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**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

<b>Predmet:</b>	<b>Biomedicinska informatika z osnovami znanstvene metodologije</b>
<b>Course title:</b>	<b>Biomedical Informatics with Basics of Scientific Methodology</b>

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Farmacija, 2. stopnja		1.	2.
Pharmacy, 2. level		1.	2.

**Vrsta predmeta / Course type** obvezni/obligatory

**Univerzitetna koda predmeta / University course code:**

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Clinical training	Druge oblike študija Other forms of study	Samost. delo Individual work	ECTS
30	15	15			90	5

**Nosilec predmeta / Lecturer:** red. prof. dr. Dejan Dinevski  
red. prof. dr. Pavel Skok

**Jeziki / Predavanja / Lectures:** slovenski/slovene  
**Languages: Vaje / Tutorial:** slovenski/slovene

**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** / **Prerequisites:** /

**Vsebina:**

- Informacijska in digitalna pismenost, lastnosti informacije, prvine informacijskih sistemov
- Informacije v znanosti; kakovost in uporaba informacij v raziskovalnem delu, napredne iskalne strategije v biomedicinskih vedah.
- Internet – razvoj in lastnosti, internetne storitve, svetovni splet, splet 2.0, semantični splet in uporaba v farmaciji
- Informacijska varnost – varnostne zahteve in mehanizmi ter pravni in etični vidiki varovanja informacij na zdravstvenem področju
- Definiranje informacijskih procesov obravnave in oskrbe pacienta v zdravstvenih institucijah (npr. lekarnah, bolnišnici...)
- Informacijska podpora procesom odločanja
- Biomedicinska informatika in klinična informatika: osnove, namen, področja uporabe v farmaciji in raziskovanju
- Medicinski informacijski standardi –DICOM, HL7, IHE

**Content (Syllabus outline):**

- Information and digital literacy, properties of information and information systems
- Information in science; information quality and usability in research, advanced search strategies in biomedicine.
- Internet – development and properties, internet services, world wide web, web 2.0, semantic web and usability in pharmacy
- Information security – security technologies and requirements, legal and ethical aspects of information protection in health systems
- Information processes definition in the field of medical treatment and care in health institutions (e.g. apothecaries, hospitals...)
- Information support for decision-making processes
- Biomedical informatics, clinical informatics: basics, purpose, application fields in pharmacy and research work.
- Medical information standards – DICOM, HL7, IHE

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- E-zdravje, zdravstvena omrežja, bolnišnični informacijski sistemi, elektronski zdravstveni karton, elektronski recepti, standardi v e-zdravju
- Telemedicina; zgodovina, tehnologije telemedicine, praktične aplikacije telemedicine, z dokazi podprte prednosti uporabe v farmaciji
- Kritično mišljenje v raziskovalnem delu; dejstvo, trditev, mnenje, teorija, dokaz, argumentiranje.
- Splošne metode znanstveno raziskovalnega dela, pomen povezanosti teoretičnih znanj in uporabe v farmaciji (oz. širše v biomedicini).
- Etična in pravna vprašanja pri raziskovanju v biomedicini (medicini in farmaciji). Definiranje odnosov vzrok – posledica v biomedicini.
- Razumevanje osnovnih statističnih pojmov v biomedicini (incidenca, prevalenca, pozitivna in negativna napovedna vrednost, občutljivost in specifičnost testov, lažno pozitivnih in negativnih rezultatov), pomena relativnega tveganja in razmerja obojev.
- Razlikovanje prospektivnih, retrospektivnih, epidemioloških, kontroliranih, randomiziranih, kohortnih, primer – kontrola raziskav, dvojno slepih.
- Pomen in uporaba statističnih orodij pri znanstveno raziskovalnem delu.

- E-health, health networks, hospital information systems, electronic health record, electronic prescription, e-health standards.
- Telemedicine; history, telemedicine technologies, applications of telemedicine, evidence based advantages of telemedicine in pharmacy.
- • Critical thinking in research work; fact, statement, opinion, theory, evidence, arguments.
- General methods of scientific research, the meaning of the connection of theoretical knowledge with its application in pharmacy (also in the wider field of biomedicine).
- Ethical and legislative questions in biomedical research (medicine and pharmacy). Definition of the cause – consequence relationship in biomedicine.
- Comprehension of basic statistic terms in biomedicine (incidence, prevalence, positive and negative prognostic values, sensitivity and specificity of tests, false positive and negative results), meaning of relative risk and expectation ratio.
- Distinction between prospective, retrospective, epidemiologic, follow-up, randomised, cohort, case – control, and double blind researches.
- Importance of computer technology and statistic software in scientific research work.

