

Study programme	MEDICAL STUDIES IN ENGLISH				
Cycle	INTEGRATED	Type	UNIVERSITY		
Study track	-	Module	-		
Year of study	1	Semester	I		
Course title	MEDICAL PHYSICS AND BIOPHYSICS	Course code	MFMSE101		
ECTS	5.5	Status	Obligatory		
Teaching hours		Lectures	Exercises	Seminars	Practice
		24	20	16	0
Teachers	Prof. Marija Raguž, PhD	24	0	16	
	Assist. Prof. Stipe Galić	0	4	0	
	Ivan Lasić, assist.	0	16	0	
Course objectives	<p>- to provide the students with knowledge regarding the basics of atomic physics and basic physical phenomena and laws.</p> <p>- to achieve theoretical knowledge that is necessary as a prerequisite for understanding the basics of nuclear physics, nuclear medicine, radiological physics, magnetic resonance imaging and ultrasound physics.</p> <p>- to provide student with the understanding of biotransport, membrane and action potential, physics of the ear and hearing, physics of the eye and vision, and measurement of the potentials on the surface of the body.</p> <p>- to provide students with understanding of the work of the human body: the deformation of a solid body (elastic and plastic deformation) and the representation of the musculoskeletal system as a system of levers.</p> <p>- to achieve understanding of the work of the heart and circulation and the physics of the lungs and breathing.</p>				
Course learning outcomes	Learning outcome (LO) Student:			Course learning outcome code	LO code at the study program level
	- Describes and explains the physical basics necessary for understanding the application of physical laws in biological systems and the basics of biological processes at the molecular level			IU-MFMSE101-1	IU-MSE1 IU-MSE7
	- Describes and explains physical quantities and units used in biophysics			IU-MFMSE101-2	IU-MSE1 IU-MSE3
	- Explains the basic concepts of mechanics and hydromechanics and applies them to the human body			IU-MFMSE101-3	IU-MSE1 IU-MSE3
	- Explains and defines the basic terms and laws of thermodynamics and uses them to explain the behavior of the human body as a thermodynamic system			IU-MFMSE101-4	IU-MSE1 IU-MSE3
	- Applies the basic concepts of electromagnetism and thermodynamics in order to explain nerve signal transmission			IU-MFMSE101-5	IU-MSE1 IU-MSE3
	- Describes and explains the mechanisms of interaction between ionizing radiation and substances, the effects that ionizing radiation can cause in humans, and recognizes the importance and scope of work of dosimetry and define doses			IU-MFMSE101-6	IU-MSE1 IU-MSE7
	- Explains the laws of optics and applies them to the propagation and nature of light, the creation of an image in the eye, and optical devices and the correction of optical errors of the eye using glasses			IU-MFMSE101-7	IU-MSE1 IU-MSE7
	- Defines and explains vibration of mechanical systems and applies it to the description of sound waves and explains the connection between acoustic parameters and physiological sensations of sound waves			IU-MFMSE101-8	IU-MSE1 IU-MSE7
	- Distinguishes radiograms from scintigrams, echograms and images obtained by magnetic resonance or computerized tomography, and recognizes what these basic imaging methods of medical diagnostics represent and what they are for			IU-MFMSE101-9	IU-MSE1 IU-MSE7
Prerequisites for the	In accordance with the Rulebook on the Integrated Studies at the School of Medicine University of Mostar				

course enrolment							
Course content	Week / shift		Topic				
	Lectures		(L1) Introduction. Basics of nuclear physics (L2) Radiation and matter (L3) Physical basis of nuclear medicine (L4) Physics of diagnostic radiology (L5) Physics of MR imaging (L6) Ultrasound physics (L7) Biotransports, membrane potential (L8) Action potential (L9) Biophysics of senses, ear and hearing (L10) Biophysics of the eye and vision (L11) Biomechanics of tissues (L12) Body biomechanics (L13) Haemoreology 1 (L14) Haemoreology 2				
	Seminars		(S1) Recapitulation seminar 1: L1-L3 (S2) Recapitulation seminar 2: L4-L6 (S3) Comparison of diagnostic methods (S4) Potentials on the surface of the body (S5) Recapitulation seminar 3: L7-L8 (S6) Recapitulation seminar 4: L9-L10 (S7) Recapitulation seminar 5: L11-L12 (S8) Recapitulation seminar 6: L13-L14				
Exercises		(E1) Introduction to cyclic exercises. Overview. Statistics. (E2) Cyclic exercises C1 – C6 (E3) Cyclic exercises C1 – C6 (E4) Cyclic exercises C1 – C6 (E5) Cyclic exercises C1 – C6 (E6) Cyclic exercises C1 – C6 (E7) Cyclic exercises C1 – C6 (E8) Radioactivity and Radiation Protection (E9) Computer Tomography, External Beam Radiotherapy (E10) Practical exam C1: Microscopy C2: Periodic Signal Analysis C3: Electric Circuit C4: Viscosity C5: Surface Tension C6: Air Humidity					
Language	English						
E-learning	Classes are taken in person. If necessary, lectures, seminars and part of the exercises can take place combined (live and online) or completely online via e-learning platforms (Google-Meet) up to max 20 %.						
Teaching methods	Teaching, interactive and active-experiential						
Types of assessment (indicate - Bold)							
Type of pre-examination obligation					Type of exam		
midterm	seminar paper	essay/report	practical/project task	other	written exam	oral exam	practical
Allocation of ECTS credits and share in the grade							
Student obligations		Learning outcome code	Hours of workload		Share in ECTS		Share in grade
Attending classes			60		2		
Students' activity during interactive seminars			30		1		20% - in pre-exam term

