

COURSE DESCRIPTION

University: Comenius University in Bratislava	
Faculty: Jessenius Faculty of Medicine in Martin	
Course ID: JLF.ÚLBf/J-S-VL-504/15	Course title: Medical Biophysics
Educational activities: Type of activities: practicals / lecture Number of hours: per week: 4 / 2 per level/semester: 60 / 30 Form of the course: on-site learning	
Number of credits: 8	
Recommended semester: 1.	
Educational level: I.II.	
Prerequisites:	
Podmienky na absolvovanie predmetu: Evaluation of students is based on oral exam, credit test and results from practicals and seminars. The final evaluation of students before oral exam is given by addition of their particular points. This will assign them into the rank: A \geq 450, B \geq 390, C \geq 330, D \geq 270, E \geq 210, Fx < 210 Scale of assessment (preliminary/final): 50/50	
Learning outcomes: After completion of the subject Medical Biophysics, students are able to master the basic physical and physical-chemical processes in biological systems and human body. Students understand biophysical principles of physiological and pathological processes in humans at a level of a cell, tissues and the organ systems. They know and apply to practice the basic biological effects of physical factors affecting the human body and a protection against their harmful influences. They master the biophysical principles of medical instrumentation used in diagnostic and some therapeutical methods.	
Class syllabus: -Structure and function of cell membrane. Transport mechanisms. The resting membrane potential. -The action potential, its origin and propagation. Synapse and synaptic transmission. -Biophysical principles of muscle contraction. Skeletal, cardiac and smooth muscle. Biophysical basics of respiration. External and internal breathing, ventilation, distribution, diffusion and perfusion. -Biophysics of the circulatory system. Heart as a force pump, structure, function, power output. -Laminar and turbulent blood flow - basic laws. Blood pressure. Capillary blood flow, filtration in capillary loop, oedema. -Biophysical mechanism of sensory perception. Biophysics of vision. Biophysics of hearing. -Recording of electrical and nonelectrical biosignals. -Interaction of mechanical and meteorological factors with living systems. -Interaction of electrical and magnetic fields and nonionising radiation with living systems. -Radioactivity and ionising radiation. -Origin of ionizing radiation and the interaction of ionizing radiation, radiological quantities and units. -Detection of ionising radiation. Interaction of ionising radiation with living systems.	

<p>-X-ray imaging techniques. Imaging techniques using radionuclides. -Biophysical principles of some diagnostical and therapeutical methods in medicine. -Biocybernetics. Simulation and modelling of biological processes. Theory of information. -Controlled and regulated biological systems.</p>
<p>Recommended literature: Nave, C.R., Nave, B.C.: Physics for the health sciences. Philadelphia, W.B. Saunders Comp. 1985,421 pp. Tarjan, I., et al.: An introduction to biophysics with medical orientation. Budapest. Akademiai Kiado, 1999, 448 pp. Hoppe, W.: Biophysics. Berlin, Springer Verlag 1983. 941 pp. Jakuš, J., Poliaček, I., Šimera M.: Practical Tasks in Medical Biophysics, Martin, Osveta, 2013, 144 pp.</p>
<p>Languages necessary to complete the course: English language</p>
<p>Poznámky: ---</p>
<p>Past grade distribution Total number of evaluated students: A: %, B: %, C: %, D: %, E: %, FX: 0%</p>
<p>Lecturers: prof. MUDr. Ján Jakuš, DrSc., prof. RNDr. Ivan Poliaček, PhD., doc. RNDr. Michal Šimera, PhD., Mgr. Nadežda Višňovcová, PhD., Ing. Marcel Veterník, PhD., Ing. Jakub Míšek, PhD.</p>
<p>Last change: 9.9.2019</p>
<p>Approved by: prof. MUDr. Ján Jakuš, DrSc.</p>