**Temeljni literatura in viri / Readings:**

**TEMELJNA LITERATURA:**

1. Shortliffe EH, Cimino J: Biomedical Informatics, Springer USA, 2021. Str. 1-464
2. Norman K. Denzin (Editor), Yvonna S. Lincoln (Editor) Handbook of Qualitative Research, 5th ed. Sage publications, London 2017.

**DODATNA LITERATURA:**

1. Holzinger A: Biomedical informatics, Medical University Graz, Published by BoD, Germany, 2012.

**Cilji in kompetence:**

- Doseči vse tri ravni informacijske pismenosti ter spoznati elemente in principe informacijske družbe.
- Pridobiti raven znanja in spretnosti za samostojno praktično uporabo informacijskih aplikacij za študij in raziskovalno delo
- Razviti sposobnost vrednotenja, iskanja, selekcije in umeščanja novih informacij ter pridobiti zmožnost njihove interpretacije, ocene relevantnosti in uporabe v odločitvenih procesih
- Spoznati področje in standarde biomedicinske informatike in vidike e- zdravja
- Pridobitev nekaterih teoretičnih znanj in praktičnih veščin, ki jih potrebuje raziskovalec pri

**Objectives and competences:**

- Acquire all three levels of information literacy and get to know the elements and principles of information society.
- To gain the knowledge for independent use of information applications for study and research
- To develop the ability to evaluate, search, select and use the new information, develop the capacity for interpretation and use in decision-making processes
- To get to know the field of biomedical informatics, its standards and the principles of e-Health applications
- To gain theoretical knowledge and practical skills needed for a researcher in biomedical research (medicine and pharmacy).

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<p>raziskovalnem delu v biomedicini (medicina in farmacija).</p> <ul style="list-style-type: none"> <li>Razumeti pomen znanosti in pogojev za raziskovalno delo ter ustvarjanje novega znanja,</li> <li>Spoznati osnove raziskovalnega dela v biomedicini (medicina in farmacija) in bioznanostih, povezavo in pomen epidemiologije, biostatistike in njenih orodij.</li> </ul>	<ul style="list-style-type: none"> <li>Understanding the meaning of science and research working conditions and acquiring new knowledge,</li> <li>Acquiring basic knowledge about research in biomedicine (medicine and pharmacy) and biosciences, relationship and importance of epidemiology, biostatistics and their tools.</li> </ul>
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**Predvideni študijski rezultati:**

**Intended learning outcomes:**

<p><u>Znanje in razumevanje:</u> Študent</p> <ul style="list-style-type: none"> <li>pozna področja biomedicinske informatike in e-zdravja ter telemedicine</li> <li>razume temeljne principe in standarde po katerih deluje prenos, shranjevanje in uporaba informacij ter delovanje farmacevtskih informacijskih sistemov</li> <li>razvije sposobnosti, ki omogočajo dosledno razlago raziskovalnih podatkov in zagotavljajo ustrezne informacije o pridobljenih rezultatih.</li> <li>razume pomen znanosti, kritičnega vrednotenja izsledkov raziskav v biomedicini (medicine in farmacije) in preverjanje domnev.</li> <li>se zaveda možnih napak pri analizah, sklepanju in prikazovanju rezultatov.</li> <li>pridobi sposobnost analize znanstveno raziskovalnih prispevkov, vsebinska in kvalitativna.</li> </ul>	<p><u>Knowledge and understanding:</u> Student</p> <ul style="list-style-type: none"> <li>acquires knowledge about biomedical informatics, e-Health and telemedicine</li> <li>understands basic principles and standards of data/information processes and usage.</li> <li>understands pharmaceutical information systems.</li> <li>develops strategies that enable consistent interpretation of research data and provide correct information on study results.</li> <li>understands the importance of science, critical assessment of the research results in biomedicine (medicine and pharmacy) and hypothesis testing.</li> <li>Is aware of the possibility of errors in analyses, conclusions and result presentations.</li> <li>acquires the ability of scientific research contributions, content and qualitative analysis.</li> </ul>
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**Metode poučevanja in učenja:**

