



Pomeranian Medical University in Szczecin

SYLLABUS of the MODULE (BIOPHYSICS)

General Information

Code		Title	Biophysics
Module type			<i>Obligatory</i>
Faculty			<i>Faculty of Medicine (MD)</i>
Field of study			<i>medicine (MD)</i>
Major			<i>Not applicable</i>
Level of study			<i>II level/ long-cycle (S2J)</i>
Mode of study			<i>intramural</i>
Year of study			<i>1</i>
Semester			<i>Winter</i>
ECTS points			<i>2</i>
Types of training			<i>seminars /practical classes (20/10 hours)</i>
Tutor responsible for the module			<i>dr hab. n. med. Wojciech Podraza- podrazaw@pum.edu.pl</i>
Tutors conducting the subject			<i>dr n. med. Hanna Domek; hdomek@pum.edu.pl,, dr n. med. Karolina Jezierska; karo@pum.edu.pl dr hab. n. med. Wojciech Podraza; podrazaw@pum.edu.pl dr inż. Krzysztof Penkala; Krzysztof.Penkala@zut.edu.pl</i>
WWW			<i>www.pum.edu.pl</i>
Language			<i>English</i>

Detailed information

Module objectives		<p>Seminars and exercises are designed:</p> <ul style="list-style-type: none"> - to provide students with the basic issues concerning the physical basis of physiological processes. - to become familiar with the physical phenomena in contemporary medical diagnostics and therapy - to have knowledge of the general principles of operation of medical equipment - to have knowledge of the mechanisms of action of physical factors on body
Prerequisite /essential requirements	Knowledge	Knowledge of physics and mathematics from the high school.
	Skills	The student is able to define and estimate the measurement error, graphically presents the results of measurements, knows basic math functions, exponents and logarithms.
	Competences	The openness to knowledge, willingness to cooperate in a group, awareness of high requirements of future doctor.

Description of the learning outcomes for the subject /module			
Number of learning outcome	Student, who has passed the (subject) Knows /is able to /can:	SYMBOL (referring the standards) EKK	Method of verification of learning outcomes
KL2JPW01	knows the physical laws describing the flow of fluids and factors affecting the vascular resistance of a blood flow	K_B.W5	E, R, D
KL2JPW02	knows natural and artificial sources of ionizing radiation and its interaction with matter	K_B.W6	E, R, D,
KL2JPW03	knows the physico-chemical and molecular actions of the organs of senses	K_B.W7	E, R, D, P
KL2JPW04	knows the physical basis of non-invasive imaging methods	K_B.W8	E, P
KL2JPW05	knows the physical principles of selected therapeutic techniques, including ultrasound and radiation	K_B.W9	E, R, D
KL2JPW06	knows the possibilities of the modern telemedicine as a tool to support the work of a doctor	K_B.W33	E, P
KL2JPU01	uses knowledge of the laws of physics to explain the impact of external factors such as temperature, acceleration, pressure, electromagnetic fields and ionizing	K_B.U1	E, P, D

	radiation on the body		
KL2JPU02	able to assess the harmfulness of ionizing radiation dose and apply the principles of radiation protection	K_B. U2	E, D, R
KL2JPU03	uses of databases, including the Internet and searches for necessary information using the available tools	K_B.U12	D, P, R
KL2JPU04	knows how to plan and execute simple scientific research and interpret the results and draw conclusions	K_B.U15	R, S

Matrix presenting the learning outcomes of the subject/module in relation to the form of classes									
Number of learning outcome	Student, who has passed the (subject) Knows /is able to /can:	Types of training							
		Lecture	Seminar	Laboratory classes	Project work	Clinical classes	Classes	Practical classes	Other
KL2JPW01	knows the physical laws describing the flow of fluids and factors affecting the vascular resistance of a blood flow	X							
KL2JPW02	knows natural and artificial sources of ionizing radiation and its interaction with matter	X		X					
KL2JPW03	knows the physico-chemical and molecular actions of the organs of senses	X							
KL2JPW04	knows the physical basis of non-invasive imaging methods	X							
KL2JPW05	knows the physical principles of selected therapeutic techniques, including ultrasound and radiation	X		X					
KL2JPW06	knows the possibilities of the modern telemedicine as a tool to support the work of a doctor	X							
KL2JPW07	knows the physical basis for the electromagnetic phenomena in the body and the possibility of the use of passive and active electrical properties of tissues	X		X					
KL2JPU01	uses knowledge of the laws of physics to explain the impact of external factors such as temperature, acceleration, pressure, electromagnetic fields and ionizing radiation on the body	X		X					
KL2JPU02	able to assess the harmfulness of ionizing radiation dose and apply the principles of radiation protection	X							
KL2JPU03	uses of databases, including the Internet and searches for necessary information using the available tools	X		X					
KL2JPU04	knows how to plan and execute simple scientific research and interpret the results and draw conclusions		X						
KL2JPU05	able to assess the usefulness of impedance measurements in medicine		X	X					

