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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Vezja in signali v energetiki | | | | | | | | | | | | | | |
| **Course title:** | | | Circuits and Signals in Power Engineering | | | | | | | | | | | | | | |
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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 | | | | | Mehatronika, Elektroenergetika | | | | | | | | 1 | | 1 | | |
| 2nd cycle masters study programme in Electrical Engineering | | | | | Mechatronics, Electrical Power Engineering | | | | | | | | 1 | | 1 | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Obvezni-strokovni / Compulsory professional | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64215 | | | | | |
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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** |
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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):** | | | | | | | |
| Definicija, lastnosti in omejitve strnjenega linearnega vezja, karakteristike idealnih elementov.  Bazični električni signali: harmonični signal, enotina stopnica, enotin impulz in operacije na signalih.  Topološki opis vezja, vpadna matrika, matrika oken grafa, vejna, zančna in vozliščna metoda postavljanja enačb vezja.  Teorem o transformaciji virov, dualnost in Tellegenov teorem.  Klasična analiza: sistemska diferencialna enačba in njena rešitev, začetni pogoji in interpretacija rešitve.  Konvolucijska metoda.  Izmenična analiza: kazalci, sistemska funkcija, imitančna in prevajalna funkcija, kompleksna moč in Tellegenov teorem.  Enovhodna vezja: Théveninov in Nortonov dvopol, teorem o maksimalnem prenosu moči, resonanca.  Dvovhodna vezja: teorem o recipročnosti, parametri dvovhodnih vezij, ekvivalentna vezja in združevanje. Vhodna impedanca, preslikave impedanc in impedančno prilagajanje, prevajalne lastnosti in prevajalna funkcija.  Analiza s spektri: Signalni spektri, uporaba Fourierove trigonometrijske in eksponentne vrste in integrala pri analizi linearnih vezij.  Laplaceova transformacija: Laplaceov transform, model vezja v domeni kompleksne frekvence, začetno stanje vezja, sistemska funkcija, analiza vezij z Laplaceovo transformacijo. Računanje inverzne transformacije. | | | | | | | |  | | Definition, characteristics and limitations of the built-linear circuits, the characteristics of ideal elements.  Basic electrical signals: the harmonic signal, unit step, unit impulse and operations on signals.  Topological circuit description, the incidence array, the array of graph windows, loop and nodal method of setting circuit equations.  Theory of the source transformation, and Tellegen duality theorem.  Classical Analysis: System differential equation and its solution, initial conditions and interpretation solutions.  Convolution.  AC analysis: indicators, system function, imitance and transfer function, complex power and Tellegen theorem.  Single input circuits, Thevenin and Norton equivalent circuit, theorem of maximum power transmission, resonance.  Two port circuits: the reciprocity theorem, the parameters of port circuits, the equivalent circuit and integration. The input impedance, impedance mapping and impedance adaptation, conductivity and transfer function.  Spectral analysis: Signal spectrum, using Fourier trigonometric and exponential type and integral in the analysis of linear circuits.  Laplace transform: Laplace transform, circuit model in the complex frequency domain, the initial state of the circuit, system function, circuit analysis with Laplace transform. Calculating the inverse transformation. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. B. P. Lahti: Linear Systems and Signals, Oxford university press, 2005 2. P. D. Cha, J. I. Molinder: Fundamentals of Signals and Systems, Cambridge university press, 2006 3. J. Mlakar: Linearna vezja in signali, Založba FE in FRI, 2002 4. A. Košir: Linearna vezja in signali, zbirka rešenih vaj, Založba FE in FRI, 2005. | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Temeljno znanje o električnih vezjih in signalih. Temeljno znanje o analizi linearnih sistemov in o izbranih fenomenih v električnih sistemih. | |  | | Basic knowledge of electrical circuits and signals. Basic knowledge of linear systems analysis and on selected phenomena in electrical 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. | | | | | |