**Learning and teaching methods:**

<p>Predavanja Seminar Vaje (Domače naloge, e-izobraževanje)</p> <p>V okviru seminarjev se bodo obravnavale aktualne teme s področja predmeta</p>	<p>Lectures Seminars Tutorial (Homework, e-learning)</p> <p>The seminars will cover trending topics in the subject area</p>
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<b>Načini ocenjevanja:</b>	<b>Delež (v %) / Weight (in %)</b>	<b>Assessment:</b>
<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt)</p> <ul style="list-style-type: none"> <li>Pisni izpit</li> </ul> <p>ŠTUDIJSKE OBVEZNOSTI ŠTUDENTOV</p> <ul style="list-style-type: none"> <li>Aktivno sodelovanje na vajah in seminarjih</li> </ul> <p>POGOJ ZA PRISTOP K IZPITU</p> <ul style="list-style-type: none"> <li>80 % prisotnost na vajah in seminarjih</li> </ul>	<p><b>100 %</b></p>	<p>Type (examination, oral, coursework, project):</p> <ul style="list-style-type: none"> <li>Written exam</li> </ul> <p>ACADEMIC OBLIGATIONS OF STUDENTS</p> <ul style="list-style-type: none"> <li>Active participation at seminars and tutorials.</li> </ul> <p>CONDITIONS FOR TAKING THE EXAM</p> <ul style="list-style-type: none"> <li>80 % attendance at seminars and tutorials.</li> </ul>

**Reference nosilca / Lecturer's references:**

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**DEJAN DINEVSKI:**

1. BIZJAK, Mojca, KOŠNIK, Mitja, TERHORST, Dorothea, **DINEVSKI, Dejan**, MAURER, Marcus. Cold agglutinins and cryoglobulins associate with clinical and laboratory parameters of cold urticaria. *Frontiers in immunology*, ISSN 1664-3224, 29 Apr. 2021, [Vol.] 12, str. 1-9, ilustr.
2. BIZJAK, Mojca, KOŠNIK, Mitja, **DINEVSKI, Dejan**, THOMSEN, Simon Francis, FOMINA, Daria, BORZOVA, Elena, KULTHANAN, Kanokvalai, MESHKOVA, Raisa, AARESTRUP, Fernando Monteiro, AHSAN, Dalia Melina, TERHORST, Dorothea, MAURER, Marcus (avtor, korespondenčni avtor), et al. Adrenaline autoinjector is underprescribed in typical cold urticaria patients. *Allergy*. [Online ed.]. 2022, vol. 77, str. [1-14],
3. **DINEVSKI, Dejan**, LUČOVNIK, Miha, ŽEBELJAN, Ivan, GUZELJ, Domen, VESENJAK DINEVSKI, Izidora, SALON, Adam, DE BOEVER, Patrick, GOSWAMI, Nandu. Analysis of retinal blood vessel diameters in pregnant women practicing yoga: a feasibility study. *Healthcare*. 2022, vol.10, iss.7, str. 1-6.

**PAVEL SKOK:**

1. FIJAČKO, Nino, MASTERSON CREBER, Ruth, GOSAK, Lucija, ŠTIGLIC, Gregor, EGAN, Dominic, CHAKA, Brian, DEBELJAK, Nika, STRNAD, Matej, **SKOK, Pavel**. Evaluating quality, usability, evidence-based content, and gamification features in mobile learning apps designed to teach children basic life support: systematic search in apps stores and content analysis. *JMIR mhealth and uhealth*. 2021, vol. 9, issue 7, str. 1-16, ilustr. ISSN 2291-5222. <https://mhealth.jmir.org/2021/7/e25437>, DOI: 10.2196/25437.
2. **SKOK, Pavel**, SKOK, Kristijan. Gut microbiota and the pathophysiology of cardiovascular disease. *Archives of Medical Science*. 2021,[str. 1-24], ilustr. ISSN 1896-9151. <https://www.archivesofmedicalscience.com/Gut-microbiota-and-the-pathophysiology-of-cardiovascular-disease,127177,0,2.html>, DOI: 10.5114/aoms/127177.
3. GORENJAK, Mario, ZUPIN, Mateja, JEZERNIK, Gregor, **SKOK, Pavel**, POTOČNIK, Uroš. Omics data integration identifies ELOVL7 and MMD gene regions as novel loci for adalimumab response in patients with Crohn's disease. *Scientific reports*. 2021, vol. 11, str. 1-12, ilustr. ISSN 2045-2322. <https://www.nature.com/articles/s41598-021-84909-z>, <https://doi.org/10.1038/s41598-021-84909-z>, DOI: 10.1038/s41598-021-84909-z.