UNIWERSYTET MEDYCZNY
IM. PIASTÓW ŚLĄSKICH WE WROCŁAWIU

Appendix 5
to Resolution No. 15630
of Senate of Wroclaw Medical University
of 30 March 2016

Syllabus 2019/2020			
Description of the course			
Module/Course	Biophysics	Group of detailed education results	
		Group code B	Group name Basic medical sciences
Faculty	Medicine		
Major	medicine		
Specialties	Not applicable		
Level of studies	Uniform magister studies X * 1st degree studies ☐ 2nd degree studies ☐ 3rd degree studies ☐ postgraduate studies ☐		
Form of studies	X full-time part-time		
Year of studies	I	Semester	X Winter ☐ Summer
Type of course	X obligatory ☐ limited choice ☐ free choice / elective		
Course	☐ major X basic		
Language of instruction	☐ Polish X English ☐ other		

* mark ☐ with an X

Number of hours

Form of education

	Lectures (L)	Seminars (SE)	Auditorium classes (AC)	Major Classes – not clinical (MC)	Clinical Classes (CC)	Laboratory Classes (LC)	Classes in Simulated Conditions (CSC)	Practical Classes with Patient (PCP)	Specialist Classes – magister studies (SCM)	Foreign language Course (FLC)	Physical Education obligatory (PE)	Vocational Practice (VP)	Self-Study (Student's own work)	E-learning (EL)
Winter Semester														
Department of Biophysics	22					33							82,5	
Summer Semester														
TOTAL per year:														
	22					33							82,5	

Educational objectives (max. 6 items)

C1. Description of physical phenomena responsible for processes occurring at the level of biomolecules, membranes, cells and tissues.

C2. Description of physical bases of functioning of senses, circulation, electrical excitability related to signal transduction in the nervous system, neuromuscular transmission and electrical activity of the heart.

C3. Acquisition of basic knowledge in medical physics in relation to therapeutic and diagnostic methods, in which ultrasounds, different forms of electromagnetic waves and radiation are used (e.g. USG, computer tomography, PET, NMR tomography, application of lasers in medicine).

C4. Description of the effects of various physical factors on human organism in the context of therapy choice and protection of patients and medical personnel against hazardous impact of these factors.

Education result matrix for module/course in relation to verification methods of the intended education result and the type of class

Number of course education result	Number of major education result	Student who completes the module/course knows/is able to	Methods of verification of intended education results (forming and summarising)	Form of didactic class ***enter the abbreviation*
W01	B.W5	Knows physical laws describing fluid flows and factors determining haemodynamic resistance of blood capillaries	Oral interrogation, written exam	L, LC
W02	B.W6	Knows natural sources of ionizing radiation and its interaction with matter	Oral interrogation, written exam	L, LC
W03	B.W7	Knows physico-chemical bases of senses	Oral interrogation, written exam	L, LC
W04	B.W8	Knows physical bases of non-invasive imaging methods	Oral interrogation, written exam	L, LC
W05	B.W9	Knows physical bases of selected therapeutic techniques including ultrasounds and irradiation	Oral interrogation, written exam	L, LC
W06	B.W24	Knows bass of excitability and conduction in the nervous system and higher functions of the nervous system and the physiology of striated and smooth muscles and functions of	Oral interrogation, written exam	L, LC

W07	B.W34	blood Knows the rules of carrying out the scientific research based on observations and experiments and in vitro studies aimed at development of medicine.	Oral interrogation, written exam	L,
U01	B.U1	Applies the laws of physics to explain the effects of external factors such as temperature, acceleration, pressure, electromagnetic field and radiation on the organism and its elements	Oral interrogation, written exam	LC
U02	B.U2	Is able to assess the extent of hazard for ionizing radiation and applies the rules of radiological protection	Oral interrogation, written exam	LC
U03	B.U10	Applies simple measuring devices and assesses the precision of measurements	Oral interrogation	LC
U04	B.U14	Plans and executes simple scientific investigations as well as interprets obtained data and draws conclusions	Oral interrogation	LC

** L - lecture; SE - seminar; AC – auditorium classes; MC – major classes (non-clinical); CC – clinical classes; LC – laboratory classes; SCM – specialist classes (magister studies); CSC – classes in simulated conditions; FLC – foreign language course; PCP practical classes with patient; PE – physical education (obligatory); VP – vocational practice; SS – self-study, EL – E-learning .

Please mark on scale 1-5 how the above effects place your classes in the following categories:
communication of knowledge, skills or forming attitudes:
Knowledge: +++++
Skills: +++++

Student's amount of work (balance of ECTS points): 2

Student's workload (class participation, activity, preparation, etc.)	Student Workload (h)
1. Contact hours:	55
2. Student's own work (self-study):	82,5
Total student's workload	137,5
ECTS points for module/course	6,5
Comments	

Content of classes (please enter topic words of specific classes divided into their didactic form and remember how it is translated to intended educational effects)

Lectures each lecture takes 1 hour 30 mins

1. Ultrasounds in diagnosis and therapy
2. Biophysics of senses – acoustics and hearing
3. Biophysics of senses - light and vision
4. Electromagnetic radiation and its interaction with matter. Lasers in medicine.
5. Ionizing radiation - properties, effect on matter and application in medicine
6. Physical bases of nuclear magnetic resonance (NMR) and its application in spectroscopy and imaging.
7. Passive and active transport across biological membranes. Ion channels – types and roles.
8. Physical basis of signal transmission in nervous system – nerve impulse, synaptic transmission.
9. Biophysics of circulation, physical bases of electrocardiography
10. Intermolecular interactions. Structures and models of biological membranes
11. Application of thermodynamics to description of processes in biological systems

