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| **UČNI NAČRT PREDMETA / COURSE SYLLABUS** | | | | | | | | | | | | | | | | | |
| **Predmet:** | | | Biomedicinska informatika | | | | | | | | | | | | | | |
| **Course title:** | | | Biomedical Informatics | | | | | | | | | | | | | | |
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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 | | | | | Biomedicinska tehnika | | | | | | | | 1 | | 1 | | |
| 2nd cycle masters study programme in ELECTRICAL ENGINEERING | | | | | Biomedical 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:** | | | | | | | | | | | | 64209 | | | | | |
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| **Predavanja**  **Lectures** | **Seminar**  **Seminar** | | | **Vaje**  **Tutorial** | | | **Klinične vaje**  **work** | | | | **Druge oblike študija** | | | **Samost. delo**  **Individ. work** | |  | **ECTS** |
| **45** | **0** | | | **30** | | |  | | | |  | | | **75** | |  | **6** |
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| **Nosilec predmeta / Lecturer:** | | | | | Tomaž Vrtovec | | | | | | | | | | | | |
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| **Jeziki /**  **Languages:** | | **Predavanja / Lectures:** | | | | **Slovenski ali angleški jezik / Slovenian or English language** | | | | | | | | | | | |
| **Vaje / Tutorial:** | | | | **Slovenski ali angleški jezik / Slovenian or English language** | | | | | | | | | | | |
| **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):** | | | | | | | |
| Biomedicinski podatki in informacije; računalništvo in informatika v biomedicini; vloga informacijsko podprtega odločanja v biomedicini; načrtovanje sistemov v biomedicini; standardi v biomedicinski informatiki; zaščita biomedicinskih podatkov; etični vidik biomedicinske informatike; osnove klinične, zdravstvene, slikovne in bioinformatike; dostopanje ter priklic biomedicinskih informacij iz zbirk podatkov; sistemi za podporo pri odločanju v zdravstvu; sistemi za podporo pri izobraževanje v zdravstvu; razvoj in trženje informacijskih tehnologij ter sistemov v medicini in zdravstvu; osnove biostatistike. | | | | | | | |  | | Biomedical data and information; computer science and informatics in biomedicine; the role of information-driven decision making in biomedicine; development of biomedical systems; standards in biomedical informatics; protection of biomedical data; ethical aspects of biomedical informatics; basics of clinical, health, imaging and bioinformatics; access and retrieval of biomedical information from databases; decision-support systems in healthcare; education in healthcare; development and marketing of informatics technology in medicine and healthcare; basics of biostatistics. | | | | | | | |

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| **Temeljni literatura in viri / Readings:** | | | | | |
| 1. Biomedical Informatics, E.H. Shortliffe, J.J. Cimino, Springer, 2006. 2. Medical Informatics: Knowledge Management and Data Mining in Biomedicine, H. Chen, S.S. Fuller, C. Friedman, W. Hersh (Eds.), Springer, 2010. 3. PACS and Imaging Informatics: Basic Principles and Applications, H.K. Huang, Wiley- Blackwell, 2010. 4. Basic Epidemiology, R. Bonita, R. Beaglehole, T. Kjellström, WHO, 2. izdaja, 2006. 5. Introductory Biostatistics, C.T. Le, Wiley-Interscience, 2003. | | | | | |
| **Cilji in kompetence:** | |  | | **Objectives and competences:** | |
| Namen predmeta je spoznati področje biomedicinske informatike, ki se ukvarja s shranjevanjem, priklicem, zaščito, prenosom, standardizacijo in optimalno uporabo biomedicinskih podatkov in informacij. Poseben poudarek je namenjen predstavitvi pomena upravljanja in integracije biomedicinskih podatkov in informacij za dvigovanje kakovosti in učinkovitosti dela ter reševanje problemov in sprejemanje odločitev na kliničnem, znanstvenem, izobraževalnem, tehnološkem, družbenem in finančnem področju. Praktična znanja študentje pridobijo pri laboratorijskih vajah, kjer se seznanijo z obstoječimi standardi ter uveljavljenimi tehnikami in metodami za zaščito, shranjevanje, prenos in priklic biomedicinskih podatkov in informacij ter izdelajo računalniške oziroma informacijsko podprte postopke za njihovo uporabo. | |  | | The course aims to present an overview of the field of biomedical informatics, which is concerned with storage, retrieval, protection, transport, standardization and optimal usage of biomedical data and information. The importance of managing and integrating biomedical data and information for the purpose of increasing the quality and efficiency of problem solving and decision making is presented from the clinical, scientific, educational, technological, social, as well as financial point of view. Practical laboratory work consists of implementing computerized and computer-assisted techniques that adhere to the established standards in biomedical informatics and are used for protection, storage, transport and retrieval of biomedical data and information. | |
| **Predvideni študijski rezultati:** | | |  | **Intended learning outcomes:** | |
