Syllabus for academic year: 2021/2022

Training cycle: .....2021/2022 -2025/2026.....

Description of the course

Course	Biophysics	Group of detailed education results	
		Group code **B**	Group name **Scientific bases of medicine**
Faculty	Dentistry		
Major	Dentistry		
Level of studies	**X** uniform magister studies		
Form of studies	**X** full-time **X** part-time		
Year of studies	I	**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 Neurobiology Medical University of Wrocław													
Direct (contact) education[1]				**35**									
Distance learning[2]	**15**												

Educational objectives (max. 6 items)

O1. Studies on bases of biomechanics in relation to the organ of mastication.

O2. Getting knowledge about physical base of function of modern diagnostic techniques used for imaging of human tissues and organs (USG, MRI).

O3. Getting knowledge about physical base of radiology and application of ionising radiation in dentistry.

O4. Getting knowledge about physical base of function of laser and about application of lasers in dentistry.

1

2

	Student actively participates in a team work; is creative; thinks logically and independently;	Credit note for completed laboratory practicals	MC
	learns how to face challenges;	Mentioned above	MC
	is interested in a self-education	Mentioned above	MC

* 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:	**70**
4. Number of hours of directed self-study	**0**
Total student's workload	**120**
ECTS points for course	**6**

Content of classes:

Lectures

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. Types of lasers and their practical application in dentistry.

Classes

1. Emission spectra of elements.
2. Nephelometric determination of colloid concentration.
3. Examination of optical rotation of solutions and determination of concentration using a polarimeter.
4. Fluorescence analysis.
5. Determination of focal length and radius of curvature of the eye model and focal length of correcting lens.
6. Study on the time resolving power of a human eye.

7. Ionic migration velocity.
8. Computer simulation of action potential generation.
9. Membrane potential measurement 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. Geiger–Müller counter characteristics.
14. Attenuation of β radiation by aluminum.
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. Ultrasonic 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 applying 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. [et al.] ***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 student should have complete knowledge in the area of physics at the high school level, especially in areas of mechanics, optics, electricity, nuclear physics.

Conditions to receive credit for the course:

Final examination test – single-choice test – 60 questions. The condition for passing the test is giving correct answers for at least 36 questions out of 60 (60%), condition of admittance is attendance in all lectures (15) and getting a final credit note from the laboratory classes (11). 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.

O5. 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.
O6. 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*
BW 7	Knowledge of the principles of statics and biomechanics in relation to the human body	Oral answers and colloquia during laboratory practicals, written examination test	L
BW 9	Knowledge of methods of imaging of tissues and organs and the principles of operation of diagnostic equipment used for this purpose	Mentioned above	L, MC
BW 10	Knowledge of the principles of operation of ultrasound devices	Mentioned above	L, MC
BW 11	Knowledge of the principles of photometry and fibre optics and the use of light sources in dentistry	Mentioned above	L, MC
BW 12	Knowledge of the principles of operation of lasers in dentistry	Mentioned above	L, MC
BU 2	Ability to interpret the physical phenomena occurring in the masticatory organ	Oral answers and colloquia during laboratory practicals, written examination test	L, MC
BU 3	Ability to use physical processes specific to the dental profession	Mentioned above	L, MC

Grade:	Criteria for exam[3]
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

Unit realizing the course:	**Department of Biophysics and Neurobiology, Medical University of Wrocław**
Unit address:	Ul. Chałubińskiego 3, 50 - 368 Wrocław
Telephone:	71 – 784 – 15 -51
E-Mail:	marta.golinska@umed.wroc.pl

Person responsible for the course:	Dr hab. Andrzej Teisseyre
Telephone:	71 – 784 – 14 - 14
E-Mail:	andrzej.teisseyre@umed.wroc.pl

List of persons conducting specific classes:

Name and surname	Degree/scientific or professional title	Discipline	Performed profession	Form of classes
Andrzej Teisseyre	Ph. D., associate professor	Biomedical sciences - biophysics	University researcher and lecturer	Lectures
Kamila Środa - Pomianek	Ph. D., associate professor	Biomedical sciences - biophysics	University researcher and lecturer	Major classes
Anna Palko - Labuz	Ph. D.	Biomedical sciences - biophysics	University researcher and lecturer	Major classes

UNIWERSYTET MEDYCZNY
IM. PIASTÓW ŚLĄSKICH WE WROCŁAWIU

Appendix No.3
to Resolution No. 2303
of Senate of Wroclaw Medical University
of 28 April 2021

Date of Syllabus development

...30.06.2021.....

Syllabus developed by

.....Andrzej Teisseyre.....

Signature of Head(s) of teaching unit(s)

Uniwersytet Medyczny we Wrocławiu
KATEDRA I ZAKŁAD BIOFIZYKI
I NEUROBIOLOGII
kierownik
prof. dr hab. Jerzy Mozrzymas

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WYDZIAŁ
LEKARSKO-STOMATOLOGICZNY
DZIEKAN
prof. dr hab. Marcin Mikulewicz

Dean's signature