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| **Naziv predmeta** | **Geni i bol - budućnost liječenja po mjeri** | | | | | | | | | | | | |
| **Kod** | MFMI… | Godina studija | | 1-6. | | | | | | | | | |
| **Nositelj/i predmeta** | doc. dr. sc. Sandra Kostić | Bodovna vrijednost (ECTS) | | 2 | | | | | | | | | |
| Suradnici | izv. prof. dr. sc. Katarina Vukojević | Način izvođenja nastave (broj sati u semestru) | | P | | S | V | | | T |  | | |
| 10 | | 15 |  | | |  |
| Status predmeta | Izborni | Postotak primjene e-učenja | |  | | | | | | | | | |
| **OPIS PREDMETA** | | | | | | | | | | | | | |
| Ciljevi predmeta | Cilj predmeta je omogućiti studentima razumijevanje i usvajanje temeljnih pojmova vezanih za bol i personalizirano liječenje boli na temelju saznanja iz područja genomike, proteomike i farmakogenomike. | | | | | | | | | | | | |
| Uvjeti za upis predmeta i ulazne kompetencije potrebne za predmet | Nema | | | | | | | | | | | | |
| Očekivani ishodi učenja na razini predmeta (4-10 ishoda učenja) | Nakon što odslušaju i polože ovaj kolegij, studenti će znati / moći:  - Opisati, raščlaniti i objasniti osnovne pojmove vezane za bol (nocicepcija, nociceptori, centralna i periferna senzitizacija, alodinija, hiperalgezija…)  - Navesti i objasniti razliku između akutne i kronične boli  - Identificirati, raščlaniti i opisati metode, lijekove i pristupe liječenja boli koji su danas dostupni pacijentima  - Navesti i objasniti najvažnija dostignuća u području farmakogenomike i objasniti njihov terapeutski potencijal.  - Imenovati i opisati primjere iz literature koji ukazuju na povezanost interakcije gena i okoline sa formiranjem praga tolerancije boli  - Opisati specifične poremećaje vezane za bol, uključujući i kongenitalnu neosjetljivost na bol | | | | | | | | | | | | |
| Sadržaj predmeta detaljno razrađen prema satnici nastave | *Predavanja:*  - Osnovni pojmovi vezani za bol – razlika akutne i kronične boli i trenutni pristupi u liječenju (prošlost i sadašnjost)  - Farmakogenomika – budućnost liječenja boli po mjeri  - Najnovije zanimljivosti u istraživanju genetike boli – od pretkliničkih pokusa do klinike  - Formiranje praga tolerancije na bol interakcijom gena i okoline: epigenetika  *Seminari:*  - Neosjetljivost na bol kao posljedica mutacije jednog gena, primjeri pacijenata | | | | | | | | | | | | |
| Vrste izvođenja nastave: | ☐ predavanja  ☐ seminari i radionice  ☐ vježbe  ☐ *on line* u cijelosti  ☐ mješovito e-učenje  ☐ terenska nastava | | | ☐ samostalni zadaci  ☐ multimedija  ☐ laboratorij  ☐mentorski rad  ☐       (ostalo upisati) | | | | | | | | | |
|
| Obveze studenata | Nazočnost na nastavi 80% predavanja, 90% seminari i 100% vježbe | | | | | | | | | | | | |
| Praćenje rada studenata *(upisati udio u ECTS bodovima za svaku aktivnost tako da ukupni broj ECTS bodova odgovara bodovnoj vrijednosti predmeta):* | Pohađanje nastave | 60% |  | |  | | |  | | | | |  |
| Seminarski rad |  |  | |  | | | (Ostalo upisati) | | | | |  |
| Pismeni ispit | 40% |  | |  | | | (Ostalo upisati) | | | | |  |
|  |  |  | |  | | | (Ostalo upisati) | | | | |  |
|  |  |  | |  | | | (Ostalo upisati) | | | | |  |
| Ocjenjivanje i vrjednovanje rada studenata tijekom nastave i na završnom ispitu | Pisani ispit | | | | | | | | | | | | |
| Obvezna literatura (dostupna u knjižnici i putem ostalih medija) | **Naslov** | | | | | | | | **Broj primjeraka u knjižnici** | | | **Dostupnost putem ostalih medija** | |
| Webster LR, Belfer I. Pharmacogenetics and Personalized Medicine in Pain Management.  Clin Lab Med. 2016 Sep;36(3):493-506. doi: 10.1016/j.cll.2016.05.007. Epub 2016 Jun 22.  Ko TM, Wong CS, Wu JY, Chen YT. Pharmacogenomics for personalized pain medicine. Acta Anaesthesiol Taiwan. Mar;54(1):24-30, 2016.  Devor M: How Do Pain Genes Affect Pain Experience? In: Pain Genetics: Basic to Translational Science, First Edition. Editors: Belfer I and Diatchenko L. John Wiley & Sons, Inc., 1-14, 2014.  Meyer K, Kaspar BK. Making Sense of Pain: Are  Pluripotent Stem Cell–derived Sensory Neurons a New Tool for Studying Pain Mechanisms? Mol Ther. 2014 Aug;22(8):1403-5.  Mogil JS. Pain genetics: past, present and future. Trends Genet. 2012 Jun;28(6):258-66.  Dib-Hajj SD, Waxman SG. Translational pain research: Lessons from genetics and genomics. Sci Transl Med. 2014 Aug 13;6(249):249sr4.  Cregg R, Russo G, Gubbay A, Branford R, Sato H. Pharmacogenetics of analgesic drugs. Br J Pain. 2013 Nov; 7(4):189-208.  Janicki PK. Pharmacogenomics of Pain Management. In: Comprehensive Treatment of Chronic Pain by Medical, Interventional, and Integrative Approaches, 23 T.R. Deer et al. (eds.), American Academy of Pain Medicine 2013.  Young EE, Lariviere WR, Belfer I. Genetic basis of pain variability: recent advances. J Med Genet. 2012 Jan;49(1):1-9. | | | | | | | |  | | | *da* | |
| Dopunska literatura |  | | | | | | | | | | | | |
| Načini praćenja kvalitete koji osiguravaju stjecanje utvrđenih ishoda učenja | -Analiza kvalitete nastave od strane studenata i nastavnika,  -Analiza prolaznosti na ispitima,  -Izvješća Povjerenstva za kontrolu provedbe nastave,  -Izvaninstitucijska evaluacija (posjet timova za kontrolu kvalitete Nacionalne agencije za kontrolu kvalitete, uključenje u TEEP). | | | | | | | | | | | | |
| Ostalo (prema mišljenju predlagatelja) |  | | | | | | | | | | | | |

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| **NAME OF THE COURSE** | | **Pain and genes – custom made pain treatment** | | | | | | | | | | | | |
| **Code** | MFMI… | | | | Year of study | | | | 1-6 | | | | | |
| Course teacher | Assistant prof. Sandra Kostić, PhD | | | | Credits (ECTS) | | | | 2 | | | | | |
| Associate teachers | Associate prof. Katarina Vukojević, MD, PhD | | | | Type of instruction (number of hours) | | | | L | S | | E | | T |
| 10 | 15 | |  | |  |
| Status of the course | Elective | | | | Percentage of application of e-learning | | | |  | | | | | |
| **COURSE DESCRIPTION** | | | | | | | | | | | | | | |
| Course enrolment requirements and entry competences required for the course | \_ | | | | | | | | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | After the end of the course, the students will be able to:  - Describe and explain the basic pain terminology and definitions (e.g. nociception, nociceptors, central and peripheral sensitization, allodynia, hyperalgesia…)  - Identify and describe the main difference between acute and chronic pain  - Identify and describe the methods, drugs and different approaches for the pain treatment available to patients today  - Name and explain the most relevant achievements in the field of pharmacogenomics and their therapeutic potential  - Name and describe the examples from the scientific literature which point to the link between the gene-environment interaction and our pain tolerance  - Name and describe specific pain disorders which result from gene mutations, including congenital insensitivity to pain | | | | | | | | | | | | | |
| Course content broken down in detail by weekly class schedule (syllabus) | *Lectures:*  -The basic pain terminology and definitions (e.g. nociception, nociceptors, central and peripheral sensitization, allodynia, hyperalgesia…)  - The main difference between acute and chronic pain; Methods, drugs and different approaches for the pain treatment available to patients today  - Pharmacogenomics – the future of custom made pain treatment  - The most relevant achievements in the field of pharmacogenomics and their therapeutic potential – from preclinical trials to clinics  - The link between the gene-environment interaction and our pain tolerance: epigenetics  *Seminars:*  - Specific pain disorders which result from gene mutations, including congenital insensitivity to pain | | | | | | | | | | | | | |
| Format of instruction | ☐ lectures  ☐ seminars and workshops  ☐ exercises  ☐ *on line* in entirety  ☐ partial e-learning  ☐ field work | | | | | ☐ independent assignments  ☐ multimedia  ☐ laboratory  ☐ work with mentor  ☐       (other) | | | | | | | | |
|
| Student responsibilities | In accordance to Rules of studying and Deontological code for USSM students. | | | | | | | | | | | | | |
| Screening student work *(name the proportion of ECTS credits for each* *activity so that the total number of ECTS credits is equal to the ECTS value of the course)* | Class attendance | | 60 % | Research | | |  | Practical training | | | | |  | |
| Experimental work | |  | Report | | |  | (Other) | | | | |  | |
| Essay | |  | Seminar essay | | |  | (Other) | | | | |  | |
| Tests | |  | Oral exam | | |  | (Other) | | | | |  | |
| Written exam | | 40 % | Project | | |  | (Other) | | | | |  | |
| Grading and evaluating student work in class and at the final exam | Written exam | | | | | | | | | | | | | |
| Required literature (available in the library and via other media) | **Title** | | | | | | | | **Number of copies in the library** | | **Availability via other media** | | | |
| Webster LR, Belfer I. Pharmacogenetics and Personalized Medicine in Pain Management.  Clin Lab Med. 2016 Sep;36(3):493-506. doi: 10.1016/j.cll.2016.05.007. Epub 2016 Jun 22. | | | | | | | |  | | Yes | | | |
| Ko TM, Wong CS, Wu JY, Chen YT. Pharmacogenomics for personalized pain medicine. Acta Anaesthesiol Taiwan. Mar;54(1):24-30, 2016. | | | | | | | |  | | Yes | | | |
| Devor M:How Do Pain Genes Affect Pain Experience?In: Pain Genetics: Basic to Translational Science, First Edition. Editors: Belfer I and Diatchenko L. John Wiley & Sons, Inc., 1-14, 2014. | | | | | | | |  | | Yes | | | |
| Meyer K, Kaspar BK. Making Sense of Pain: Are  Pluripotent Stem Cell–derived Sensory Neurons a New Tool for Studying Pain Mechanisms? Mol Ther. 2014 Aug;22(8):1403-5. | | | | | | | |  | | Yes | | | |
| Mogil JS. Pain genetics: past, present and future. Trends Genet. 2012 Jun;28(6):258-66. | | | | | | | |  | | Yes | | | |
| Dib-Hajj SD, Waxman SG. Translational pain research: Lessons from genetics and genomics. Sci Transl Med. 2014 Aug 13;6(249):249sr4. | | | | | | | |  | | Yes | | | |
| Cregg R, Russo G, Gubbay A, Branford R, Sato H. Pharmacogenetics of analgesic drugs. Br J Pain. 2013 Nov; 7(4):189-208. | | | | | | | |  | | Yes | | | |
| Janicki PK. Pharmacogenomics of Pain Management. In: Comprehensive Treatment of Chronic Pain by Medical, Interventional, and Integrative Approaches, 23 T.R. Deer et al. (eds.), American Academy of Pain Medicine 2013. | | | | | | | |  | | Yes | | | |
| Young EE, Lariviere WR, Belfer I. Genetic basis of pain variability: recent advances. J Med Genet. 2012 Jan;49(1):1-9. | | | | | | | |  | | Yes | | | |
| Optional literature (at the time of submission of study programme proposal) |  | | | | | | | | | | | | | |
| Quality assurance methods that ensure the acquisition of exit competences | * Teaching quality analysis by students and teachers * Exam passing rate analysis * Committee for control of teaching reports * External evaluation | | | | | | | | | | | | | |
| Other (as the proposer wishes to add) |  | | | | | | | | | | | | | |