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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Matematika IV | | | | | | | | | | | | | | | |
| **Course title:** | | | Mathematics IV | | | | | | | | | | | | | | | |
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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 | | | | | **Ni smeri** | | | | | | | | 2. | | letni | | | |
| 1st cycle academic study programme Electrical Engineering | | | | |  | | | | | | | | **2.** | | **summer** | | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Obvezni – splošni/compulsory general | | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64115 | | | | | | |
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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:** | | | | | Gregor Dolinar, Melita Hajdinjak | | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja/Lectures:** | | | | slovenski | | | | | | | | | | | | |
|  | | **Vaje / Tutorial:** | | | | slovenski | | | | | | | | | | | | |
| **Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** | | | | | | | | |  | **Prerequisits:** | | | | | | | |  |
| Vpis v letnik študija ter opravljeni izpiti Matematika I, Matematika II in Matematika III.  Namesto opravljenih izpitov pri predmetih Matematika I, Matematika II in Matematika III zadostujejo tudi opravljeni izpiti, ki pokrivajo naslednje vsebine: številske množice (naravna števila, racionalna števila, realna števila, kompleksna števila), zaporedja (stekališče, limita, omejenost), številske vrste (konvergenca, kriteriji za konvergenco vrste, alternirajoča vrsta), funkcije (definicijsko območje, zaloga vrednosti, sodost in lihost, injektivnost, surjektivnost, bijektivnost, kompozitum, inverzna funkcija, elementarne funkcije, limita, zveznost), odvod funkcije (pravila za odvajanje, geometrijska interpretacija, diferencial, uporaba odvoda), integral funkcije (nedoločeni integral, določeni integral, uporaba integrala), funkcijske vrste (potenčna vrsta, Taylorjeva vrsta, Fourierjeva vrsta), funkcije dveh in več spremenljivk (parcialni odvodi, odvod posredne funkcije, ekstrem, vezani ekstrem), diferencialne enačbe (enačbe prvega reda (ločljive spremenljivke, linearna, eksaktna), linearne enačbe višjih redov (konstantni koeficienti, Eulerjeva), sistemi diferencialnih enačb, linearno neodvisne rešitve), kompleksna analiza (analitične funkcije, elementarne kompleksne funkcije, integriranje kompleksnih funkcij, Laurentova vrsta, teorija residuov). | | | | | | | | |  | Enrolment in the year of the course and completed exams Mathematics I, Mathematics II, and Mathematics III.  The exams Mathematics I, Mathematics II, and Mathematics III can be replaced by exams that cover the following topics: number systems (positive integers, rational numbers, real numbers, complex numbers), sequences (accumulation points, limit, boundedness), series (convergence, convergence tests, harmonic series, alternating series), functions of one real variable (domain of definition, image, oddness and evenness, injectivity, surjectivity, bijectivity, composition, inverse function, elementary functions, continuity, limit), derivative of a function (derivation rules, geometric interpretation, differential, applications), integral of a function (indefinite integral, definite integral, applications of definite integral), function series (power series, Taylor series, Fourier series), functions of two and more variables (partial derivatives, chain rule, extrema, conditional extrema), ordinary differential equations (ODE) of the first order (with separable variables, linear), ODE of higher orders (with constant coefficients, Euler's equation), linear systems of ODEs, linearly independent solutions, complex analysis (complex analytic functions, elementary complex functions, complex integration, Laurent series, theory of residues). | | | | | | | | |
| Vsebina: | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |  |
| Integralske transformacije (Fourierova transformacija, Laplaceova transformacija). Specialne funkcije (Gamma funkcija, Beta funkcija, Besselova funkcija). Parcialne diferencialne enačbe (enačba valovanja, enačba za prevajanje toplote, Laplaceova enačba). Variacijski račun (Eulerjeva enačba). Metoda končnih elementov. | | | | | | | |  | | Integral transformations (Fourier transformation, Laplace transformation). Special functions (Gamma function, Beta function, Bessel functions). Partial differential equations wave equation, heat equation, Laplace equation). Calculus of variations (Euler equation). The finite element method. | | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |  |
| 1. G. Tomšič, T. Slivnik: Matematika IV, Založba FE in FRI, Ljubljana, 2004. 2. E. Kreyszig: Advanced engineering mathematics, John Wiley & Sons, 2006. 3. R. L. Burden, J. D. Faires: Numerical Analysis, 9th Edition, Brooks/Cole, 2011. 4. L. Komzsik: Applied Calculus of Variations for Engineers, CRC Press, Taylor & Francis Group, Boca Raton, 2009. 5. T. Žitko: Zbirka nalog iz Matematike IV, Založba FE in FRI, Ljubljana, 2004. 6. Spletna učilnica eFE https://e.fe.uni-lj.si | | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |  |
| Nadgradnja pojmov, postopkov in zakonitosti matematične analize. Njihova osvojitev in sposobnost uporabe pri tehničnih problemih. Razvoj analitičnega razmišljanja ter skrbnega in natančnega sklepanja. | |  | | To upgrade the concepts, procedures, and laws of mathematical analysis. To master them and acquire the ability to use them in practice for solving technical problems. To develop analytical thinking and careful and exact mathematical reasoning. | | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |  |
