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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Elektronske komponente in senzorji | | | | | | | | | | | | | | |
| **Course title:** | | | Electronic components and sensors | | | | | | | | | | | | | | |
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| **Študijski program in stopnja**  **Study programme and level** | | | | | **Študijska smer**  **Study field** | | | | | | | | **Letnik**  **Academic year** | | **Semester**  **Semester** | | |
| Univerzitetni študijski program prve stopnje Elektrotehnika | | | | | **Elektronika** | | | | | | | | 3. | | zimski | | |
| 1st cycle academic study programme Electrical Engineering | | | | | **Electronics** | | | | | | | | **3.** | | **winter** | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Obvezni- strokovni/compulsory professional | | | | | |
|  | | | | | | | | | | | |  | | | | | |
| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64146 | | | | | |
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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:** | | | | | Matej Možek | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | |
| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | slovenski / Slovenian | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | slovenski / Slovenian | | | | | | | | | | | |
| **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):** | | | | | | | |
| Standardizacija,  Zanesljivost, Pospešeno staranje, degradacija, pospešitveni faktor,  Linearni upori: pregled struktur, lastnosti in uporabe uporovnih družin, Nelinearni upori: NTC, PTC, varistorji, Kondenzatorji: pregled struktur, lastnosti in uporabe kondenzatorskih družin plastični, keramični, elektrolitski (mokri, suhi), specialni, Tuljave: tuljave brez jedra, z jedrom (feriti), z/brez reže. Načrtovanje tuljave z jedrom z režo ter omrežnega in impulznega transformatorja  Piezoelektrični elementi: PE efekt, aktuatorji, kvarčni kristali, elementi na površinske zvočne valove-SAW Senzorji: Pomembni parametri senzorjev, pregled principov zaznave, obdelava senzorskih signalov, elementi senzorskega sistema, vezja za obdelavo senzorskega signala | | | | | | | |  | | Standardization,  Reliability, Accelerated aging. Acceleration Factor,  Resistors: Review of structures, properties and applications of resistor families,  Nonlinear resistors: NTC and PTC thermistors, varistors Capacitors: Review of structures, properties and applications of capacitor families: Plastic, Ceramic. Electrolytic (liquid, solid), Special.  Coils: Coils air core, ferrite cores with/without gap. Power and pulse transformer design. Piezoelectric elements: Piezoelectric effects. Piezoelectric actuators, Quartz crystals. SAW (Surface Acoustic Wave) devices.  Sensors: Essential sensor parameters, Overview of sensing principles, Processing of sensor signals, Components of sensor systems, Sensor signal conditioning circuits | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | | |
| 1. Bǎjenescu, Titu-Marius I, Bâzu, Marius I. "Component reliability for electronic systems", 2010, Boston ; London : Artech House, ISBN 978-1-59693-436-8 2. Maheshwari, Preeti "Electronic components and processes", 2006, New Delhi : New Age International, ISBN 978-81-224-1794-4 3. Fraden, Jacob, ["Handbook of modern sensors : physics, designs, and applications"](http://books.google.si/books?id=W0Emv9dAJ1kC&lpg=PP1&dq=4.%09Soloman%2C%20Sabrie%20%22Sensors%20handbook%22&hl=sl&pg=PP1#v=onepage&q&f=false), 2010, Springer, ISBN 1-4419-6465-7 4. Horowitz, Paul, Hill, Winfield "*The art of electronics*", 2008, Cambridge University Press, ISBN 978-0-521-37095-0 5. Soloman, Sabrie "*Sensors handbook*",2010 , McGraw-Hil ISBN 978-0-07-160570-0 6. Amon, Slavko "Elektronske komponente", 2013, spletni učbenik, Fakulteta za elektrotehniko, dostopen na domači strani predmeta: <http://ks.fe.uni-lj.si/> | | | | | | |
| **Cilji in kompetence:** | | |  | **Objectives and competences:** | | |
| Uporaba pasivnih elektronskih komponent in sestavov v elektronskih sistemih. Načrtovanje senzorskih sistemov na področju elektronike. | | |  | Use of passive electronic components and assemblies in electronic systems. Design of sensor systems. | | |
| **Predvideni študijski rezultati:** | |  | | | **Intended learning outcomes:** | |
| Spoznati vrste, lastnosti in aplikacij pasivnih elektronskih komponent pri reševanju praktičnih problemov v elektronskih sistemih.  Razumevanje principov delovanja in aplikacij senzorjev, vezij za obdelavo senzorskega signala in zasnove senzorskih sistemov. | |  | | | Understanding of types, properties and applications of passive components for use in electronic systems.  Insight in sensing principles and sensor applications, sensor signal conditioning circuits and design of sensor systems. | |
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| **Metode poučevanja in učenja:** | |  | | | **Learning and teaching methods:** | |
| Predavanja, laboratorijske vaje, naloge. | |  | | | Lectures, lab. course, coursework | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | | **Assessment:** |
| Način: laboratorijske vaje, pisni izpit, 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 izpitu.  Prispevki k oceni:  pisni izpit  ustni izpit | 50%  50% | | | | | Type: laboratory exercises, written exam, oral 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 final grade:  written exam  oral examination |
| **Reference nosilca / Lecturer's references:** | | | | | | |
| 1. MOŽEK, Matej, VRTAČNIK, Danilo, RESNIK, Drago, PEČAR, Borut, AMON, Slavko. Adaptive calibration and quality control of smart sensors. V: IVANOV, Ognyan (ur.). Applications and experiences of qulity control. Rijeka: Intech, cop. 2011, str. 645-662  2. MOŽEK, Matej, VRTAČNIK, Danilo, RESNIK, Drago, PEČAR, Borut, AMON, Slavko. Digital temperature compensation of capacitive pressure sensors = Digitalna temperaturna kompenzacija kapacitivnih senzorjev tlaka. Informacije MIDEM, ISSN 0352-9045, mar. 2010, letn. 40, št. 1, str. 38-44  3. SANTO-ZARNIK, Marina, MOŽEK, Matej, MAČEK, Srečo, BELAVIČ, Darko. An LTCC-based capacitive pressure sensor with a digital output = Kapacitivni senzor tlaka z digitalnim izhodom izdelan v LTCC tehnologiji. Informacije MIDEM, ISSN 0352-9045, 2010, vol. 40, no. 1, str. 74-81  4. RESNIK, Drago, VRTAČNIK, Danilo, ALJANČIČ, Uroš, MOŽEK, Matej, AMON, Slavko. Experimental study of Ti/Pt thin film heater and temperature sensors on Si platform. V: IEEE Sensors 2009 Conference, 25-28 October 2009, Christchurch, New Zealand. Sensors 2009. [S. l.]: IEEE, cop. 2009, str. 635-638  5. RESNIK, Drago, HOČEVAR, Stanko, BATISTA, Jurka, VRTAČNIK, Danilo, MOŽEK, Matej, AMON, Slavko. Si based methanol catalytic micro combustor for integrated steam reformer applications. Sensors and actuators. A, Physical, ISSN 0924-4247, Jun. 2012, vol. 180, no. 1, str. 127-136 | | | | | | |