

SYLLABUS

The academic year when the cycle of instruction is commenced 2019/2020

Module/course name:	BIOPHYSICS		Module code	LK.3.B.002
Faculty:	Faculty of Medicine MUL			
Major:	Medical			
Specialty:				
Level of study:	I (Bachelor studies) <input type="checkbox"/> II (Master studies) <input type="checkbox"/> integrated Master studies X III (Doctoral studies) <input type="checkbox"/>			
Mode of study :	full-time X part-time (extramural) <input type="checkbox"/>			
Year of study:	I <input checked="" type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V <input type="checkbox"/> VI <input type="checkbox"/>	Semester :	1 <input type="checkbox"/> 2 X 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12 <input type="checkbox"/>	
Module/course type:	obligatory X elective <input type="checkbox"/>			
Language of instruction:	Polish <input type="checkbox"/> English X			
Form of education	Hours			
Lecture	15			
Seminar	-			
Laboratory class	45			
E-learning	-			
Practical class	-			
Internship	-			
Student's work input (participation in class, preparation, evaluation, etc.)		Student's hourly workload		
1. In class		60		
2. Student's own work		40		
Summary of the student's workload		100		
ECTS points for module/course		4		

Educational objectives:

This course focuses on the application of physics to medicine. Students will learn about the human body, exploring its performance as a system based on universal laws of the nature. Some topics include physics of the senses like vision and hearing or physics of the main systems of the body. Students will also study physical background of diagnostic and therapeutic applications like the ECG, radiation physics, imaging methods, hearing test. By the end of the course students should be familiar with basic physical phenomena in biophysics and medical physics. Student should understand the basis of physical methods in diagnosis and therapy as well as understand effects of physical factors on biological structures especially on the human body.

Course objectives

At the end of the course, the student should:

Know and understand

- Physical principles involved in the functioning of human body.
- Basic physics of imaging methods and the principles and operation of medical imaging instrumentation.
- Fundamentals of physics in medical therapy.

Be aware of

- Health hazard of nuclear radiation exposure, and hazard associated with electricity, EM radiation,

acceleration, excessive heat.

Be able to

- Interpret physical phenomena that occur in human body.
- Work with standard date-measuring devices, perform measurement, interpret results (including basic analysis of accuracy of a measurement) and analyze conclusion from experiment result.

The matrix of learning outcomes for module/ subject with reference to verification methods of the intended educational outcomes and forms of instruction:

Learning outcome code	A student who has obtained a credit for the module/course has the knowledge/skill to:	Methods of verifying the achievement of the intended learning outcomes:	Form of instruction * provide the symbol
W01 (B.W5.)	knows physical laws describing fluid flow and factors affecting blood flow vascular resistance;	SSQ, MCQ	Lecture, lab
W02 (B.W6.)	knows natural and artificial sources of ionizing radiation and its interactions with matter;	SSQ, MCQ	Lecture, lab
W03 (B.W7.)	knows physicochemical and molecular basis of sense organ activity;	SSQ, MCQ	Lecture, lab
W04 (B.W8.)	knows physical basis of non-invasive imaging methods;	SSQ, MCQ	Lecture, lab
W05 (B.W9.)	knows physical basis of selected therapeutic modalities, including ultrasounds and irradiation;	SSQ, MCQ	Lecture, lab
U01 (B.U1.)	applies knowledge of the laws of physics to explain the effect of external factors, such as temperature, gravity, pressure, electromagnetic field and ionizing radiation on human body and its elements;	SSQ, MCQ	Lecture, lab
U02 (B.U2.)	can assess damaging effect of ionizing radiation dose and observes principles of radiological protection	SSQ, MCQ	Lecture, lab
U03 (B.U9.)	operates simple measuring equipment and assesses accuracy of measurements,	an extended observation by a teacher; written lab report	lab
K 01	Understands the need for life-long learning,	an extended observation by a teacher	Lecture, lab

K 02	Knows how to take care of the safety of him/herself, his/her surrounding and associates	an extended observation by a teacher	lab
K 03	Shows that is able and has a habit of self-education	an extended observation by a teacher	lab

Course content: (use keywords referring to the content of each class following the intended learning outcomes):

