



| Syllabus, academic year 2016/2017 | | | | | | | | | | | | | | |
|---|---|---------------|-------------------------|-----------------------------------|-----------------------|-------------------------|---|--------------------------------------|---|-------------------------------|-------------------------------------|--------------------------------------|---------------------------------|-----------------|
| 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* 1 st degree studies <input type="checkbox"/> 2 nd degree studies <input type="checkbox"/> 3 rd degree studies <input type="checkbox"/> postgraduate studies <input type="checkbox"/> | | | | | | | | | | | | | |
| Form of studies | X full-time X part-time | | | | | | | | | | | | | |
| Year of studies | I | | | | | Semester | X Winter <input type="checkbox"/> Summer | | | | | | | |
| Type of course | X obligatory <input type="checkbox"/> limited choice <input type="checkbox"/> free choice / elective | | | | | | | | | | | | | |
| Course | X major <input type="checkbox"/> basic | | | | | | | | | | | | | |
| Language of instruction | <input type="checkbox"/> Polish X English <input type="checkbox"/> other | | | | | | | | | | | | | |
| * mark <input type="checkbox"/> 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 | | | | | | | | | | | | | | |
| | 22 | | | | | 33 | | | | | | | | |
| Summer Semester | | | | | | | | | | | | | | |
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| TOTAL per year: 55 | | | | | | | | | | | | |
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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 <i>**enter the abbreviation</i> |
|-----------------------------------|----------------------------------|---|---|---|
| W 02 | B.W5 | Knows physical laws describing fluid flows and factors determining haemodynamic resistance of blood capillaries | Oral interrogation, written exam | L, LC |
| W 03 | B.W6 | Knows natural sources of ionizing radiation and its interaction with matter | Oral interrogation, written exam, | L, LC |
| W 04 | B.W7 | Knows physico-chemical bases of senses | Oral interrogation, written exam, | L, LC |
| W 05 | B.W8 | Knows physical bases of non-invasive imaging methods | Oral interrogation, written exam, | L, LC |
| W 06 | B.W9 | Knows physical bases of selected therapeutic techniques including ultrasounds and irradiation | Oral interrogation, written exam, | L, LC |

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| W 09 | 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 blood | Oral interrogation, written exam | L, LC |
| W 10 | B.W34 | 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, |
| U 01 | 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 |
| U 02 | 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 |
| U 05 | B.U11. | Applies simple measuring devices and assesses the precision of measurements | Oral interrogation | LC |
| U 07 | B.U15 | 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: +++++

Social competences:

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

| Student's workload (class participation, activity, preparation, etc.) | Student Workload (h) |
|--|----------------------|
|--|----------------------|

| | |
|-------------------|----|
| 1. Contact hours: | 55 |
|-------------------|----|



| | |
|--|-------|
| 2. Student's own work (self-study): | 87.6 |
| Total student's workload | 142.6 |
| ECTS points for module/course | 5.0 |
| 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 <ol style="list-style-type: none">1. Intermolecular interactions. Structures and models of biological membranes2. Application of thermodynamics to description of processes in biological systems3. Passive and active transport across biological membranes. Ion channels – types and roles.5. Biophysics of senses - light and vision6. Biophysics of senses – acoustics and hearing7. Biophysics of circulation, physical bases of electrocardiography8. Ultrasounds in diagnosis and therapy9. Ionizing radiation - properties, effect on matter and application in medicine10. Physical bases of nuclear magnetic resonance (NMR) and its application in spectroscopy and imaging.11. Lasers and experimental methods in molecular biophysics. | |
| Seminars <ol style="list-style-type: none">1.2.3. | |
| Practical classes Laboratory of Bioacoustics and Biomechanics <ul style="list-style-type: none">- 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 Laboratory of Bioelectricity <ul style="list-style-type: none">- 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- Ion transport through the membrane Laboratory of Biooptics and Spectroscopy <ul style="list-style-type: none">- 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 | |

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| Other | | | | | | | | | | | |
|--|--|--------|--|--------------------|-------------|--------------------|--------------------|---------------|-------------------|----------------------------|--------------------|
| 1. 2. 3. etc. ... | | | | | | | | | | | |
| 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 3. 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 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 50-80 questions (one out of 5 answers is correct). 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. | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>Grade:</th> <th>Criteria (only for courses/modules ending with an examination)</th> </tr> </thead> <tbody> <tr> <td>Very Good (5.0)</td> <td>Score > 92%</td> </tr> <tr> <td>Good Plus (4.5)</td> <td>92% > Score > 84 %</td> </tr> <tr> <td>Good (4.0)</td> <td>84 > Score > 76 %</td> </tr> <tr> <td>Satisfactory Plus (3.5)</td> <td>76% > Score > 68 %</td> </tr> </tbody> </table> | | 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 % |
| 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 % | | | | | | | | | | |

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|-----------------------|-------------------|
| Satisfactory (3.0) | 68 %> Score > 60% |
|-----------------------|-------------------|

Name and address of module/course teaching unit, contact: telephone and e-mail address

Department of Biophysics,

T. Chałubińskiego 10 St., 50-368 Wrocław,
tel. 71 784 14 00, 71 784 14 01

e-mail: krystyna.michalak@umed.wroc.pl

Coordinator / Person responsible for module/course, contact: telephone and e-mail address

Department of Biophysics (Laboratory of Neuroscience),

Prof. Jerzy Mozrzyimas

T. Chałubińskiego 3a St., 50-368 Wrocław,
tel. 71 784 1551, 71 784 1550

e-mail: jerzy.mozrzyimas@umed.wroc.pl

List of persons conducting specific classes: full name, degree/scientific or professional title, discipline, performed profession, form of classes.

dr hab. Andrzej Teisseyre, LC - DSc in medical sciences, MSc of chemistry, Adjunct

dr hab. Olga Wesołowska, LC - DSc in medical sciences, MSc of biotechnology, Adjunct

dr Marcin Kołaczkowski, LC – PhD in biological sciences, MSc in biotechnology, Adjunct

dr Tomasz Wójtowicz, LC - PhD in biological sciences, MSc in biology, Adjunct

Date of Syllabus development

2/8/2016

Uniwersytet Medyczny we Wrocławiu

Katedra Biofizyki
SAMODZIELNA PRACOWNIA BIOFIZYKI
UKŁADU NERWOWEGO
Kierownik

prof. dr hab. Jerzy Mozrzyimas

Signature of Head of teaching unit

Signature of Faculty Dean

Wrocław Medical University
FACULTY OF MEDICINE
VICE-DEAN FOR STUDIES IN ENGLISH
Prof. Andrzej Hendrich, PhD

Uniwersytet Medyczny we Wrocławiu

KATEDRA BIOFIZYKI
ZAKŁAD BIOFIZYKI
Kierownik
prof. dr hab. Krystyna Michalak