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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Konstruiranje električnih strojev | | | | | | | | | | | | | | |
| **Course title:** | | | Design of Electrical Machines | | | | | | | | | | | | | | |
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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 | | | | | | | | 2 | | 1 | | |
| 2nd cycle masters study programme in Electrical Engineering | | | | | All study fields | | | | | | | | 2 | | 1 | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Izbirni-splošni /elective general | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64310 | | | | | |
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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 |
|  | | | | | | | | | | | | | | | | | |
| **Nosilec predmeta / Lecturer:** | | | | | Damijan Miljavec | | | | | | | | | | | | |
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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 predmeta | | | | | | | | |  | Enrolment in the year of the course | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| Koncept elektromagnetnega konstruiranja električnih strojev in določanje njihovih osnovnih parametrov. Konstruiranje magnetnega kroga. Konstruiranje električnega kroga. Teorija in uporaba metode končnih elementov pri konstruiranju električnih strojev. Uporaba razvojnih programskih paketov pri konstruiranju električnih strojev. Izračuni parametrov nadomestnega vezja in izhodnih karakteristik asinhronskega stroja, sinhronskega stroja, električnega stroja s trajnimi magneti, reluktančnega stroja ter najnovejših tipov električnih strojev iz njihovih geometrijskih podatkov. Izračuni izgub v železu in bakru ter določanje izkoristka konstruiranih električnih strojev. Uvod v optimizacijske postopke pri konstruiranju električnih strojev. | | | | | | | |  | | The concept of the electromagnetic design of electrical machines and determination of their basic parameters. Design of electrical machine magnetic circuits and electric circuit. Theory and application of finite element methods in engineering design of electrical machines. Application of commercial software packages in the design of electric machines. Calculations of equivalent circuit parameters and output characteristics of the induction machine, synchronous machine, electric machine with permanent magnets, reluctance machine and the latest types of electrical machines from their geometric data. The calculations of iron and copper losses and determining the efficiency of designed electric machines. Introduction to optimization procedures in the design of electric machines. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. Machines, ISBN-13: 978-1118581575 ISBN-10: 1118581571 Edition: 2nd December 31, 2013 2. Bianchi Nicola: Electrical machine analysis using finite elements, Boca Raton : Talor & Francis, cop. 2005. 3. Željeznov, Miljutin: Osnove teorije elektromagnetnega polja, Ljubljana, FE, 1981. 4. Anton R. Sinigoj: ELMG, Ljubljana, FE, 1996. 5. A Monti, F Ponci, M Riva: Electrical machine theory through finite element analysis, 2007. 6. J. R. Hendershot, T.J.E. Miller: Design of brushless permanent magnet motors, Clarendon press 1994. 7. Jereb Peter, Damijan Miljavec: Vezna teorija električnih strojev, Založba FE in FRI 2008 8. Drago Dolinar, Štumberger Gorazd: Modeliranje in vodenje elektromehanskih sistemov,FERI, Maribor, 2002 9. Drago Dolinar, Peter Jereb: Splošna teorija električnih strojev, FERI, Maribor,1995. Maribor,1995Zagradišnik Ivan, Slemnik Bojan: Električni rotacijski stroji, Maribor, 2001. 10. Damijan Miljavec, Peter Jereb: Električni stroji – temeljna znanja, Ljubljana, 2005.Juha Pyrhonen, Tapani Jokinen, Valeria Hrabovcova: Design of Rotating Electrical | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Cilj predmeta je pridobiti teoretična znanja potrebna za konstruiranje električnih strojev. Spoznati in uporabljati razvojne programske pakete pri konstruiranje električnih strojev. Usposobiti študenta za sintezo in analizo geometrijskih modelov električnih strojev ter z njihovo uporabo analizirati stacionarna in prehodna elektromagnetna ter elektromehanska stanja. | |  | | The aim of the course is to acquire theoretical knowledge required for the design of electrical machines. Getting to know and to use specialized software packages for the design of electrical machines. To prepare the students for the synthesis and analysis of geometric models of electric machines and their use to analyze stationary and transient electromagnetic and electromechanical states. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Poudarek je na aplikativnih znanjih in razumevanjih, ki jih bodoči projektant oziroma uporabnik potrebuje pri oblikovanju električnih strojev. | | |  | The emphasis is on applied knowledge and on understandings how to design electrical machines regarding customer demands, machines properties and field of their use. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja in laboratorijske vaje v obliki projektov. | | |  | Lectures, demonstrations, work with computer tools, coursework and project work. | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Način: projekt.  Ocene od 1 do vključno 5 so negativne, ocene od vključno 6 do 10 so pozitivne.  Prispevki k oceni:  projekt | 100 % | | | | Type: project.  Negative grades: from 1 to 5, positive grades: from 6 to 10.  Contributions to final grade:  project |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. VUKOTIĆ, Mario, MILJAVEC, Damijan. Design of a permanent-magnet flux-modulated machine with a high torque density and high power factor. IET electric power applications, ISSN 1751-8660, 2016, vol. 10, iss. 1, str. 36-44. 2. VIDMAR, Gregor, MILJAVEC, Damijan. A universal high-frequency three-phase electric-motor model suitable for the delta and star winding connections. IEEE transactions on power electronics, ISSN 0885-8993, Aug. 2015, vol. 30, no. 8, str. 4365-4376. 3. VIDMAR, Gregor, MILJAVEC, Damijan, AGREŽ, Dušan. Measurement and evaluation of EDM bearing currents by the normalized Joule integral. Measurement science & technology, ISSN 0957-0233, 2014, vol. 25, no. 7, str. 1-10. 4. GOTOVAC, Gorazd, LAMPIČ, Gorazd, MILJAVEC, Damijan. Analytical model of permeance variation losses in permanent magnets of the multipole synchronous machine. IEEE transactions on magnetics, ISSN 0018-9464, Feb. 2013, vol. 49, no. 2, str. 921-928. 5. JEREB, Peter, MILJAVEC, Damijan. Vezna teorija električnih strojev. 1. izd. Ljubljana: Fakulteta za elektrotehniko, 2009. | | | | | |