



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.W20	Knows base 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 blood	Oral interrogation, written exam	L, LC
W07	B.W29	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.U9	Applies simple measuring devices and assesses the precision of measurements	Work during classes, oral interrogation	LC
U04	B.U13	Plans and executes simple scientific investigations as well as interprets obtained data and draws conclusions	Work during classes, oral interrogation	LC
K 01		Co-operates in the group while performing experiments (laboratory classes); actively performs experimental measurements; takes responsibility for the laboratory equipment		



** 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:5

Skills:5

Social competences:5

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

Student's workload (class participation, activity, preparation, etc.)	Student Workload (h)
1. Contact hours:	18
2. Online learning hours (e-learning):	37
3. 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

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

Seminars

- 1.
- 2.
- 3.

Practical classes

Detailed schedule can be found on the webpage of Department of Biophysics and Neuroscience.

On-line classes:



1. Emission spectra of elements.
2. Examination of optical rotation of solutions and determination of concentration using a saccharimeter.
3. Fluorescence and its application in quantitative luminescence analysis.
4. Ionic migration velocity.
5. Magnetic moment in the magnetic field.
6. Estimation of volume and radius of a single molecule with the viscometric method
7. Detection of ionizing radiation with Geiger-Mueller counter.
8. Attenuation of ionizing radiation.
9. Microcalorimetric simulation studies on phase transitions in lipids.
10. Study of properties of electromagnetic waves.
11. Radiation absorption in solutions of organic dyes. Analysis of solution composition.
12. Determination of size of molecules forming a monomolecular layer

On-site classes:

1. Nephelometric determination of colloid concentration.
2. Model of eye and description of optic prism.
3. Examination of time resolution of the human eye.
4. Nernst equilibrium (voltage measurements on ionoselective membranes).
5. Dipole model of the heart.
6. Analog model of synaptic transmission.
7. Simulation of action potential generation.
8. Audiometry.
9. Propagation of action potential along myelinated and unmyelinated axons.
10. Measurement of liquid flow velocity with the use of Doppler effect.
11. Harmonic analysis of acoustic waves.
12. Ultrasound probe.

Other

- 1.
- 2.
- 3.

etc. ...

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

1. Splinter R., Handbook of physics in medicine and biology. CRC Press 2010
2. Tuszynski & Kurzynski, Introduction to Molecular Biophysics, CRC Press 2003
3. Kane SA, Introduction to physics in modern medicine, CRC Press 2009

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

1. Purves D, Neuroscience, Sinauer Associates, 2004,
2. Bushberg JT, The essential physics of medical imaging, Wolters Kluwer, 2012
3. Cotterill R, Biophysics. An introduction, Wiley & Sons, 2004

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 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 met 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 30-50 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 (recommended: student's presentation prepared during self-study).

Grade:	Criteria (only for courses/modules ending with an examination)
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%
	Criteria (only for courses/modules ending with e credit)
Credit	Does not apply to the Faculty of Medicine

Grade:	Criteria (examination evaluation criteria)
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%
Unit realizing the subject	Department of Biophysics and Neurobiology
Unit address	ul. Chałubińskiego 3a
Telephone	71 784 15 51
E-Mail	biofizyka@umed.wroc.pl

Person responsible for module	dr hab. Olga Wesołowska
Coordinator	dr hab. Olga Wesołowska
Telephone	71 784 14 15
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List of persons conducting specific classes				
Full name	Degree/scientific or professional title	Discipline	Performed profession	Form of classes
Olga Wesołowska	DSc	Medical Sciences	Adjunct	lectures, practical classes
Andrzej Teisseyre	DSc	Medical Sciences	Adjunct	Practical classes
Kamila Środa- Pomianek	DSc	Medical Sciences	Adjunct	Practical classes
Marcin Kołaczkowski	DSc	Medical Sciences	Adjunct	Practical classes
Anna Palko-Łabuz	PhD	Medical Sciences	Adjunct	Practical classes
Grzegorz Wiera	PhD	Medical Sciences	Adjunct	Practical classes

Date of Syllabus development
28.09.2020.

Syllabus developed by
dr hab. Olga Wesołowska

Signature of Faculty Dean

Wrocław Medical University
Faculty of Medicine
Vice Dean for Quality Studies
prof. Beata Chłeszczanska, PhD

Signature of Head of teaching unit
Uniwersytet Medyczny we Wrocławiu
KATEDRA I ZAKŁAD BIOFIZYKI
I NEUROBIOLOGII
Kierownik
prof. dr hab. Jerzy Mozrzyński