Seminars -

Practical classes each practical class takes 2 hours 15 mins

- Ultrasonic Doppler effect
- Audiometry
- Harmonic analysis of acoustic waves
- Determination of macromolecule's molecular weight by colloid solution viscosity measurements
- Determination of electromagnetic waves properties
- Ultrasound probe
- Microcalorimetric method of investigation of phase transitions in lipids
- Simulation of action potential generation
- Geiger-Muller counter characteristics
- Nernst equilibrium (voltage measurements on ionoselective membranes)
- Dipolar model of the heart
- Ionizing radiation attenuation
- Analog model of synaptic transmission
- Determination of visual latency in the Pulfrich effect
- Ionic migration velocity
- Emission spectra
- Nephelometric measurement of colloid concentration
- Polarization of light, saccharimeter
- Fluorescence and its application in quantitative luminescence analysis
- Model of eye and description of optic prism properties
- Absorption of solutions of organics dyes. Analysis of solution composition.
- Examination of time resolution of the human eye

Other -

Basic literature (list according to importance, no more than 3 items)

1. R. Cotterill „Biophysics. An introduction", J. Wiley & Sons, 2004
2. R. Glaser "Biophysics", Springer, 2004
3. Purves D, et al. "Neuroscience" , 2004, Sinauer Associates

Additional literature and other materials (no more than 3 items)

1. S.A. Kane "Introduction to physics in modern medicine", CRC Press 2009
2. P. Nelson "Biological Physics", W. H. Freeman and Company 2004

Bushberg JT, Seibert JA, Leidholdt EM, Boone JM, "The essential physics of medical imaging" 3rd edition, Wolters Kluwer, Lippicott Williams & Wilkins, 2012

Didactic resources requirements (e.g. laboratory, multimedia projector, other...) Laboratories are equipped with experimental set ups for each students' group, multimedia projector, computers
Preliminary conditions (minimum requirements to be met by the student before starting the module/course) Students are expected to possess basic knowledge in physics, biology and chemistry
Conditions to receive credit for the course (specify the form, criteria and conditions of receiving credit for classes included in the module/course, admission terms to final theoretical or practical examination, its form and requirements to be med by the student to pass it and criteria for specific grades). Credit for practical exercises at students' laboratories is granted following verification of theoretical knowledge for each theme (oral interrogation or short written test) and verification of written report for the experimental part. In the case of theoretical exercises, credit requires successful written test. Written exam consists of approximately 40-60 questions (single-choice test). Positive grade is obtained when student receives score not smaller than 60% points. Grades higher than sufficient are obtained in proportion to the score and the intervals for subsequent (higher) grades are equal. Analogous system is applied for retake exams. In the case of retake exams the lecturer may propose the oral form of examination. Each absence must be made up, including rector's days or dean's hours. The form of making missed classes up should be agreed with the academic tutor.

Grade:	Criteria for course
Very Good (5.0)	Score > 92%
Good Plus (4.5)	92% > Score > 84 %
Good (4.0)	84 > Score > 76 %
Satisfactory Plus (3.5)	76% > Score > 68 %
Satisfactory (3.0)	68 %> Score > 60%

Grade:	Criteria for exam (if applicable)
Very Good (5.0)	Score > 92%
Good Plus (4.5)	92% > Score > 84 %
Good (4.0)	84 > Score > 76 %
Satisfactory Plus (3.5)	76% > Score > 68 %
Satisfactory (3.0)	68 %> Score > 60%

Name of unit teaching course:	Department of Biophysics
Address	T. Chałubińskiego 10 St., 50-368 Wrocław
Phone	71/784 14 00 (01)
E-mail	biofizyka@umed.wroc.pl

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Person responsible for course:	**dr hab. Olga Wesołowska**
Phone	**71/784 14 15**
E-mail	**olga.wesolowska@umed.wroc.pl**

List of persons conducting specific classes:	*degree/scientific or professional title*	*Discipline*	*Performer profession*	*Form of classes*
Olga Wesołowska	DSc	Biotechnology	Adjunct	lectures, practical classes
Andrzej Teisseyre	DSc	Chemistry	Adjunct	Practical classes
Kamila Środa-Pomianek	PhD	Biotechnology	Adjunct	Practical classes
Marcin Kołaczkowski	PhD	Biotechnology	Adjunct	Practical classes
Anna Palko-Łabuz	PhD	Biotechnology	Adjunct	Practical classes
Grzegorz Wiera	PhD	Biotechnology	Adjunct	Practical classes

Date of Syllabus development

02.09.2019

Syllabus developed by

Olga Wesołowska

Signature of Head of teaching unit

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Uniwersytet Medyczny we Wrocławiu
Katedra Biofizyki
ZAKŁAD BIOFIZYKI
adiunkt

dr hab. Olga Wesołowska

Uniwersytet Medyczny we Wrocławiu
Katedra Biofizyki
SAMODZIELNA PRACOWNIA BIOFIZYKI
UKŁADU NERWOWEGO
prof. dr hab. Jerzy Mozrzymas

Signature of Faculty Dean

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Uniwersytet Medyczny we Wrocławiu
WYDZIAŁ LEKARSKI
Prodziekan ds. Studiów
w Języku Angielskim
prof. dr hab. Andrzej Hendrich