| Znanje in razumevanje: Razumevanje pomena upravljanja in integracije biomedicinskih informacij ter praktična znanja o obstoječih standardih, uveljavljenih tehnikah in metodah za shranjevanje, zaščito, prenos, priklic in uporabo biomedicinskih podatkov in informacij.  Uporaba: Pridobljena znanja so uporabna pri upravljanju z biomedicinskimi podatki in informacijami. Biomedicinska informatika je izrazito interdisciplinarno področje, ki združuje področja elektrotehnike, biomedicinske tehnike, računalništva in informatike, medicine, farmacije, biologije, upravljanja, sociologije in ekonomije.  Refleksija: Razumevanje prepletenosti področij v biomedicini, predvsem medicini in zdravstvu, ter vloge biomedicinske informatike pri upravljanju in integriranju podatkov in informacij na teh področjih.  Prenosljive spretnosti: Poznavanje učinkovitosti oz. neučinkovitosti ter ustreznosti oz. neustreznosti standardov, regulativ, etičnih predpisov ter tehnik in metod za shranjevanje, zaščito, priklic, prenos in uporabo biomedicinskih podatkov in informacij. | | |  | Knowledge and understanding: Understanding the importance of managing and integrating biomedical data and information, and practical knowledge of existing standards and established techniques for protection, storage, transport, retrieval and application of biomedical data and information.  Application: The knowledge gained is useful for managing biomedical data and information. Biomedical informatics is an extremely interdisciplinary field, merging approaches from biomedical, electrical and computer engineering, informatics, medicine, pharmacy, biology, management, sociology and economy.  Reflection: To understand the intertwinement of perspectives in biomedicine, especially medicine and healthcare, and the role of biomedical informatics in managing and integrating data and information within these fields.  Skills: To recognize the efficiency (or inefficiency) and adequacy (or inadequacy) of standards, regulations and ethical considerations, as well as of techniques and methods for storing, protection, retrieval, transport and application of biomedical data and information. | |
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| **Metode poučevanja in učenja:** | | |  | **Learning and teaching methods:** | |
| Predavanja so namenjena podajanju teoretičnih postopkov, obstoječih standardov ter uveljavljenih metod, ki so dodatno utemeljene z opisom praktičnih primerov na različnih področjih. Laboratorijske vaje so namenjene pridobivanju praktičnih znanj, in sicer izdelavi postopkov za računalniško oziroma informacijsko podprto zaščito, shranjevanje, prenos in priklic biomedicinskih podatkov in informacij. | | |  | During lectures, theoretical aspects of techniques, existing standards and established methods are given, which are additionally supported by descriptions of practical examples from different fields of application. During laboratory practice, techniques for computer-and information-based protection, storing, transport and retrieval of biomedical data and information are developed and implemented. | |
| **Načini ocenjevanja:** | Delež (v %) /  Weight (in %) | | | | **Assessment:** |
| Način: sprotne obveznosti iz laboratorijskih vaj, zagovor laboratorijskih vaj, pisni izpit, ustni izpit.  Ocene od 1 do vključno 5 so negativne.  Ocene od vključno 6 do 10 so pozitivne.  Pozitivna ocena sprotnih obveznosti laboratorijskih vaj je pogoj za pristop k zagovoru laboratorijskih vaj. Pozitivna ocena laboratorijskih vaj je pogoj za pristop k pisnemu izpitu. Pozitivna ocena pisnega izpita je pogoj za pozitivno končno oceno. Ustni izpit se opravi po potrebi v koliko želi študent spremeniti končno oceno.  Prispevki k oceni:   * sprotne obveznosti iz lab. vaj * zagovor laboratorijskih vaj * pisni izpit | 20%  30%  50% | | | | Type: laboratory work assignments, laboratory work defence, written exam, oral exam.  Negative grades: from 1 to 5.  Positive grades: from 6 to 10.  A positive grade of laboratory work assignments is a prerequisite for the laboratory work defence. A positive grade of laboratory work defence is a prerequisite for the written exam. A positive grade of the written exam is a prerequisite for a positive final grade. The oral exam is performed optionally when a student wishes to change the final grade.  Contributions to the final grade:   * laboratory work assignments * laboratory work defence * written exam |
| **Reference nosilca / Lecturer's references:** | | | | | |
| 1. Dejan Knez, Boštjan Likar, Franjo Pernuš in Tomaž Vrtovec. Computer-assisted screw size and insertion trajectory planning for pedicle screw placement surgery. IEEE Transactions on Medical Imaging, 35(6):1420-1430, 2016. [doi:10.1109/TMI.2016.2514530] [FV: 3.390 (2014); 18/249 engineering, electrical & electronic; 1. četrtina] 2. Robert Korez, Bulat Ibragimov, Boštjan Likar, Franjo Pernuš in Tomaž Vrtovec. A framework for automated spine and vertebrae interpolation-based detection and model-based segmentation. IEEE Transactions on Medical Imaging, 34(8):1649-1662, 2015. [doi:10.1109/TMI.2015.2389334] [FV: 3.390 (2014); 18/249 engineering, electrical & electronic; 1. četrtina] 3. Bulat Ibragimov, Jerry L. Prince, Emi Z. Murano, Jonghye Woo, Maureen Stone, Boštjan Likar, Franjo Pernuš in Tomaž Vrtovec. Segmentation of tongue muscles from super-resolution magnetic resonance images. Medical Image Analysis, 20(1):198-207, 2015. [doi:10.1016/j.media.2014.11.006] [FV: 3.654 (2014); 8/102 computer science, interdisciplinary applications; 1. četrtina] 4. Bulat Ibragimov, Boštjan Likar, Franjo Pernuš in Tomaž Vrtovec. Shape representation for efficient landmark-based segmentation in 3D. IEEE Transactions on Medical Imaging, 33(4):861-874, 2014. [doi:10.1109/TMI.2013.2296976] [FV: 3.390 (2014); 18/249 engineering, electrical & electronic; 1. četrtina] 5. Tomaž Vrtovec, Michiel M.A. Janssen, Boštjan Likar, René M. Castelein, Max A. Viergever in Franjo Pernuš. A review of methods for evaluating the quantitative parameters of sagittal pelvic alignment. The Spine Journal, 12(5):433-446, 2012. [doi:10.1016/j.spinee.2012.02.013] [FV: 3.355 (2012); 3/63 orthopedics; 1. četrtina] | | | | | |