

PHYSICS AND BIOPHYSICS

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UNIVERSITY OF ZAGREB
FACULTY OF VETERINARY MEDICINE
Heinzelova 55
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Division: Basic and Pre-clinical Science Division
Physics and Biophysics Unit
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Register no.:
Zagreb, 04/09/2025



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Veterinarski fakultet u Zagrebu			
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Urudžbeni broj	Prilozi	Vrijednost	
251-61-03-25-49	0	-	

COURSE SYLLABUS

Course name: PHYSICS AND BIOPHYSICS

Academic year 2025/2026

Course leader: Dr. Selim Pašić, associate professor

Deputy course leader: -

Teachers: Dr. Selim Pašić, associate professor, dr. Nato Popara, assistant.

First day of classes: 30/09/2025

Last day of classes: 20/01/2026

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STUDENT OBLIGATIONS

Lecture attendance	A student gains 0.375 point for attending 1 lecture lesson. During the course a student must attend 8 lectures in order to gain a minimum of 3 points (8 lessons x 0.375 units $\approx$ 3 points). A student can gain 6 points max. (16 lessons x 0.375 = 6 points) from this evaluation element.
Practicals attendance	A student gains 0.316 point for attending one exercise. During the course a student must attend 26 exercises in order to gain a maximum of 8 points (26 lessons x 0.316 units = 8 points). A student can gain 12 points max. (38 lessons x 0.316 units = 12 points) from this element of evaluation.
Active participation in seminars and practicals	During the course a student must complete 12 lab tasks. The student must be prepared for each problem according to methodical units. During the exercise a student must solve the discussed problems and analyse the measured data. If a student completes all activities process correctly, they can gain a maximum of 0.8333 points per exercise. The maximal number of points from all exercises is 10 (12 exercises x 0.8333 points). The minimal number of points is 5.
Final exam	A student must gain the minimal number of points from all five evaluation elements to have right to take the final exam. The final exam is in written form and it consists of 20 tasks, among them are about 40% calculation exercises. Each correctly solved task in the test carries 2 points. A student should solve at least 12 tasks to obtain the minimal number of points (24). The maximum number of points a student can gain at the final exam, is 40.
Examination requirements	Student requirements are defined in the Regulations on the Integrated Undergraduate and Graduate Study of Veterinary Medicine. Given the above, the student must acquire a minimum number of points from all assessment elements in order to take the final exam. Article 41: a student can justifiably be absent from up to 50 % of the lectures; 30% of the seminars and 30 % of the exercises.

GRADING AND EVALUATING STUDENT WORK

Continuous knowledge-checking (mid-terms)	Time of holding regular preliminary exams: 1. measuring units preliminary exam - 12/01/2026, 15:30, 10:15, Department of physics 2. data processing exam - according to the schedule the 7th exercise. During the course, the following preliminary exams will be organized: a. measuring units preliminary exam (12 tasks x 0.5 points = 6 points). Minimal number of points is 4 (8 tasks x 0.5 = 4 points). b. An exam testing data processing and 12 admittance exams for each lab exercise. Each exercise
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	consists of 5 questions. Each correct answer on the question carries 0.4 points. The maximal number of points per one admittance exam is 2 points (5 questions x 0.4 points = 2 points). The maximal number of points is 26 ((12 lab exercises + data processing exam x 2 points/lab exercise = 26 points). The minimal number of points is 16. The maximum number of points from this evaluation element is 32. Minimal number of points is 20. A student which doesn't achieve a minimum of points from this evaluation element has right to three retakes, which will be hold during the semester. The retakes consist of two parts: a units of measurement retake and a retake of the admittance colloquia for all 12 exercises. The student must gain a minimum of 4 points to achieve a minimum in the units of measurement retake and 16 points in the admittance colloquia retake in order to achieve right to take the final exam. Students who didn't gain the minimal point from the two evaluations elements: attending lectures and attending exercises do not have a right to retakes.
Final exams (dates)	10. 02. 2026., 20. 02. 2026.
Form of final exam	Written test

LITERATURE

Obligatory literature	1. PAŠIĆ, S.: Preparations for practicum in physics for students of veterinary medicine, peer-reviewed Web manual. 2. PAŠIĆ, S.: Forms for laboratory exercises in physics with brief instructions for data processing, peer-reviewed Web manual. 3. PAŠIĆ, S.: Internal script (Lectures, Introduction to measurement and processing of results, Conversion of measurement units, Scalars and vectors), website of the course on the Merlin system 4. PAŠIĆ, S., N. POPARA (2023): Osmosis-fatal dehydration of a cell surrounded by water, Matematičko-fizički list, 73, 188-189. 5. PAŠIĆ, S., N. POPARA (2023): Hydrostatics and blood pressures, 73, 247-249. 6. POPARA, N, S. PAŠIĆ, L. BAJIĆ(2025): Velocity measurement using the classic Doppler effect and its application in medicine, Matematičko-Fizički list, accepted for publication. 7. PAŠIĆ, S., A. KLOBUČAR (2023): How does an ultrasound diagnostic device measure distances in tissue? Matematičko-fizički list, 74, 82-85.
Optional literature	1. PAŠIĆ, S., A. KLOBUČAR (2023): What tissue properties can we see on an X-ray image? Veterinarska stanica 54, 467-476. 2. POPARA, N., D. CVITKOVIĆ, M. VILIĆ, S. PAŠIĆ (2024): Considerations on static pressure

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gradients in closed circulatory systems, Physiological Reports 12, e15983.

OBJECTIVES AND LEARNING OUTCOMES

Course objectives	The goal of the course is to deepen the understanding of the most basic laws of physics that are the basis of medical physics and biophysics. Then familiarization with the basics of medical physics and biophysics and some of their applications in physiology, diagnostics, physical therapy and radiobiology. Students will learn about laboratory devices, work in the laboratory, and basic statistical processing and presentation of data. The goal is to teach students the application of measurement units and dimensional analysis in other fields, such as pharmacology.
Learning outcomes	After successfully completing the course, the student will be able to: • Know how to convert measurement units and apply dimensional analysis in clinical veterinary medicine • By applying the laws of mechanics, analyze the biomechanics of animal bodies, and understand the mechanical properties of tissues • Apply the laws of hydromechanics to the circulatory system, blood pressure measurement and stethoscope operation • Apply the basic laws of thermodynamics and electricity to the transport of substances through the cell membrane • Explain the concepts of vibrations and waves and apply them to ultrasound and Doppler diagnostics • Understand the response and interaction of living things with sound, electromagnetic waves and charged particles • Use laboratory equipment, statistically process and present the obtained results

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GRADING SCHEME

<i>Points</i>	<i>Grade</i>
Up to 59	1 (F)
60-68	2 (E)
69-76	2 (D)
77-84	3 (C)
85-92	4 (B)
93-100	5 (A)

Course leader:

dr. Selim Pašić, associate professor

Vice Head of Department:

dr. Selim Pašić, associate professor

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Note: The course leader is required to submit a Course Syllabus to all teachers and associates pertaining to the Course