Lectures:

1. Electromagnetic radiation and human body – spectrum of e-m radiation
2. Electric current, electric and magnetic fields and human body
3. Physics of the eye
4. Extension of vision, microscopy
5. Physics of the ear and hearing
6. Radioisotopes in medicine: interaction with matter
7. Imaging methods in medicine: part I
8. Imaging methods in medicine: part II
9. Ultrasound in medicine
10. Circulatory system I
11. Circulatory system II
12. Physics of breathing
13. Transport of substances, Physics of a biological membrane
14. Electric signals in (and on) the body
15. Part A: Basic thermodynamics of the body; Part B: Acceleration and the human body.

Laboratory classes:

1. Introductory lab (rules and regulations, units, vectors, review of mathematics useful in biophysics)
2. Spectroscopy. Laser light and diffraction grating.
3. Microscopy - measurement of size of small objects.
4. Inertia of the eye.
5. Retinoscopy.
6. The physical basis of ultrasound imaging - Ultrasonography.
7. Fluid flow systems in biology.
8. Forces in the body - calculations of forces acting on joint and muscle forces using a mechanical models.
9. Audiometry.
10. Conductivity of electrolytes. Body composition analysis.
11. Nuclear physics in medicine.
12. Electrical signals from the body (ECG).
13. Medical application of electromagnetic waves.
14. Summary of practical skills
15. General summary and makeup labs

Obligatory literature for lectures:

1. Physics of the Body, Cameron John R., Skofronick James G., Grant Roderick M., Medical Physics Publishing.
2. Lecture notes !

Complementary literature for lectures:

1. College Physics, Willson Jerry D., Buffa Anthony J., Prentice Hall;

Obligatory literature for labs:

1. Physics of the Body, Cameron John R., Skofronick James G., Grant Roderick M., Medical Physics Publishing.

Complementary literature for labs:

1. College Physics, Willson Jerry D., Buffa Anthony J., Prentice Hall;

Requirements for didactic aids (multimedia projector, movie camera, etc.): laboratories, multimedia projector

Conditions for obtaining a credit for the subject:

To pass 12 laboratory classes - each lab consists of: a short written test (each test - maximum 3 points, 1.5 points to pass), an experimental part performed by one's own and a written lab report (maximum one point each). After the labs passed student can obtain **additional two points** for her/his excellent attitude during labs.

To pass the Final Test (lecture topics)

To be allowed to take the Final Test, student must pass the Labs.

In order to complete the Physical Basis of Medicine/Biophysics students have to **collect at least 24 points from the Labs and at least 31 points from Final Exam.**

- Maximum number of points to obtain from the course is **110 points** (Labs are worth 50 points, Final Exam is worth 60 points).
- Grades are as follows:
 - $\leq 50\%$ (0 – 55 points) - fail (2),
 - $> 50\%$ (55.1 – 66 points) - satisfactory (3)
 - $> 60\%$ (66.1 – 77 points) - fairly good (3.5)
 - $> 70\%$ (77.1 – 85.9 points) - good (4)
 - $> 78\%$ (86 – 95.9 points) - above good (4.5)
 - $> 87\%$ (96 - 110 points) - very good (5).
- Students who passed the final test in the first term and attended the lectures can obtain additional 2 points from the Coordinator if will need for a better grade.

The name and address of the department/clinic where the course is taught (module/course); contact details (phone number/ email address):

Department of Biophysics (KATEDRA I ZAKŁAD BIOFIZYKI) ul. dr Kazimierza Jaczewskiego 4, 20-090 Lublin, tel. 6336,

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Names of the author/authors of this syllabus: Prof. dr hab. Hanna Trębacz



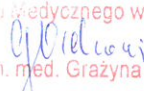
Names of the teacher/teachers conducting classes:

Lectures: dr Witold Okulski, prof. dr hab. Hanna Trębacz

Laboratory classes: mgr Angelika Barzycka, dr Małgorzata Gospodarek, mgr Monika Mańko, dr Witold Okulski, dr Jan Warchoń, dr Justyna Widomska,;

Signature of the head of the department/clinic

Dean's signature

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Uniwersytetu Medycznego w Lublinie

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Date of submission: