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| **Naziv predmeta** | | | | |  | | | | | | | | | | |
| **Kod** | MyoEPBio | | Godina studija | | | 2-6. | | | | | | | | | |
| **Nositelj/i predmeta** | Marko Ljubković  Jasna Marinović | | Bodovna vrijednost (ECTS) | | | 2 | | | | | | | | | |
| Suradnici |  | | Način izvođenja nastave (broj sati u semestru) | | | P | | S | V | | | T |  | | |
| 10 | | 10 | 5 | | |  |
| Status predmeta | Izborni | | Postotak primjene e-učenja | | | 0 | | | | | | | | | |
| **OPIS PREDMETA** | | | | | | | | | | | | | | | |
| Ciljevi predmeta | U sklopu ovog predmeta, poseban će se naglasak dati razumijevanju uloge srčanih staničnih ionskih kanala; njihovoj molekularnoj strukturi, regulaciji i ulozi u normalnoj funkciji srca. Također će se raspravljati o njihovom doprinosu u razvoju različitih patoloških stanja u srcu. Uz navedeno, studenti će također biti upoznati s biokemijskim principima funkcije srčanih mitohondrija, njihovom važnošću u opskrbi srčanih stanica ATP-om, kao i ulogom u drugim biološkim procesima, koji su dio normalne ili poremećene srčane fiziologije. Na koncu, prikazat će se i neki od aspekata srčane prilagodbe, kao na primjer, na tjelovježbu. | | | | | | | | | | | | | | |
| Uvjeti za upis predmeta i ulazne kompetencije potrebne za predmet | Odslušan predmet Fiziologija čovjeka na drugoj godini studija Medicine | | | | | | | | | | | | | | |
| Očekivani ishodi učenja na razini predmeta (4-10 ishoda učenja) | Izborni predmet je namijenjen studentima koji žele saznati više o elektrofiziološkim principima funkcije srčanih stanica, kao i mehanizmima stvaranja i korištenja energetski bogatih molekula u miokardu. Studenti će se upoznati s važnošću ionskih kanala u fiziološkoj funkciji miokarda, kao i s njihovim doprinosom i ulogom u razvoju raznih patoloških procesa relevantnih u kliničkoj praksi. Studenti će također naučiti više o ulozi mitohondrija u zdravlju i bolesti srca kao i teoretskim i praktičnim terapeutskim mogućnostima vezanih uz njihovu funkciju. | | | | | | | | | | | | | | |
| Sadržaj predmeta detaljno razrađen prema satnici nastave | **Dan 1.** Predavanje (5 sati): Osnovni principi stvaranja i širenja srčanog akcijskog potencijala; Srčane aritmije; Bolesti srčanih ionskih kanala; Srčana zaštita promjenom aktivnosti staničnih ionskih kanala. **Dan 2.** Predavanje (5 sati): Osnovni principi srčane bioenergetike i uloge mitohondrija; Mitohondrijski ionski kanali, Promjene mitohondrijske funkcije u bolestima srca. **Dan 3.** Seminar (5 sati): Srčana prilagodbe na tjelovježbu, dobri i loši aspekti. **Dan 4.** Vježba (5 sati): Laboratorijski alati i metode za procjenu stanične i mitohondrijske srčane funkcije. **Dan 5.** Seminar (5 sati): Diskusija pročitane literature | | | | | | | | | | | | | | |
| Vrste izvođenja nastave: | x predavanja  x seminari i radionice  x 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 | 1 | |  | | |  | | |  | | | | |  |
| Seminarski rad | 2 | |  | | |  | | | (Ostalo upisati) | | | | |  |
| Pismeni ispit |  | |  | | |  | | | (Ostalo upisati) | | | | |  |
|  |  | |  | | |  | | | (Ostalo upisati) | | | | |  |
|  |  | |  | | |  | | | (Ostalo upisati) | | | | |  |
| Ocjenjivanje i vrjednovanje rada studenata tijekom nastave i na završnom ispitu | Usmena prezentacija | | | | | | | | | | | | | | |
| Obvezna literatura (dostupna u knjižnici i putem ostalih medija) | **Naslov** | | | | | | | | | | **Broj primjeraka u knjižnici** | | | **Dostupnost putem ostalih medija** | |
| Berne RM, Levy MN, Koeppen BM, Stanton BA. Physiology, Elsevier Inc, 2004.  Stryer L, Berg JM, Tymoczko JL. Biochemistry W.H.Freeman & Co Ltd; | | | | | | | | | |  | | | *Da* | |
| Dopunska literatura | Journal articles in the topic of cardiac bioenergetics and electrophysiology | | | | | | | | | | | | | | |
| 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** | | **Basic principles of cardiac electrophysiology and bioenergetics** | | | | | | | | | | | | |
| **Code** | MyoEPBio | | | | Year of study | | | | 2-6. | | | | | |
