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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Modul A: Slikovna informatika | | | | | | | | | | | | | | |
| **Course title:** | | | Module A: Imaging Informatics | | | | | | | | | | | | | | |
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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 | | | | | **Vse smeri** | | | | | | | | 3. | | letni | | |
| 1st cycle academic study programme Electrical Engineering | | | | | **All fields** | | | | | | | | **3.** | | **summer** | | |
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| **Vrsta predmeta / Course type** | | | | | | | | | | | | Izbirni – splošni/ elective general | | | | | |
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| **Univerzitetna koda predmeta / University course code:** | | | | | | | | | | | | 64135 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| **30** |  | | | **30** | | |  | | | |  | | | **65** | |  | **5** |
|  | | | | | | | | | | | | | | | | | |
| **Nosilec predmeta / Lecturer:** | | | | | Boštjan Likar | | | | | | | | | | | | |
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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. | | | | | | | | |  | Enrolment in the year of the course. | | | | | | | |
| **Vsebina:** | | | | | | | |  | | **Content (Syllabus outline):** | | | | | | | |
| Človeški vid: struktura očesa, nastanek slike, prilagajanje svetlobi, prostoru in sceni, prostorska in svetlostna ločljivost, zaznavanje barv, optične prevare, interpretacija in razumevanje slik.  Digitalne slike in videi: predstavitve in definicije, prostorsko in časovno vzorčenje ter kvantizacija vrednosti, vrste in načini pridobivanja slik, parametri kakovosti.  Prikazovanje in manipulacija slik in videov: prikazovanje sivinskih, barvnih in večdimenzionalnih slik in videov s pomočjo prerezov in projekcij, upodabljanje površine in volumna, interpolacija in decimacija, sivinske in geometrijske preslikave, aritmetične operacije.  Zgoščevanje slik in videov: osnove zgoščevanja, redundanca kodiranja, prostorska in časovna redundanca, nepomembna informacija, merjenje informacije in kakovosti, sistemi za zgoščevanje, formati in standardi za zgoščevanje.  Obdelava, obnova in analiza: filtriranje in obnavljanje kakovosti, morfološka obdelava slik, obdelava barvnih slik, osnovni postopki za razgradnjo, kvantitativno vrednotenje in razumevanje slikovne vsebine.  Uporaba slikovnih podatkov: na različnih področjih v vsakdanjem življenju, industriji in biomedicini za pridobivanje večdimenzionalnih informacij o prostoru, objektih in subjektih. | | | | | | | |  | | Human vision: eye structure, image formation, adaptation to light, space and scene, resolution, color sensing, optical illusions, image interpretation and understanding.  Digital images and videos: representations and definitions, space and time sampling, quantization, image acquisition technologies, quality parameters.  Visualization and manipulation: visualization of greyscale, color and multi-dimensional data via cross-sections and projections, surface and volume rendering, intensity and geometric transformations, arithmetic operations.  Compression: compression fundamentals, coding, spatial and temporal redundancy, irrelevant information, measuring image information and quality, compression systems, formats and standards.  Processing, restoration and analysis: filtering and quality improvement, morphological image processing, color image processing, fundamentals of segmentation, quantitative analysis and image understanding.  Applications: in general use, in industry and in biomedicine for the acquisition of multi-dimensional information about space, objects and subjects. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | | | | |
| 1. R.C. Gonzalez, R.E. Woods, Digital Image Processing, Prentice Hall, 3rd edition, 2008.  2. B. Likar, Biomedicinska slikovna informatika in diagnostika, Založba FE in FRI, 1. izdaja, 2008.  Elektronsko gradivo – prosojnice predavanj in navodila za vaje: <http://lit.fe.uni-lj.si/SI> | | | | | | | | |
| **Cilji in kompetence:** | | |  | | **Objectives and competences:** | | | |
| Spoznati lastnosti človeškega vida, načine pridobivanja digitalnih slikovnih podatkov ter postopke za njihovo prikazovanje, manipulacijo, zgoščevanje, obdelavo in uporabo v vsakdanjem življenju, industriji in biomedicini. | | |  | | The aim of the subject is to introduce basic properties of human vision and the technologies for digital image acquisition, visualization, manipulation, compression, processing, and for problem solving in general use, in industry and in biomedicine. | | | |
| **Predvideni študijski rezultati:** | | | |  | **Intended learning outcomes:** | | | |
| Vrste slikovnih podatkov in informacij ter postopki za njihovo upravljanje, obdelavo in uporabo. | | | |  | Types of images and information contents, procedures for image management, processing and general use. | | | |
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| **Metode poučevanja in učenja:** | | | |  | **Learning and teaching methods:** | | | |
| Teoretične osnove, postopke in primere uporabe študentje spoznajo na predavanjih, praktična znanja pa pridobijo z reševanjem nalog na laboratorijskih vajah. | | | |  | Basic theory, procedures and practical examples are considered at lectures, while practical knowledge is gained through problem-solving tasks at lab works. | | | |
| **Načini ocenjevanja:** | | Delež (v %) /  Weight (in %) | | | | | **Assessment:** | |
| Laboratorijske vaje  Teoretično znanje (ustni izpit) | | 50%  50% | | | | | Lab works  Theoretical knowledge (oral exam) | |
| **Reference nosilca / Lecturer's references:** | | | | | | | | |
| 1. Bulat Ibragimov, Boštjan Likar, Franjo Pernuš in Tomaž Vrtovec, Shape representation for efficient landmark-based segmentation in 3D, IEEE Transactions on Medical Imaging, 2014.  2. Jaka Katrašnik, Franjo Pernuš in Boštjan Likar, A method for characterizing illumination systems for hyperspectral imaging, Optics Express, 21(4):4841-4853, 2013.  3. Miha Možina, Dejan Tomaževič, Franjo Pernuš in Boštjan Likar, Automated visual inspection of imprint quality of pharmaceutical tablets, Machine Vision and Applications, 24(1):66-73, 2013.  4. Primož Markelj, Dejan Tomaževič, Boštjan Likar in Franjo Pernuš, A review of 3D/2D registration methods for image-guided interventions, Medical Image Analysis, 16(3):642-661, 2012.  5. Žiga Špiclin, Boštjan Likar in Franjo Pernuš, Groupwise registration of multi-modal images by an efficient joint entropy minimization scheme, IEEE Transactions on Image Processing, 21(5):2546-2558, 2012. | | | | | | | | |