



Biophysics

ECTS: 2.50

SUBJECT MATTER CONTENT

LECTURE

Basic physical concepts and SI units. Physics of biological structures. Interactions in nature; (2h). Elements of thermodynamics of processes taking place in biological systems. Living organisms as examples of open thermodynamic systems; (2h). Biological membranes. Transport processes and bioelectric phenomena occurring in membranes; (1h). Biophysics of the senses. Transmission of information in biological systems. The sense of sight. Sense of hearing; (2h). Cardiovascular biophysics. Laws governing fluid flows; (1h). Ionizing radiation - origin, properties, interaction with living organisms, use in diagnostics and therapy; 2 (h).

LABORATORY CLASSES

ĆWICZENIA: Students perform a set of five laboratory exercises. 1) Ionizing radiation. Determination of linear and mass gamma absorption coefficient for various materials. 2) The electrical activity of the heart. Electrocardiography. 3) Measurement of the viscosity coefficient of liquids using the Stokes method. Blood pressure measurement using the Korotkov's auscultation method. 4) Fundamentals of the biophysics of the sense of hearing. Study of the excitability threshold of the human ear. Physical basis for the use of ultrasound in medicine. Ultrasound. 5) Determination of thermodynamic changes of state functions. Determination of the change in system entropy

TEACHING OBJECTIVE

1) To provide basic knowledge about the phenomena and laws of physics needed to understand the biophysical basis of the functioning of the body and the foundations of modern diagnostic methods. 2) Developing self-education through the ability to use various sources of knowledge. 3) Acquiring the ability to carry out simple physical measurements with the use of measuring tools and / or measuring apparatus. 4) Acquiring the ability to precisely and clearly elaborate the obtained results.

DESCRIPTION OF THE LEARNING OUTCOMES OF THE COURSE IN RELATION TO THE DESCRIPTION OF THE CHARACTERISTICS OF THE SECOND LEVEL LEARNING OUTCOMES FOR QUALIFICATIONS AT LEVELS 6-8 OF THE POLISH QUALIFICATION FRAMEWORK IN RELATION TO THE SCIENTIFIC DISCIPLINES AND THE EFFECTS FOR FIELDS OF STUDY:

Symbols for outcomes related to the discipline:

R/WA_P7S+++

Symbols for outcomes related to the field of study:

A.U2. ++, K.4.+ , K.9.++ , A.W8. ++, A.W7. ++, K.5+, A.U21. ++, C.U4. +, C.U3. +, A.W5. +

LEARNING OUTCOMES:

Knowledge:

Legal acts specifying learning outcomes:
682/2020
Disciplines: Veterinary science
Status of the course: Obligatoryjny
Group of courses: A - przedmioty podstawowe
Code: ISCED 0841
Field of study: Veterinary Medicine
Scope of education:
Profile of education: General academic
Form of studies: full-time
Level of studies: uniform master's studies
Year/semester: 1/1

Types of classes: Lecture, Laboratory classes
Number of hours in semester: Lecture: 10.00, Laboratory classes: 20.00
Language of instruction: Polish
Introductory subject: mathematics, physics, biology
Prerequisites: knowledge of physics, mathematics and biology in the field of high school

Name of the organisational unit conducting the course: Katedra Fizyki i Biofizyki
Person responsible for the realization of the course: dr inż. Monika Pietrzak
e-mail: pietrzak@uwm.edu.pl

Additional remarks:

W1 –
W2 –

Skills:

U1 –
U2 –
U3 –

Social competence:

K1 –
K2 –
K3 –

TEACHING FORMS AND METHODS:

Lecture(W1;W2;K3);
Laboratory classes(W1;W2;U1;U2;U3;K1;K2;K3);

FORM AND CONDITIONS OF VERIFYING LEARNING OUTCOMES:

Lecture (Written exam) - The final exam consists of ten open-ended tasks (you can get from 0 to 1 point for each answer) and five descriptive questions (you can get from 0 to 2 points for each answer). In order to pass the final exam, it is necessary to obtain not less than 65% of possible points. The grading of grades is based on the established score thresholds, i.e. assigning the grade to a specific percentage of points that can be obtained. These thresholds are as follows: 94-100%, grade: very good (5.0); 87-93%, good plus (4.5); 80-86%, evaluation: good (4.0); 73-79%, grade: sufficient plus (3.5); 66-72%, evaluation: satisfactory (3.0); 65%, assessment: insufficient (2.0). In the event of a top-down suspension of classroom classes and the need for distance learning, the methods of verifying the achievement of learning outcomes declared in the syllabus, i.e. the forms of passing the exam and exercises, may change in a manner appropriate to the situation. -

Laboratory classes (Write-up) - Report from each performed laboratory experiment, which, depending on the experiment, consists of: a table with the performed measurements, calculations of the determined quantities, graphs, determination of measurement uncertainties and conclusions The student is obliged to correct the incorrectly made report. Failure to pass a report on any of the experiments is tantamount to obtaining an insufficient final grade for the exercises. -

Laboratory classes (Written test) - There are five written tests per semester, at the beginning of each laboratory exercise. The subject of the test concerns the experiment performed by the student. The test consists of six questions in the form of open-ended tasks and / or essay questions. For each question you can get from 0 to 1 points. To pass the test, the student must obtain at least 65% of the possible points. The grading of grades is based on the established score thresholds, i.e. assigning the grade to a specific percentage of points that can be obtained. These thresholds are as follows: 94-100%, grade: very good (5.0); 87-93%, good plus (4.5); 80-86%, evaluation: good (4.0); 73-79%, grade: sufficient plus (3.5); 66-72%, evaluation: satisfactory (3.0); 65%, assessment: insufficient (2.0). The student may attempt to improve the test twice. The condition for receiving the final pass from the exercises is to obtain positive grades from all tests taking place during the classes. In case of passing all the tests, the final grade for the exercises is issued on the basis of the arithmetic mean value of all the grades obtained from the tests (including failing grades). The rounding of the rating is based on the following ranges: mean ≥ 4.76 : very good (5.0); average in the range of 4.26 - 4.75: good plus (4.5); average in the range: 3.76 - 4.25: good (4.0); average in the range of 3.26 - 3.75: sufficient plus (3.5); mean ≤ 3.25 : satisfactory (3.0). Failure to pass any of the tests is tantamount to obtaining an unsatisfactory final grade in the exercises. In the event of a top-down suspension of classroom classes and the need for distance learning, the methods of verifying the achievement of learning outcomes declared in the syllabus, i.e. the forms of passing the exam and exercises, may change in a manner appropriate to the situation. -

BASIC LITERATURE:

1. William Moebs, Samuel J. Ling, Jeff Sanny, *Fizyka dla szkół wyższych*, Tom 1-3, Wyd. OpenStax, R. 2017

2. G. Ibron, *Podstawy biofizyki*, Wyd. Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego w Olsztynie, R. 1997
3. F. Jaroszyk, *Biofizyka*, Wyd. PZWL, Warszawa, R. 2001
4. R. Drabent, Z. Machholc, J. Siódmiak, Z. Wieczorek, *Ćwiczenia laboratoryjne z fizyki*, Wyd. Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego w Olsztynie, R. 2013

SUPPLEMENTARY LITERATURE:

1. M. Bryszewska, W. Leyko, *Biofizyka dla biologów*, Wyd. PWN, Warszawa,, R. 1997
2. R. Resnick, D. Holliday, J. Walker, *Podstawy fizyki*, Tom 1-5, Wyd. PWN, Warszawa, R. 2006