| Course teacher | Marko Ljubković  Jasna Marinović | | | | Credits (ECTS) | | | | 2 | | | | | |
| Associate teachers |  | | | | Type of instruction (number of hours) | | | | L | S | | E | | T |
| 10 | 10 | | 5 | |  |
| Status of the course | Elective | | | | Percentage of application of e-learning | | | |  | | | | | |
| **COURSE DESCRIPTION** | | | | | | | | | | | | | | |
| Course objectives | During the course, special emphasis will be given to learning about the nature of cardiac sarcolemmal ion channels; their molecular structure, gating and importance for the cardiac muscle function. Additionally, their contribution to development of various pathological states will be addressed. Students will also become acquainted with biochemical principles of mitochondrial function, their importance for the cellular supply with ATP and the role in other biological processes that are part of either normal of impaired physiological function.  Lastly, some aspects of cardiac adaptation will be covered (e.g. adaptation to exercise). | | | | | | | | | | | | | |
| Course enrolment requirements and entry competences required for the course | Previously taken course in Medical Physiology on the second year of the program. | | | | | | | | | | | | | |
| Learning outcomes expected at the level of the course (4 to 10 learning outcomes) | This elective is designed for the students motivated to learn more about electrophysiological principles of cardiac myocytes' function, as well as the mechanisms of production and utilization of energy rich molecules in the cardiac muscle. Students will acquire basic knowledge about the importance of ion channels in the myocardial function and about their role in various pathological states, relevant for the clinical routine. The course will also provide insight into the role of mitochondria in cardiac health and disease and students will learn about various therapeutic strategies based on the mitochondrial function. | | | | | | | | | | | | | |
| Course content broken down in detail by weekly class schedule (syllabus) | **Day 1.** Lectures (5 hours): Basic principles of cardiac action potential generation and propagation. Cardiac arrhythmias. Channelopathies. Cardiac protection by modulation of sarcolemmal ion channels. **Day 2.** Lectures (5 hours): Basic principles of cardiac bioenergetics – the role of mitochondria. Mitochondrial ion channels. Mitochondrial changes in cardiac disease. **Day 3.** Lectures (5 hours): Cardiac adaptation to exercise: the good and the bad. **Day 4.** Practical (5 hours): Laboratory tools for investigation of cellular and mitochondrial function in the heart. **Day 5.** Seminar (5 hours): Discussion of the assigned scientific papers. | | | | | | | | | | | | | |
| Format of instruction | x lectures  x seminars and workshops  x 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 | | 1 | Research | | |  | Practical training | | | | |  | |
| Experimental work | |  | Report | | |  | (Other) | | | | |  | |
| Essay | |  | Seminar essay | | | 1 | (Other) | | | | |  | |
| Tests | |  | Oral exam | | |  | (Other) | | | | |  | |
| Written exam | |  | Project | | |  | (Other) | | | | |  | |
| Grading and evaluating student work in class and at the final exam | Oral presentation | | | | | | | | | | | | | |
| Required literature (available in the library and via other media) | **Title** | | | | | | | | **Number of copies in the library** | | **Availability via other media** | | | |
| Berne RM, Levy MN, Koeppen BM, Stanton BA. Physiology, Elsevier Inc, 2004. | | | | | | | |  | | yes | | | |
| Stryer L, Berg JM, Tymoczko JL. Biochemistry W.H.Freeman & Co Ltd; | | | | | | | |  | | yes | | | |
| Journal articles in the topic of cardiac bioenergetics | | | | | | | |  | | yes | | | |
| Journal articles in the topic of electrophysiology | | | | | | | |  | | yes | | | |
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| 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) |  | | | | | | | | | | | | | |