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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Mehatronski sistemi | | | | | | | | | | | | | |
| **Course title:** | | | Mechatronic 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 | | | | | Vse smeri | | | | | | | 1 | | 1 | | |
| 2nd cycle masters study programme in Electrical Engineering | | | | | All study fields | | | | | | | 1 | | 1 | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | Izbirni-splošni /elective general | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | 64255 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| **30** |  | | | **45** | | |  | | |  | | | **75** | |  | **6** |
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| **Nosilec predmeta / Lecturer:** | | | | | Vanja Ambrožič | | | | | | | | | | | |
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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.  Potrebna predznanja iz matematike, osnov elektrotehnike, meritev in električnih strojev. | | | | | | | |  | Enrolment in the year of the course.  Knowledge of mathematics, electrical engineering fundamentals, measurements, electrical machines. | | | | | | | |

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| **Vsebina:** |  | **Content (Syllabus outline):** |
| - Mehanski sistemi z gibljivimi elementi  - Fizikalni opis mehanskih elementov (nosilci, vzmeti, blažilniki, ležaji, zobniki, prenosi, manipulatorji…)  - Modeliranje in simulacija mehatronskih sistemov  - Hidravlični in pnevmatski aktuatorji  - Nekonvencionalne izvedbe električnih aktuatorjev  - Mehatronika v transportnih sistemih (industrijskih, cestnih, tirnih)  - Primeri kompleksnih mehatronskih sistemov: hibridno vozilo, magnetna levitacija… |  | Mechanical systems with moving parts  Physical description of mechanical systems (beams, shock-absorbers, bearings, transmissions, manipulators…)  Modelling and simulation of mechatronic systems  Hydraulic and pneumatic actuators  Unconventional realization of electric actuators  Mechatronics in transport systems (industrial, road, tracks)  Examples of complex mechatronics systems: hybrid vehicle, magnetic levitation… |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. pisno gradivo, prirejeno za predmet 2. Rolf Isermann, Mechatronic Systems Fundamentals, Springer, 2005 3. S. Cetinkunt, Mechatronics, Wiley, 2007 | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Spoznavanje fizikalne slike in analiza heterogenih sestavnih sklopov mehatronskih sistemov. Integracija doseženih specifičnih znanj na primeru sodobnih kompleksnih aplikacij. | |  | | Acquiring knowledge of a physical modelling and analysis of heterogeneous mechatronic subsystems. Integration of specific knowledge into examples of modern complex applications. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| **Znanje in razumevanje**: Študent bo pridobil osnovna znanja iz teorije mehanskih elementov in sistemov. Spoznal bo konvencionalne in nekonvencionalne izvršne elemente ter razumel medsebojno delovanje posamičnih podsestavov v kompleksnem sistemu.  **Uporaba**: Povezovanje doseženih teoretičnih znanj iz drugih predmetov z novo pridobljenimi znanji iz predmeta na področju vseprisotnih elektromehanskih sistemov.  **Refleksija**: Predmet posreduje uravnovešena teoretična in praktična znanja. Hkrati bo študentu elektrotehnike predstavil sorodna področja, ki jih srečuje v inženirski praksi. Na ta način bo preglednejša povezanost med teoretičnim ozadjem in inženirsko realnostjo.  **Prenosljive spretnosti**: Raziskovalno delo: iskanje primerov mehatronskih sistemov po strokovni literaturi in spletu ter njihova predstavitev kolegom. Timsko delo na projektih. | | |  | **Knowledge and understanding:**  The student will get acquainted with basic theory of mechanic elements and systems, as well as conventional and unconventional actuators. He will also understand the interaction between different units inside a complex system.  **Application:** Connection between achieved theoretical knowledge from other subjects with new knowledge in the area of widespread electromechanical systems.  **Reflection:** The subject will offer balanced theoretical and practical knowledge. At the same time, the student will be presented similar areas from the engineering practice. Thus, the connection between theoretical background and engineering reality becomes clearer.  **Transferable skills:** Use of information technologies when searching for examples of mechatronic systems and their presentation to the colleagues. Team work on projects. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja, seminarji in laboratorijske vaje. | | |  | Lectures, seminars and laboratory exercises, | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Ocene od 1 do vključno 5 so negativne, ocene od vključno 6 do 10 so pozitivne.  Pozitivna ocena laboratorijskih vaj in seminarja sta pogoj za pristop k izpitu.  Prispevki k oceni:   * vaje in seminar * izpit | 50%  50% | | | | Negative grades: from 1 to 5, positive grades: from 6 to 10.  Positive evaluation of laboratory exercises and seminar is a prerequisite for the exam.  Contributions to the final grade:   * exercises and seminar * exam |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. KONTARČEK, Andraž, NEMEC, Mitja, BAJEC, Primož, AMBROŽIČ, Vanja. Single open-phase fault detection with fault-tolerant control of an inverter-fed permanent magnet synchronous machine. Automatika, ISSN 0005-1144, 2014, vol. 55, no. 4, str. 474-486, ilustr., doi: 10.7305/automatika.2014.12.624. [COBISS.SI-ID 10892372] 2. AMBROŽIČ, Vanja, ZAJEC, Peter. Električni servo pogoni. 1. izd. V Ljubljani: Slovensko združenje elektroenergetikov CIGRÉ-CIRED, 2016. ISBN 978-961-6265-27-0. [COBISS.SI-ID 283707392] 3. DROBNIČ, Klemen, NEMEC, Mitja, FIŠER, Rastko, AMBROŽIČ, Vanja. Simplified detection of broken rotor bars in induction motors controlled in field reference frame. Control engineering practice, ISSN 0967-0661. [Print ed.], Aug. 2012, vol. 20, no. 8, str. 761-769, ilustr. [COBISS.SI-ID 9208660] 4. MAKUC, Danilo, DROBNIČ, Klemen, AMBROŽIČ, Vanja, MILJAVEC, Damijan, FIŠER, Rastko, NEMEC, Mitja. Parameters estimation of induction motor with faulty rotor. Przeglęad Elektrotechniczny, ISSN 0033-2097, 2012, rok 88, 1a, str. 41-46, ilustr. [COBISS.SI-ID 8870228] 5. NEMEC, Mitja, DROBNIČ, Klemen, NEDELJKOVIĆ, David, FIŠER, Rastko, AMBROŽIČ, Vanja. Detection of broken bars in induction motor through the analysis of supply voltage modulation. IEEE transactions on industrial electronics, ISSN 0278-0046. [Print ed.], Aug. 2010, vol. 57, no. 8, str. 2879-2888, ilustr. [COBISS.SI-ID 7819604] | | | | | |