju FPGA. Informacije MIDEM, ISSN 0352-9045, mar. 2011, letn. 41, št. 1, str. 53-58  5. PERKO, Klemen, KOCIK, Rémy, HAMOUCHE, Rédha, TROST, Andrej. A modelling-based methodology for evaluating the performance of a real-time embedded control system. Simulation modelling practice and theory, ISSN 1569-190X, Aug. 2011, vol. 19, no. 7, str. 1594-1612 | | | | | |