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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Poglavja iz robotike | | | | | | | | | | | | | | |
| **Course title:** | | | Selected topics in robotics | | | | | | | | | | | | | | |
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| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| doktorski študijski program tretje stopnje Elektrotehnika | | | | | Ni smeri | | | | | | | | 1 | |  | | |
| 3rd cycle: doctoral study programme Electrical Engineering | | | | |  | | | | | | | |  | |  | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Izbirni / Elective | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64825 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| **30** |  | | |  | | |  | | | |  | | | **95** | |  | **5** |
|  | | | | | | | | | | | | | | | | | |
| **Nosilec predmeta / Lecturer:** | | | | | prof. dr. Marko Munih | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | **Slovene language/English** | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | |  | | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | | |  | **Prerequisits:** | | | | | | | |
| Vpis v doktorski študijski program. | | | | | | | | |  | Valid enrolment into PhD program. | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| - Analiza in sinteza serijskih in paralelnih robotskih mehanizmov.  - Specifični pristopi v kinematiki, dinamiki, vodenju in senzoriki v robotiki.  - Paralelni robotski sistemi: analiza gibanja, kinematične singularnosti, manipulabilnost.  - Prijemalni robotski sistemi: robotske roke z več prsti, robotski prijem pri človeku in robotu, tetivni sistemi.  - Robotski sistemi v medicini: rehabilitacijska robotika, roboti v kirurgiji, biorobotika.  - Hodeči robotski sistemi: enonožni, dvonožni in večnožni roboti, analiza in sinteza hoje pri človeku in robotu.  - Eksotični roboti. | | | | | | | |  | | - Analysis and synthesis of serial and parallel robot mechanisms  - Advanced approaches in kinematics, dynamics, control and sensory systems in robotics  - Parallel robot systems: kinematic singularities, manipulability, sensitivity of constructional errors  - Robotic grasping systems: multifinger robot grippers, grasping in man and robot, tendon systems  - Robot systems in medicine: rehabilitation robotics, robotics in surgery, biorobotics  - Walking robots: monopod, biped, and multilegged robots, analysis and sysnthesis of locomotion in man and robot  - Exotic robots | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| [1] B. Siciliano, O. Khatib, Handbook of Robotics, Springer, 2008.  [2] M. W. Spong, S. Hutchinson, M. Vidyasagar, Robot Modeling and Control, Willey, 2005.  [3] J. Lenarčič, T. Bajd, M.Stanišič, Robot Mechanisms, Springer 2012.  [4] Arimoto S, Control theory of multi-fingered hands, Springer, 2008.  [5] Springer Tracts in Advanced Robotics (several books) | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Cilj je predstavitev poglavij s področij kinematike, dinamike, vodenja in senzorike najsodobnejših robotskih sistemov. | |  | | The aim of the course is to present topics from the areas of kinematics, dynamics, control, and sensory systems of most advanced robot systems. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Predvideni študijski rezultati so razumevanje fizikalnega ozadja, poznavanje tehnologij na posameznih področjih robotike. | | |  | The envisaged results of the study include comprehension of mathematical and physical background together with expertise in technological solutions in specific areas of robotics. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja in seminarsko delo osnovano na člankih v revijah npr. IEEE Trans. Robot., Int. J. Robot. Res., Advanced Robotics ter konferencah IEEE ICRA in IROS. Predavanja obravnavajo teoretične postopke, najbolj uveljavljene tehnologije in praktične primere. Seminar vključuje lastno raziskovalno delo in predstavitev. | | |  | Lectures and seminars are based on recent papers published in eminent robotic journals, i.e. IEEE Trans. Robot., Int. J. Robot. Res., Advanced Robotics and conference proceedings IEEE ICRA and IROS. The lectures cover theoretical background, advaced technologies, and practical examples. Seminar is based on student's personal research and includes presentation of research results. | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Ustni izpit, seminar-projekt | **50/50** | | | | Oral examination, seminar-project |
| **Reference nosilca / Lecturer's references:** | | | | | |
| J. Činkelj, R. Kamnik, P. Čepon, M. Mihelj, M. Munih (2010) Closed-loop control of hydraulic telescopic handler, Automation in Construction, Vol. 19, No. 7, 954-963.  J. Podobnik, D. Novak, M. Munih, Grasp coordination in virtual environments for robot-aided upper extremity rehabilitation. Biomedical engineering, ISSN 1016-2372, Dec. 2011, vol. 23, no. 6, 457-466.  ŽBONTAR, Klemen, MIHELJ, Matjaž, PODOBNIK, Boštjan, POVŠE, Franc, MUNIH, Marko. Dynamic symmetrical pattern projection based laser triangulation sensor for precise surface position measurement of various material types. Applied optics, ISSN 0003-6935, 2013, vol. 52, no. 12, 2750-2760.  AMBROŽIČ, Luka, GORŠIČ, Maja, GEEROMS, Joost, FLYNN, Louis, LOVA, Molino, KAMNIK, Roman, MUNIH, Marko, VITIELLO, Nicola. Cyberlegs : a user-oriented robotic transfemoral prosthesis with whole-body awareness control. *IEEE robotics & automation magazine*, ISSN 1070-9932, Dec. 2014, vol. 21, no. 4, 82-93.  BERAVS, Tadej, BEGUŠ, Samo, PODOBNIK, Janez, MUNIH, Marko. Magnetometer calibration using Kalman filter covariance matrix for online estimation of magnetic field orientation. IEEE transactions on instrumentation and measurement, ISSN 0018-9456, Aug. 2014, vol. 63, no. 8, 2013-2020. | | | | | |