UNIWERSYTET MEDYCZNY
IM. PIASTÓW ŚLĄSKICH WE WROCŁAWIU

Appendix
to Resolution No. 2417
of Senate of Wroclaw Medical University
of 25 May 2022

Syllabus for academic year: 2022/2023 Cycle: 2022/2023 – 2026/2027													
Description of the course													
Course	BIOFIZYKA								Group of detailed education results				
	BIOPHYSICS								Group of classes (group code) B		Group name sciences **Scientific bases of medicine**		
Faculty	FACULTY OF DENTISTRY												
Major	DENTISTRY												
Level of studies	X uniform magister studies												
Form of studies	X full-time												
Year of studies	X 1							Semester:	X winter				
Type of course	X obligatory												
Language of study	X English												
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)	Foreign language Course (FLC)	Physical Education (PE)	Vocational Practice (VP)	Directed Self-Study (DSS)	E-learning (EL)
Winter semester:													
Department of Biophysics and Neuroscience	15			35									
Direct (contact) education[1]				**35**									
Distance learning[2]	**15**												
TOTAL per year:													
Department of Biophysics and Neuroscience	15			35									
Direct (contact) education				**35**									
Distance learning	**15**												

Educational objectives

C1. Studies on bases of biomechanics in relation to the organ of mastication.

C2. Getting knowledge about physical base of function of modern diagnostic techniques used for imaging of

[1] Education conducted with direct participation of university teachers or other academics

[2] Education with applied methods and techniques for distance learning

human tissues and organs (USG, MRI).
C3. Getting knowledge about physical base of radiology and application of ionizing radiation in dentistry.
C4. Getting knowledge about physical base of function of laser and about application of lasers in dentistry.
C5. Getting ability to use various laboratory equipment, perform measurements applying spectroscopic, electrical, optical and other methods, getting ability to use professional computer software and to analyze obtained experimental data.
C6. Development social competences needed to practice the medical profession, in accordance with graduate`s profile.

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

Number of detailed education result	Student who completes the course knows/is able to	Methods of verification of intended education results	Form of didactic class **enter the abbreviation*
B.W7	knows the principles of statics and biomechanics in relation to the human body	Oral interrogation, written exam (single choice test)	L, LC
B. W8	knows physical basses of non-invasive imaging methods	Oral interrogation, written exam (single choice test)	L, LC
B.W9	knows the methods of imaging of tissues and organs and the principles of operation of diagnostic equipment used for this purpose	Oral interrogation, written exam (single choice test)	L, LC
B.W10	knows the principles of operation of ultrasound devices	Oral interrogation, written exam (single choice test)	L, LC
B.W11	knows the principles of photometry and fibre optics and the use of light sources in dentistry	Oral interrogation, written exam (single choice test)	L, LC
B.W12	knows the principles of operation of lasers in dentistry	Oral interrogation, written exam (single choice test)	L, LC
B.U2	can interpret the physical phenomena occurring in the masticatory organ	Oral interrogation, written exam (single choice test)	LC
B.U3	can use physical processes specific to the dental profession	Oral interrogation, written exam (single choice test)	LC

* L- lecture; SE- seminar; AC- auditorium classes; MC- major classes (non-clinical); CC- clinical classes; LC- laboratory classes; CSC- classes in simulated conditions; PCP- practical classes with patient; FLC- foreign language course; PE- physical education; VP- vocational practice; DSS- directed self-study; EL- E-learning

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

Student's workload (class participation, activity, preparation, etc.)	Student Workload
1. Number of hours of direct contact:	35
2. Number of hours of distance learning:	15
3. Number of hours of student's own work:	100
4. Number of hours of directed self-study	n/a
Total student's workload	150
ECTS points for course	6

Content of classes:

Lectures (15 weeks/1 hour per week; online via Teams)

1. Principles of biomechanics in relations to human organism with a special regard to the organ of mastication. Neuromuscular transmission. Molecular mechanism of skeletal muscle contraction.
2. Sounds and hearing.
3. Ultrasound, principles of work of ultrasonic devices, application of ultrasound in dentistry.
4. Light and vision.
5. Ionising radiation and physical base of its application in medicine.
6. Methods of tissue imaging applying ionising radiation (CT, PET).
7. Physical base of nuclear magnetic resonance (NMR)
8. Magnetic Resonance Imaging (MRI).
9. Principles of work of a laser.
10. Type of lasers and their practical application in dentistry.

