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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Modul B: Načrtovanje vgrajenih sistemov | | | | | | | | | | | | | | |
| **Course title:** | | | Module B: Designing Embedded 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 | | | | | **vse smeri** | | | | | | | | **3.** | | **letni** | | |
| 1st cycle academic study programme Electrical Engineering | | | | | **all fields** | | | | | | | | **3.** | | **summer** | | |
|  | | | | | | | | | | | | | | | | | |
| **Vrsta predmeta / Course type** | | | | | | | | | | | | izbirni, splošni / elective, general | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64136 | | | | | |
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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:** | | | | | Tadej Tuma | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | **slovenski / slovenian** | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | **slovenski / slovenian** | | | | | | | | | | | |
| **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):** | | | | | | | |
| Predmet se navezuje na »64137 Programiranje vgrajenih sistemov«  1) Mikrokrmilniška vodila: Načrtovanje naslovnih vodil, popolno, nepopolno, simetrično asimetrično, implicitno eksplicitno, statično in dinamično dekodiranje  2) Pomnilniki z zaporednim, direktnim, naključnim dostopom, delovanje cache pomnilnika.  3) Centralno procesna enota: delovanje, cevovodi, registri, sklad, prekinitve, strojni ukazi  4) Periferni vmesniki: Časovniki, serijska vodila, paralelna vodila, D/A pretvorniki, A/D pretvorniki, načrtovanje mrežnih povezav med vgrajenimi sistemi.  5) Strojne posebnosti za delo v realnem času in večopravilnem programiranju. | | | | | | | |  | | This course relies on course »64137 Programming Embedded Systems«  1) The microcontroller bus: address bus design, different decoding techniques.  2) Memory: direct, serial, random access. The function of cache memory.  3) Central processing unit: fundamentals, instruction pipelines, registers, stack, interrupts, assembly instructions.  4) Peripheral interfaces: timers, serial and parallel communication lines, D/A converters, A/D converters, data transfers.  5) Hardware specifics for multitasking real time performance. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. PUHAN, Janez, TUMA, Tadej. Uvod v mikrokrmilniške sisteme : zgradba in programiranje. 2. dopolnjena izd. Ljubljana: Založba FE in FRI, cop. 2011. III, 206 str.  2. LPC213x User Manual, Philips, 2012, PDF datoteka.  3. Spletna stran prototipnega razvojnega sistema <http://www.s-arm.si>, 2016. | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Razumeti načela vgrajenih mikrokrmilniških sistemov. Osvojiti postopke načrtovanje strojne opreme poljubnega vgrajenega sistema. Pridobiti praktične izkušnje na konkretnem primeru v okviru laboratorijskih vaj v povezavi s predmetov 64137. | |  | | Understanding fundamentals of embedded microcontroller systems. Mastering procedures for hardware design of arbitrary embedded systems. Developing practical skills during project oriented laboratory work in combination with course 64137. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Sposobnost načrtovanja in izdelave preprostejšega vgrajenega sistema. | | |  | Capability of designing the hardware for simple embedded systems. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja, vodena diskusija, laboratorijsko skupinsko delo, samostojno seminarsko delo. | | |  | Lectures, discussion groups, laboratory project work (group and individual). | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Način: laboratorijske vaje, 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 ustnem izpitu.  Prispevki k oceni:  laboratorijske vaje  ustni izpit | 50%  50% | | | | Type: laboratory exercises, oral exam. Negative grades: from 1 to 5, positive grades: from 6 to 10. Positive evaluation of laboratory exercises is a prerequisite for the oral exam.  Contributions to final grade:  laboratory exercises  oral examination |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. TUMA, Tadej, BÜRMEN, Arpad. Circuit simulation with SPICE OPUS : theory and practice, (Modeling and simulation in science, engineering and technology). Boston; Basel; Berlin: Birkhäuser, cop. 2009.  2. PUHAN, Janez, BÜRMEN, Arpad, TUMA, Tadej, FAJFAR, Iztok. Teaching assembly and C language concurrently. Int. J. Electr. Eng. Educ., Apr. 2010, vol. 47, no. 2, str. 120-131,  3. OLENŠEK, Jernej, BÜRMEN, Arpad, PUHAN, Janez, TUMA, Tadej. Automated analog electronic circuits sizing. V: QING, Anyong. Differential evolution : fundamentals and applications in electrical engineering. [Piscataway]: IEEE Press; Singapore: J. Wiley & Sons, cop. 2009, str. [353]-367.  4. BÜRMEN, Arpad, OLENŠEK, Jernej, TUMA, Tadej. Mesh adaptive direct search with second directional derivative-based Hessian update. Computational optimization and applications, ISSN 0926-6003. [Print ed.], Dec. 2015, vol. 62, no. 3, str. 693-715.  5. KORINŠEK, Gašper, DERLINK, Maja, VIRANT-DOBERLET, Meta, TUMA, Tadej. An autonomous system of detecting and attracting leafhopper males using species- and sex-specific substrate borne vibrational signals. Computers and electronics in agriculture, ISSN 0168-1699. [Print ed.], 2016, vol. 123, str. 29-39. | | | | | |