| Poznavanje in razumevanje integralskih transformacij, nekaterih specialnih funkcij in variacijskega računa. Sposobnost reševanja najpomembnejših parcialnih diferencialnih enačb ter analize in matematične interpretacije tehničnih problemov. Sposobnost uporabe programskih orodij pri reševanju teh problemov.  Pri analizi in reševanju tehničnih problemov.  Kritična analiza uporabe osnovnih matematičnih postopkov in zakonitosti pri reševanju tehničnih problemov, s katerimi se srečamo v praksi.  Identifikacija, analiza, matematična interpretacija in reševanje problemov. Natančnost, doslednost, skrbnost in urejenost. | | |  | Knowledge and understanding of integral transformations, some special functions, and calculus of variations. The ability to solve the most important partial differential equations and to analyse and mathematically interpret technical problems. The ability to use computes software for analysing and solving these problems.  Critical analysis of the use of the basic mathematical procedures and laws for solving technical problems that we encounter in practise.  The identification, analysis, mathematical interpretation, and solving of problems. Exactness, consistency, diligence, and tidiness. | | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |  |
| Predavanja, avditorne vaje, laboratorijske vaje in domače naloge. Skupinska analiza, interpretacija in reševanje tehničnih problemov. | | |  | Lectures, tutorials, laboratory tutorials and homework assignments. Collective analysis, interpretation, and solving of technical problems. | | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |  |
| Načini:  - domače naloge,  - preverjanje laboratorijskih vaj,  - pisni izpit,  - ustni izpit.  K izpitu lahko pristopijo tisti, ki pravilno rešijo določeno število domačih nalog, pozitivno opravijo preverjanje laboratorijskih vaj in so prisotni na določenem številu avditornih in laboratorijskih vaj.  Ocenjevalna lestvica:  negativno (od 1 do 5),  pozitivno (od 6 do 10).  Pozitivna ocena na pisnem izpitu je pogoj za pristop k ustnemu izpitu. Pozitivna ocena na ustnem izpitu je pogoj za skupno pozitivno oceno.  Kandidat lahko opravi pisni izpit tudi z dvema kolokvijema.  Prispevki k oceni:  - pisni izpit,  - ustni izpit. | 50%  50% | | | | Types:  - homework assignments,  - evaluation of laboratory exercises,  - writing exam,  - oral exam.  Only those who solve a predetermined number of homework assignments, pass the evaluation of laboratory exercises and have a sufficient visit of tutorials and laboratory exercises can attend the exams.  Grading scale:  negative (1-5),  positive (6-10).  Positive grade at the writing exam is a prerequisite for the oral exam. Positive grade at the oral exam is a prerequisite for a positive final grade.  The candidate can also pass the final exam by attending two partial exams.  Contributions to final grade:  - writing exam,  - oral exam. | |
| **Reference nosilca / Lecturer's references:** | | | | | |  |
| **Gregor Dolinar**  1. DOLINAR, Gregor, KUZMA, Bojan, NAGY, Gergő, SZOKOL, Patrícia. Restricted skew-morphisms on matrix algebras. *Linear Algebra and its Applications*, ISSN 0024-3795, 2016, vol. 490, str. 1-17.  2. DOLINAR, Gregor, GUTERMAN, Aleksandr Èmilevič, MAROVT, Janko. Monotone transformations on B(H) with respect to the left-star and the right-star partial order. *Mathematical inequalities & applications*, ISSN 1331-4343, 2014, vol. 17, no. 2, str. 573-589.  3. DOLINAR, Gregor, GUTERMAN, Aleksandr Èmilevič, KUZMA, Bojan, OBLAK, Polona. Commuting graphs and extremal centralizers. *Ars mathematica contemporanea*, ISSN 1855-3966, 2014, vol. 7, no. 2, str. 453-459.  4. DOLINAR, Gregor, MOLNÁR, Lajos. Automorphisms for the logarithmic product of positive semidefinite operators. Linear and Multilinear Algebra, ISSN 0308-1087, 2013, vol. 61, no. 2, str. 161-169.  5. PERUTKOVÁ, Šárka, DANIEL, Matej, RAPPOLT, Michael, PABST, Georg, DOLINAR, Gregor, KRALJ-IGLIČ, Veronika, IGLIČ, Aleš. Elastic deformations in hexagonal phases studied by small-angle X-ray diffraction and simulations. PCCP. Physical chemistry chemical physics, ISSN 1463-9076, Feb. 2011, vol. 13, no. 8, str. 3100-3107.  **Melita Hajdinjak**  1. SULIĆ KENK, Vildana, MANDELJC, Rok, KOVAČIČ, Stanislav, KRISTAN, Matej, HAJDINJAK, Melita, PERŠ, Janez. Visual re-identification across large, distributed camera networks. Image and vision computing, ISSN 0262-8856, Feb. 2015, vol. 34, str. 11-26.  2. VODOPIVEC, Samo, HAJDINJAK, Melita, BEŠTER, Janez, KOS, Andrej. Vehicle interconnection metric and clustering protocol for improved connectivity in vehicular ad hoc networks. EURASIP Journal on wireless communications and networking, ISSN 1687-1499, 2014, 2014, 170, str. 1-14.  3. RUGELJ, Miha, SEDLAR, Urban, VOLK, Mojca, STERLE, Janez, HAJDINJAK, Melita, KOS, Andrej. Novel cross-layer QoE-aware radio resource allocation algorithms in multiuser OFDMA systems. IEEE transactions on communications, ISSN 0090-6778, Sep. 2014, vol. 62, no. 9, str. 3196-3208.  4. HAJDINJAK, Melita, BIERMAN, Gavin M. Extending relational algebra with similarities. Mathematical structures in computer science, ISSN 0960-1295, Aug. 2012, vol. 22, no. 4, str. 686-718.  5. HAJDINJAK, Melita, MIHELIČ, France. The PARADISE evaluation framework : issues and findings. Computational linguistics, ISSN 0891-2017, Jun. 2006, vol. 32, iss. 2, str. 263-272. | | | | | | |