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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Zvezni signali in sistemi | | | | | | | | | | | | | | |
| **Course title:** | | | Continuous Signals and Systems | | | | | | | | | | | | | | |
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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 | | | | | **Telekomunikacije** | | | | | | | | 3. | | zimski | | |
| 1st cycle academic study programme Electrical Engineering | | | | | **Telecommunications** | | | | | | | | **3.** | | **winter** | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Obvezni- strokovni/compulsory professional | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64166 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| **45** |  | | | **45** | | |  | | | |  | | | **85** | |  | **7** |
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| **Nosilec predmeta / Lecturer:** | | | | | Andrej Košir | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | Slovensko / Slovenian | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | Slovensko / 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):** | | | | | | | |
| Časovno zvezni linearni vzročni časovno invariantni sistemi (LTI, sistemska enačba).  Zvezni signali (definicija, vrste signalov in komponiranje signalov, značilne vrednosti). Predstavitev in analiza zveznih signalov (amplitudni in fazni spekter, energijski in močnostni spekter), Laplaceova transformacija.  Definicija, lastnosti in omejitve strnjenega linearnega sistema/vezja, model vezja. Topološki opis vezja, vpadna matrika, matrika mreže, vejna, zančna in vozliščna metoda opisa sistema. Transformacija virov in Tellegenov teorem.  Klasična analiza vezja z interpretacijo rešitve, konvolucija. Izmenična analiza: kazalci, sistemska funkcija, kompleksna moč, enovhodna vezja (ekvivalence, teorem o maksimalnem prenosu moči, resonanca), dvovhodna vezja (parametri in združevanje, preslikave impedanc, impedančno prilagajanje, prevajalne funkcije).  Analiza sistemov s Fourierjevo vrsto in Fourierjevo transformacijo. Analiza sistemov z Laplaceovo transformacijo. Sistemi s povratno vezavo (analiza, kavzalnost in stabilnost). | | | | | | | |  | | Continuous time linear casual time invariant systems (LTI, system equation).  Basic continuous time electric signals: selected types and operations. Representation and analysis of continuous signals using Fourier series, Fourier transform (frequency and power spectrum) and Laplace transform.  Definition, properties and limitations of a linear circuit. Topological circuit description, describing a circuit using matrix equations. Using different methods to analyse the circuit (branch current method, window current method and intersection potential method). Power source transformation theorem and Tellengen’s theorem.  Classical analysis of circuits using differential equations, interpretation, convolution. Steady state analysis (pointers, system function, power). Single input circuits (Thevenin equivalent, maximum power transmission theorem, resonance). Dual-input circuits: reciprocity theorem, modelling circuit as a quadripole and determining different quadripole parameters. Spectral analysis (using spectrum to analyse circuits), using Laplace to analyse circuits. Linear feedback systems (analysis, causality and stability). | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. B. P. Lahti: Linear Systems and Signals, Oxford University Press, 2005.  2. A. V. Oppenheim, A. S. Willsky: Signals and Systems, Pearson Education Lim., 2014.  3. J. Mlakar: Linearna vezja in signali, Založba FE in FRI, 2007.  4. A. Košir: Linearna vezja in signali, zbirka rešenih vaj, Založba FE in FRI, 2005. | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Poznavanje temeljnega znanja o strnjenih električnih vezjih in analizah linearnih električnih vezij in linearnih sistemov. Poznavanje predstavitve, komponiranja in analize zveznih signalov. Spoznavanje temeljev LTI sistemov. Temeljna znanja in razumevanje analize linearnih sistemov in izbranih fenomenov v linearnih sistemih. | |  | | Basic understanding of linear circuits and systems. Understanding of the relationship between continuous time signal representations and linear system analysis. Recognition of a system type according to types of their components. Recognition and understanding of selected phenomena in linear systems. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| * Zmožnost razpoznave, uporabe in analize signalov * Zmožnost uporabe osnovnih operacij na signalih * Poznavanje metod analize prehodnih pojavov in stacionarnih stanj * Poznavanje osnovnih lastnosti kot so časovna invariantnost, vzročnost in stabilnost * Poznavanje osnovnih lastnosti sistemov s povratno vezavo | | |  | * ability to recognize, use, and analyse signals * ability to understand basic signals operations * knowledge of methods for finding the system transient and steady state responses. * understanding of basic linear dynamic systems concepts such as time invariance, causality and stability * knowledge of main properties of linear feedback systems | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja, domače naloge in avditorne vaje | | |  | Lectures, home projects and tutorials. | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Način: Vadnice, ustni izpit, pisni izpit  Ocene od 1 do vključno 5 so negativne, ocene od vključno 6 do 10 so pozitivne.  Sprejete vadnice pogoj za pristop k izpitu.  Prispevki k oceni:  Vadnice  Pisni izpit  Ustni izpit | 0%  50 %  50 % | | | | Type: homeworks, oral exam, written 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:  Homeworks  Written exam  Oral exam |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. KOVAČ, Uroš, KOŠIR, Andrej. Fast estimation of the non-stationary amplitude of a harmonically distorted signal using a Kalman filter. Metrol. Syst. Pomiarowe, 2013, str. 27-42.  2. PERKON, Igor, KOŠIR, Andrej, ITSKOV, Pavel M., TASIČ, Jurij F., DIAMOND, Mathew. Unsupervised quantification of whisking and head movement in freely moving rodents. Journal of neurophysiology, 2011, str. 1950-1962.  3. PESKO, Marko, JAVORNIK, Tomaž, VIDMAR, Luka, KOŠIR, Andrej, ŠTULAR, Mitja, MOHORČIČ, Mihael. The indirect self-tuning method for constructing radio environment map using omnidirectional or directional transmitter antenna. EURASIP Journal on wireless communications and networking, 2015, str. 1 – 12.  4. KOŠIR, Andrej, MUJČIĆ, Aljo, SULJANOVIĆ, Nermin, TASIČ, Jurij F. Noise variance estimation based on measured maximums of sampled subsets. Math. comput. Simul, 2004, str. 629-639.  5. VODLAN, Tomaž, KOŠIR, Andrej. Using social signal of hesitation in multimedia content retrieval: Graphical analysis of selection traces in the matrix-factorization space of multimedia items. International journal of advanced computer science & applications, 2014, str. 1-26. | | | | | |