Classes (12 weeks/3 hours per week; direct contact)

1. Emission spectra of elements.
2. Nephelometric determination of colloid concentration.
3. Examination of optical activity of solutions and determination of concentration using a saccharimeter.
4. Fluorescence analysis.
5. Determination of focal length and radius of curvature of the eye model and focal length of correcting lens.
6. Estimation of the time resolution of photoreceptor cells of a human eye.
7. Ionic migration velocity.
8. Computer simulation of action potential generation.
9. Membrane potential measurement at Nernst equilibrium.
10. Microcalorimetric simulation studies on phase transitions in lipids.
11. Analog model of synaptic transmission.
12. Propagation of action potential along unmyelinated and myelinated axons.
13. Determination of the dead time of Geiger-Müller counter by the two-source method.
14. Interaction of β radiation with matter.
15. Estimation of the difference in visual latency in the Pulfrich effect.
16. Dipole model of a heart.
17. Audiometry.
18. Magnetic moment in the magnetic field.
19. Measurement of liquid flow velocity with the use of Doppler effect.
20. Study of properties of electromagnetic waves.
21. Harmonic analysis of acoustic waves.

22. Ultrasound probe.
23. Estimation of volume and radius of a single molecule aplying the viscometric method.
24. Wave absorption in solutions of organic dyes. Analysis of solution composition.

Basic literature

1. Cotterill R. "Biophysics. An introduction", J. Wiley & Sons, 2004
2. Davidovits P. "Physics in biology and medicine", 4-th ed. – Amsterdam: Elsevier Academic Press, 2013
3. Bushberg J.T "The essential physics of medical imaging", 3-rd ed. Philadelphia, Wolters Kluwer Health/Lippincott Williams & Wilkins, 2012

Additional literature and other materials

1. Glaser R. "Biophysics", Springer – Verlag, 2004
2. Glaser R. "Biophysics an introduction", 2-nd ed., Berlin, Springer, 2012
3. Hille B. "Ionic channels of excitable membranes", Sinauer Associates inc. Sunderland, 2004

Preliminary conditions:

A students should have complete knowledge in the area of physics at the high school level, especially in areas of mechanics, optics, electricity, nuclear physics.

Rules for granting partial grades in the subject during the semester:

Each absence must be justified. Each class missed by a student must be re-taken, including classes due to rector's days or dean's hours. Student can retake missed classes by attendance of classes with other student group.

Credit for classes 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.

Conditions to receive credit for the course:

The condition to receive the credit is passing the final exam in a form of a written test. The condition of admittance to the final test is getting credit note from the classes.

The final exam is a written test containing 60 questions (single-choice test). Positive grade is obtained when a student receives score not smaller than 36 points (at least 60% of answers are correct). Grades higher than satisfactory are obtained in proportion to the score. Analogous system is applied for retake exams. In the case of retake exams the lecturer may propose the oral form of examination.

	Criteria for courses ending with a credit (without a grade)
Credit	The condition for getting credit from a laboratory practical is a correct completion of the practical, a correct preparation of the final report from the practical and positive note from the student theoretical background proof. The crediting of practicals takes place in a direct interaction between student and tutor.
Grade:	**Criteria for exam**
Very Good (5.0)	**56 - 60**
Good Above (4.5)	**51 - 55**
Good (4.0)	**46 - 50**
Satisfactory Plus (3.5)	**41 - 45**
Satisfactory (3.0)	**36 - 40**

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Department in charge of the course	**Department of Biophysics and Neurobiology**
Head of Department in charge of the course:	prof. dr hab. Jerzy Mozrzymas
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Person in charge for the course:	dr hab. Andrzej Teisseyre
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CONSULTATION: Detailed information pertaining to the dates and places for consultation of academic staff are provided on the university websites of the departments in which the given subjects are being conducted. Additionally the information is posted next to the department secretary.

Date of Syllabus development
25.07.2022.