Pre-exam/Practical exam	IU-MFMSE101-2 IU-MFMSE101-3 IU-MFMSE101-4 IU-MFMSE101-6 IU-MFMSE101-9	30	1	10% - in pre-exam term
Pre-exam/Written exam	IU-MFMSE101-1 IU-MFMSE101-2 IU-MFMSE101-3 IU-MFMSE101-4 IU-MFMSE101-5 IU-MFMSE101-6 IU-MFMSE101-7 IU-MFMSE101-8 IU-MFMSE101-9	45	1.5	70% - in pre-exam term 100% - all other terms
In total		165	5.5	100%

Method of calculating the final grade

Students have to pass the written exam (in form of a test, comprised of 60 questions, each containing 5 statements: 4 false and 1 true). The threshold for the written exam is 33 points. Number of total bonus points awarded during seminars and practical exam will be added to the written exam score if a student passes the threshold for the written exam of 33 points. Bonus points are valid only for the first exam term. According to the Rulebook on Studying final grade is obtained as follows:

A = 91-100% 5

B = 79 to 90% 4

C = 67 to 78% 3

D = 55 to 66% 2

F = 0 to 54% 1

Literature (indicate)	Title (title, author, year)	Edition		Language				Type of literature			
		own	other	croatian	english	other	multilingual	book	article	script	other
Compulsory	1. Eterović D.: Physics of diagnostic imaging for medical students, Zagreb, 2002.		*		*					*	
	2. Eterović D.: Biophysical grounds of physiology; script materials		*		*					*	
	3. Eterović D. et. al.: Laboratory exercises - Medical physics and biophysics		*		*					*	
Additional	1. JA Pope: Medical Physics (second edition); Heinemann, 1989.		*		*			*			

Additional course information

Students' obligations:

Students have to attend all course lectures, seminars and exercises. Up to 20% of justified absence from seminars and lectures can be tolerated. Students are expected to participate actively during the course.

Types of seminars:

First type is described in the course curriculum by a name of the topic to be covered. The names in the curriculum correspond to the chapter titles in the literature. Seminars are interactive. The teacher explains the topic at hand and can pose questions to the students in order to assess their current knowledge. Students are expected to prepare the content of corresponding seminars in advance.

Second type of seminar is a recapitulation seminar. The goal of this type of seminar is to address the most common issues regarding the topics covered during few previous lectures and seminars. The student's positive response at recapitulation seminar will be awarded with a bonus point. Only one bonus point per seminar can be obtained by one student. Number of possible bonus points at seminars is 6.

Types of exercises:

Introduction exercise term includes explanation of mathematical functions and statistical methods required to analyze data collected during cyclic exercises.

First exercise type - cyclic exercises (C1-C6) include six different laboratory exercises. Students are expected to prepare the content of corresponding exercise in advance. The teaching material will be posted on the students' platform (SUMARUM). At the beginning of exercises the teacher will check whether the students are ready to perform the exercise through a short conversation. During exercise the students will make measurements. They are supposed to analyze data at home and present their reports during next exercise term. The teacher will review the results and make comments if mistakes were made during collecting data or calculation. If student does not bring or present unsatisfactory report he/she will be obligated to repeat that exercise during additional exercise term that will be organized at the end of classes. Student can repeat exercise only once. If a student doesn't appear for any of exercises he/she will have to take an additional exercise term. All students who miss one exercise term will be obliged to take it.

Second exercise type will be organized in the hospital. The goal is to familiarize students with the physical methods and instrumentation used in the hospital in order to obtain detailed diagnostic information and achieve useful therapeutic effects. After completing all the exercises, students are obligated to take practical exam related to the exercises. Students will be awarded with a bonus point during practical exam. Number of minimal bonus points that student should obtain during practical exam in order to qualify to take written exam is 2. Maximal number of bonus points that student can achieve during practical exam is 5.

Attending all exercises is mandatory. Students are strongly advised to participate actively during the course. Practical exam will be related to exercises during course.

Exam:

Students have to pass the written exam (in form of a test, comprised of 60 questions, each containing 5 statements: 4 false and 1 true). The threshold for the written exam is 33 points. Number of total bonus points awarded during seminars and practical exam will be added to the written exam score if a student passes the threshold for the written exam of 33 points. Bonus points are valid only for the first exam term.