Code of subject	M_WE_SEM1BIOF ANG
Field of study	Veterinary medicine
Name of the training module including the Polish name	Biophysics
	Biofizyka
Language of instruction	English
Module type	Mandatory
Level of studies	Long-cycle master's degree studies
Form of study	Full-time
Location in the programme (year)	I
Location in the programme (semester)	I
Number of ECTS credits with a division into contact/noncontact	2 (1.2/0.8)
Name and surname of the person in charge	Izabela Świetlicka
Unit offering the subject	Department of Biophysics, Faculty of Environmental Biology
Aim of the module	The course aims to familiarise students with the role of physics in the functioning and description of the world. Students learn the basic laws governing the macro and microworld and research methods of biophysics, emphasising the role of experiment and theory in its development. The subject enables understanding biophysical phenomena and processes, relating them to living organisms' functioning, and learning the basics of physical phenomena used in medical and veterinary diagnostics.
Learning outcomes – the total number of learning outcomes may not exceed (4-8) for the module. A description of the intended learning outcomes that a student should achieve after the completion of the module should be provided. The outcomes for all forms of classes used should be presented.	**Konwledge:**
	K1. The student knows the fundamental physical laws and principles governing the structure, function and behaviour of living organisms.
	K2. The student has sufficient knowledge to identify and understand biophysical phenomena used in the operation of selected scientific and research equipment
	Skills:
	S1. The student can determine fundamental physical quantities and interpret performed measurements
	S2. The student can use basic measuring equipment
	S3. The student can use the knowledge of the laws of physics to explain the influence of external factors on living organisms
	Social competences:
	C1. The student is ready to expand and update its knowledge and skills constantly and to share knowledge
	C2. The student is ready for teamwork, communication and cooperation
Preliminary and additional requirements	No prerequisites and additional requirements

Contents of the training module – a compact description	The module allows the student to supplement and expand the knowledge of selected areas of biophysics. Biophysics is presented as a coherent science, based on fundamental laws. During the lectures, issues related to the basic biophysical phenomena and processes occurring in nature are discussed, including: • Physical quantities, measurement, the system of physical units • Elements of mechanics. Statics and equilibrium conditions. Muscles and levers in living organisms. • Thermodynamic (energetic) view of living organisms. • Transport and exchange of matter, energy and momentum in living organisms. • Mechanical waves. Auditory sensations and other effects of sound waves and the use of their properties in medical diagnosis • Electromagnetic waves. Visual impressions. Biopotentials. • Ionizing radiation and its influence on living organisms. The use of ionising radiation in diagnostics. • Elements of information and control theory. The program of laboratory classes includes: • Experiments in the field of Thermodynamics (Entropy / Enthalpy / Blood flow) • Experience in the field of matter, energy and momentum transport (Viscosity of liquid / Surface tension / Ohm's law / Electrolysis) • Experiments in the field of mechanical waves (Ultrasound) • Experiments in the field of electromagnetic waves (Polarimeter / Spectrophotometer / Refractometer / Laser) • Experiences in the field of mechanics (Torque / Levers)
Recommended and obligatory reading list	**Obligatory:** 1. Physics of Life Science, Jay Newman 2. Handbook of Physics, W. Benenson, J. W. Harris, H. Stocker, H. Lutz 3. Physics in Biology and Medicine, P. Davidovits **Recommended** 1. Biophysics: An Introduction, R. Cotterill. 2. University Physics, W. Moebs, S. L. Ling, J. Sanny https://openstax.org/subjects/science
The intended forms/activities/ teaching methods	Lecture, laboratory classes, discussion, consultations, introductory tests on the knowledge of the laboratory exercises performed

Methods of verification and documentation forms of the achieved learning outcomes	In terms of knowledge (K1 and K2): • LECTURES: assessment of the final written work (exam) 0% -50% - unsqatisfactory 51% - 60% - satisfactory 61% - 70% - satisfactory plus 71% - 80% - good 81% - 90% - good plus 91% - 100% - very good • LABORATORY CLASSES - preliminary tests (0-5 points, minimum 51% of points to pass the laboratory classes) - conducting of all laboratory exercises planned in the schedule and preparation of the reports The final grade for the laboratory classes is determined in accordance with the following ranges: 0% -50% - unsqatisfactory 51% - 60% - satisfactory 61% - 70% - satisfactory plus 71% - 80% - good 81% - 90% - good plus 91% - 100% - very good The lecturer may increase the grade by 0.5, taking into account the student's work during the laboratory classes and the evaluation of the reports. The lecturer may lower the grade by 0.5, taking into account the student's work during the classes and in the event of non-compliance with the rules set out in the Health and Safety Regulations. Forms of documentation: entry into the evaluation system, written documentation - students' work In terms of skills (S1, S2 and S3): conducting independent physical measurements; evaluation of the laboratory experiments, assessment of experimental data processing Forms of documentation: written documentation - students' work In terms of competencies (C1 and C2): work in a laboratory team during classes, independent (group) conducting experiments Forms of documentation: written documentation - students' work and teacher's notes In the suspension of classes at the university and the need for e-learning, other verification methods of the learning outcomes are going to be implemented in a manner appropriate to the situation.

Balance of ECTS credits	**Contact** 1. Participation in lectures 10h / 0.4 ECTS 2. Participation in laboratory classes 20h / 0.8 ECTS Contact 30h / 1,2 ECTS in total **Non-contact:** 1. Preparation for laboratory exercises 1h / 0.04 ECTS 2. Preparation for preliminary tests 6h / 0.24 ECTS 3. Preparation of reports on laboratory exercises 5h / 0.2 ECTS 4. Preparation for the exam 8h / 0.32 ECTS Non-contact 20h / 0.8 ECTS in total TOTAL: 50h: 25h / ECTS = 2 ECTS
Number of contact hours	1. Participation in lectures 10h 2. Participation in laboratory classes 20h A total of 30 hours
Relationship between subject learning outcomes and veterinary studies learning outcomes	K1 –A.W4 +, A.W7 +++ A.W8 ++ K2 – A.W11 ++, B.W4 + S1 – A.U2 + S2 – A.U2 ++ S3 – A. U1 +++ C1 – K.8 ++ C2 – KS3 ++, K.9 ++
Impact of selected compounds to final grade	Final grade: • exam results • in the case of very good results (91-100% of points) from the laboratory classes, the possibility of exemption from the exam with a very good (5.0) grade.