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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Digitalno procesiranje v mehatroniki I | | | | | | | | | | | | | | |
| **Course title:** | | | Digital Processing in Mechatronics I | | | | | | | | | | | | | | |
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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 | | | | | Mehatronika | | | | | | | | 1 | | 2 | | |
| 2nd cycle masters study programme in Electrical Engineering | | | | | Mechatronics | | | | | | | | 1 | | 2 | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Obvezni-strokovni / Compulsory professional | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64230 | | | | | |
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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:** | | | | | Danjel Vončina | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | **slovenski / Slovene** | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | **slovenski / Slovene** | | | | | | | | | | | |
| **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):** | | | | | | | |
| Osnovne komponente digitalnih sistemov, arhitekture mikrokrmilnikov, zgradba centralne procesne enote, instrukcijska beseda in instrukcijski cikel, tehnike naslavljanja, dekodirna logika, periferne enote (spominska vezja, števci, časovniki, A/D in D/A pretvorniki, senzorji), zbirni jezik, programiranje mikrokrmilnikov, obdelava podatkov v realnem času, podprogrami in prekinitveni podprogrami, razvojna orodja, komunikacijski vmesniki, serijski in paralelni komunikacijski protokoli, uporaba programirljivih logičnih vezij v sistemih močnostne elektronike, uporaba mikrokrmilnikov v močnostnih polprevodniških pretvornikih, pulzno-širinski modulatorji, načrtovanje mikrokrmilniško vodenih elektromotorskih pogonov, (elektronsko komutirani motor, reluktančni motor, koračni motor). | | | | | | | |  | | Basic components of digital systems, microcontroller architectures, central processing unit, instruction word, instruction cycles, addressing modes, decoding logic, peripheral units (memory types, timers and counters, A/D and D/A converters, sensors), assembly language, microcontroller programming, real time data processing, subroutines and interrupt subroutines, development tools, series and parallel communication interfaces, parallel and series communication protocols, microcontrollers in applications of power electronics, implementation of microcontrollers in power converters, PWM modulators, implementation of microcontrollers in electric motor drive systems (BLDC, PMSM, switched reluctance motors, stepper motors). | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. D. Ibrahim, "Microcontroller Based Applied Digital Control", John Wiley & Sons, 2006 2. T. Kenjo, "Power Electronics for the Microprocessor Age", Oxford University Press, 1994 3. T. Noergaard, "Embedded Systems Architecture", Elsevier, 2005 4. J. Catsoulis, "Designing Embedded Hardware", O"Reilly, 2005 5. R. J. Tocci, F. J. Ambrosio, "Microprocessors and Microcomputers", Prentice Hall, 2000 6. F. Vahid, T. Givargis, "Embedded System Design - A Unified Hardware/Software Introduction", John Wiley & Sons, 2002 | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Študent bo osvojil znanje o digitalnih sestavih, ki se uporabljajo za krmiljenje sistemov močnostne elektronike in elektromotorskih pogonov. Tako bo lahko samostojno ali timsko pristopil tudi k načrtovanju in izvedbi zahtevnejših mikrokrmilniških nalog na področju mehatronike. | |  | | Student will get the knowledge about digital components and systems that are used in the field of power electronics and electrical drives. He will be able to design mechatronic system controls using up to date microcontrollers. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Znanje o uporabi mikrokrmilnikov v mehatronskih sistemih | | |  | Knowledge about implementation of microcontrollers in mechatronic systems | |
|  | | |  |  | |
| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja in laboratorijske vaje. | | |  | Lectures and laboratory work | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Laboratorijske vaje, izpit.  Ocenjevalna lestvica: Ocene od 1 do vključno 5 so negativne, ocene od 6 do 10 so pozitivne.  Pozitivna ocena laboratorijskih vaj je pogoj za pristop k izpitu.  Prispevki k oceni:   * laboratorijske vaje * izpit | 30%  70% | | | | Type: laboratory exercises, 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:   * laboratory exercises * exam |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. PETKOVŠEK, Marko, LEBAN, Aleš, NEMEC, Mitja, VONČINA, Danijel, ZAJEC, Peter. Series active power filter for high-voltage synchronous generators = Serijski aktivni močnostni filter za visokonapetostne sinhronske generatorje.Informacije MIDEM, ISSN 0352-9045, Dec. 2013, vol. 43, no. 4, str. 228-234. 2. FLISAR, Uroš, VONČINA, Danijel, ZAJEC, Peter. Voltage sag independent operation of induction motor based on Z-source inverter.Compel, ISSN 0332-1649, 2012, vol. 31, no. 6, str. 1931-1944. 3. KOSMATIN, Peter, MILJAVEC, Damijan, VONČINA, Danijel. A novel control strategy for the switched reluctance generator.Przeglęad Elektrotechniczny, ISSN 0033-2097, 2012, rok 88, no. 7a, str. 49-53. 4. PETKOVŠEK, Marko, KOSMATIN, Peter, ZEVNIK, Ciril, VONČINA, Danijel, ZAJEC, Peter. Measurement system for testing of bipolar plates for PEM electrolyzers = Merilni sistem za testiranje bipolarnih plošč PEM elektrolizne celice.Informacije MIDEM, ISSN 0352-9045, mar. 2012, letn. 42, št. 1, str. 60-67. 5. MODRIJAN, Gorazd, PETKOVŠEK, Marko, ZAJEC, Peter, VONČINA, Danijel. Precision B-H analyser with low THD secondary induced voltage.IEEE transactions on industrial electronics, ISSN 0278-0046. [Print ed.], Jan. 2008, vol. 55, issue 1, str. 364-370. | | | | | |