Appendix
to Resolution No. 2186
of Senate of Wroclaw Medical University
of 1 July 2020

Syllabus for academic year: ……2020/2021……. Training cycle: ……			
Description of the course			
Module/Course	Biophysics	Group of detailed education results	
		Group code B	Group name **Scientific bases of medicine**
Faculty	Dentistry		
Major			
Unit realizing the subject	Department of Biophysics and Neurobiology, Medical University of Wrocław		
Specialties			
Level of studies	Uniform magister studies X* 1st degree studies X 2nd degree studies □ 3rd degree studies □ postgraduate studies □		
Form of studies	X full-time □ part-time		
Year of studies	I	Semester	□ Winter X Summer
Type of course	X obligatory □ limited choice □ free choice / elective		
Course	X major □ basic		
Language of instruction	□ Polish X English □ other		
* mark □ with an X			

Number of hours														
Form of education														
Unit teaching the course	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														
Direct (contact) education														
Online learning (synchronous)														

Distance learning (asynchronous)														
Summer Semester														
Direct (contact) education				37										
Online learning (synchronous)	10													
Online learning (asynchronous)														
TOTAL per year:														
Direct (contact) education				37										
Online learning (synchronous)	10													
Online learning (asynchronous)														

Educational objectives (max. 6 items)

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

O2. Getting knowledge about selected life functions of a human being – studies on physical base of function of sensory organs: eyes and ears.

O3. Getting knowledge about physical base of function of modern diagnostic techniques used for imaging of human tissues and organs (USG, MRI).

O4. Getting knowledge about physical base of radiology and application of ionising radiation in dentistry.

O5. Getting knowledge about physical base of function of laser and about application of lasers in dentistry.

O6. 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.

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*
W 01	BW 7	1.Knowledge of principles of statics and biomechanics in relation to a human organism	Oral answers and colloquia during laboratory practicals, written examination test	L
	BW 8	2. Knowledge of mechanics of the organ of mastication.		
	BW 9	3.Knowledge of physical bases of methods of imaging of tissues and organs and principles of function of diagnostic equipment used for these purposes.	Mentioned above	L, LC

	BW 10 BW 11 BW 12 BW 19	4.Knowledge of principles of function of ultrasonic devices and their application in diagnostics and therapy . 5.Knowledge of principles of photometry and principles of function of optical fibers and application of light sources in dentistry . 6.Knowledge of principles of work of lasers and their application in dentistry . 7.Knowledge of selected life functions of a human organism – physical bases of function of nerve system and function of selected sensory organs .	Mentioned above Mentioned above Mentioned above Mentioned above	L, LC L, LC L, LC L, LC
U 01	BU 2 BU 3	1.Ability of interpretation of physical phenomena in a human organism, in particular, in the organ of mastication . 2.Ability of application of physical processes in a work of a dentist.	Oral answers and colloquia during laboratory practicals, written examination test Mentioned above	L, LC L, LC
K 01		Student actively participates in a team work; is creative; thinks logically and independently; learns how to face challenges; is interested in a self-education	Credit note for completed laboratory practicals Mentioned above Mentioned above	LC LC LC 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: +++++
Social competences: +++++

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Student's amount of work (balance of ECTS points)	
Student's workload (class participation, activity, preparation, etc.)	Student Workload (h)
1. Contact hours:	37
2. Online learning hours (e-learning):	10
3. Student's own work (self-study):	43
Total student's workload	90
ECTS points for module/course	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. 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.

Seminars

None

Practical 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.
25. Application of lasers in surgery of soft tissues.
26. Application of lasers in surgery of bone tissues.

Other
None

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

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 (no more than 3 items)

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.

Didactic resources requirements (e.g. laboratory, multimedia projector, other…)
Equipment setups for laboratory practicals in laboratories, multimedia projectors, computers, standard and specialist software.

Preliminary conditions (minimum requirements to be met by the student before starting the module/course)
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 (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 med by the student to pass it and criteria for specific grades)
Final examination test - condition of admittance is a previous getting a final credit note from the laboratory classes and attendance in all lectures.

Grade:	**Criteria** (only for courses/modules ending with an examination)
Very Good (5.0)	

Good Plus (4.5)	
Good (4.0)	
Satisfactory Plus (3.5)	
Satisfactory (3.0)	
	Criteria (only for courses/modules ending with e credit)
Credit	The requirement for getting credit from lectures is attendance in all the lectures. The requirement for getting credit from laboratory practicals is getting credit notes from all 13 practicals. The requirements for getting credit from a practical is correct performance of the experiment, correct preparation of the final report and positive note from the student theoretical background proof.

Grade:	**Criteria** (examination evaluation criteria)
Very Good (5.0)	56 - 60
Good Plus (4.5)	51 - 55
Good (4.0)	46 - 50
Satisfactory Plus (3.5)	41 - 45
Satisfactory (3.0)	36 - 40
Unit realizing the subject	Department of Biophysics and Neurobiology Medical University of Wrocław
Unit address	ul. Chałubińskiego 10, 50-368 Wrocław
Telephone	71 784 15 51 51
E-Mail	aleksandra.zygmunt@umed.wroc.pl

Person responsible for module	Dr hab.Andrzej Teisseyre
Coordinator	Dr hab.Andrzej Teisseyre
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List of persons conducting specific classes				
Full name	**Degree/scientific or professional title**	**Discipline**	**Performed profession**	**Form of classes**
Andrzej Teisseyre	Ph. D., associate professor	Biomedical sciences - biophysics	University researcher and lecturer	Lecture, laboratory practicals
Jacek Matys	Ph. D.	Medical sciences- surgery	Dentist	Laboratory practicals
Kamila Środa-Pomianek	Ph. D., associate professor	Biomedical sciences - biophysics	University researcher and lecturer	Laboratory practicals
Anna Palko-Labuz	Ph. D.	Biomedical sciences - biophysics	University researcher and lecturer	Laboratory practicals

Syllabus developed by

Date of Syllabus development

……18.01.2021…….. …….Andrzej Teisseyre, Ph. D, associate professor..

Signature of Head of teaching unit

……

Signature of Faculty Dean

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