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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Operacijski sistemi v realnem času | | | | | | | | | | | | | | |
| **Course title:** | | | Real-Time Operating 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:** | | | | | | | | | | | | 64289 | | | | | |
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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:** | | | | | Tadej Tuma | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | |
| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | slovenski / Slovenian | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | slovenski / Slovenian | | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | | |  | **Prerequisits:** | | | | | | | |
| Vpis v letnik predmeta | | | | | | | | |  | Enrolment in the year of the course | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| Izvori nedeterminističnega časovnega odziva. Dinamično upravljanje s pomnilnikom. Osnove časovnega rezinjenja. Različni pristopi k razvrščanju opravil: ciklično, monotono prioritetno, razvrščanje po "preemptive" principu. Večskladovni operacijski sistemi. Dokaz razvrstljivosti procesov. Arbitražni mehanizmi pri hkratnem dostopu do skupnih enot. Časovno usklajena komunikacija med procesi. Prepoznavanje in preprečevanje mrtvo sklenjenih zank (pat-situacije). Uporaba konkretnega operacijskega sistema na ARM7 arihitekturi v okviru laboratorijskih vaj. | | | | | | | |  | | Non deterministic time response. Dynamic heap management. Basic time slicing techniques. Different task scheduling approaches: cyclic, rate monotonic priority based, time sliced pre-emptive. Multiple stack operating systems. Schedulability analysis. Concurrent access to common resources. Synchronized inter task communications. Deadlock and livelock situations. Use of specific ARM7 based operating system during laboratory work. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. PUHAN, Janez. Operating systems, embedded systems and real-time systems. 1st ed. Ljubljana: FE Publishing, 2015. VII, 163 str. 2. Spletna stran operacijskega sistema K2 <http://www.s-arm.si/> 3. Spletna stran operacijskega sistema uSamrtx <http://usmartx.sourceforge.net/> 4. 4. Spletna stran operacijskega sistema RTLinux <http://www.realtimelinuxfoundation.org/> | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Razumeti sodobne industrijske operacijske sisteme za večopravilno delo v realnem času. Pridobiti pregled nad aktualnimi produkti za vgrajene mikrokrmilniške sisteme in spoznati praktično uporabo v okviru laboratorijskega dela. | |  | | Understanding contemporary industrial operating systems with multitasking and real-time capabilities. Surveille of modern embedded systems software development products and hands-on project lab work. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Sposobnost uporabe večopravilnih realnočasnih operacijskih sistemov. | | |  | Competent use of real-time multitasking operating 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. | | | | | |