Module (subject) contents		
Symbol of teaching programme	Content of teaching programme	References to learning outcomes
TK01	Medical technology in the twenty-first century (telemedicine, robotics, computerization).	KL2JPW06 KL2JPU03
TK02	Ultrasonic techniques - basic concepts, the diagnostic and therapeutic use	KL2JPW05 KL2JPU01 KL2JPU03 KL2JPU04
TK03	Lasers and their applications in medicine	KL2JPW05 KL2JPU01 KL2JPU03
TK04	Electricity and magnetism. Cellular electrophysiology. Transmembrane ion transport. Active transport. Transmission of information in the body.	KL2JPW06 KL2JPW07 KL2JPU01
TK05	Ionizing radiation in medicine and radiation protection. Modern diagnostic methods in medicine (X-rays, tomography, renography) and biology (determination of the speed of transport using isotopic markers, determination of proteins and other structures using radioactive particles).	KL2JPW02 KL2JPU02
TK06	Regulatory systems in living organisms, homeostasis.	KL2JPW07
TK07	Biophysics of cardiovascular and respiratory systems.	KL2JPW01 KL2JPU01 KL2JPU03
TK08	Modern imaging methods (MRI, PET, ultrasound, CT, thermography).	KL2JPW04 KL2JPU03
TK09	Biophysics of the process of vision. Biophysical basis of the sense of hearing, audiometry, auditory evoked potentials.	KL2JPW03 KL2JPU03 KL2JPU04
TK010	Man as a biomechanical system. Biomechanical properties of tissues and their role in biomechanics.	KL2JPW01 KL2JPU03
TK011	Optical properties of matter. Spectroscopy and microscopy.	KL2JPW04 KL2JPU03 KL2JPU04
TK012	The impact of the electromagnetic fields on the body.	KL2JPW05 KL2JPU01
TK013	The use of the impedance methods in medicine.	KL2JPW05 KL2JPW07 KL2JPU03 KL2JPU05
TK014	The impact of the physical environment on living organisms, the possibility of physical therapy.	KL2JPW05 KL2JPU01

References and educational resources			
1. Cameron J., Skofronick J.G., Grant R.M.: <i>Physics of the Body</i> , Medical Physics Publishing 1992			
2. Tuliszką M.: <i>Biophysics, Laboratory Textbook</i> , Poznań 1997			
3. Kirsten Franklin, Paul Muir, Terry Scott, Lara Wilcocks and Paul Yates, "Introduction to Biological Physics for the Health and Life Sciences", ISBN 978-0-470-66593-0, 2010 John Wiley and Sons			
4. Jim Breithaupt, "Physics", third edition, ISBN 978-0-230-23192-4, 2010 Palgrave Macmillan			
Student's workload (balance sheet of ECTS points)			
Form of student's activity (in-class participation; activeness, produce a report, etc.)	Workload [h]		
	Tutor	Student	Average
activities that require direct participation of tutors	35	35	
Preparation to the classes		5	
Reading of the indicated/specified literature		5	
Report writing/project making		5	
Time spent to prepare for the exam			
Other		2	
Student's workload in total		52	
ECTS points for the subject		2	
Uwagi			

Methods of assessment, for example:

E – exam- problem resolving

S – verifying of practical skills

R – report

D – discussion

P – presentation

Others- C - credit

KIEROWNIK
Zakładu Fizyki Medycznej

dr hab. n. med. Wojciech Podraza

