UNIVERSITY OF ZAGREB
FACULTY OF VETERINARY MEDICINE
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Department of Physics and Biophysics
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Register no.:
File no.: 61-03-24/20-b
Zagreb, 06/09/2024

COURSE SYLLABUS

Course name: PHYSICS AND BIOPHYSICS

Academic year 2024-25

Course leader:

Teachers: Dr. Selim Pašić, associate professor

Associate teachers: Nato Popara, mag. Phys.

First day of classes: 04/10/2024

Last day of classes: 20/01/2025

Start Date	Start T	End Ti	Subject	Group	Note	Length	Instructor	Room
04/10/2024	10:15	11:45	p01 Physics in medicine and measurement units	1E-1, 1E-2, 1E-3		1:30	Pašić S.	P_fizika
08/10/2024	11:45	13:15	p02 Mechanics	1E-1, 1E-2, 1E-3		1:30	Pašić S.	P_fizika
09/10/2024	11:00	12:30	p03 Fluid mechanics	1E-1, 1E-2, 1E-3		1:30	Pašić S.	P_fizika
14/10/2024	10:00	11:30	p04 Heat	1E-1, 1E-2, 1E-3		1:30	Pašić S.	P_fizika
17/10/2024	11:45	13:15	p05 Vibration, waves and acoustics	1E-1, 1E-2, 1E-3		1:30	Pašić S.	P_fizika
18/10/2024	11:30	13:00	p06 Optics	1E-1, 1E-2, 1E-3		1:30	Pašić S.	P_fizika
22/10/2024	11:00	12:30	p07 Electricity and magnetism	1E-1, 1E-2, 1E-3		1:30	Pašić S.	P_fizika
24/10/2024	8:15	9:45	p08 Structure of matter	1E-1, 1E-2, 1E-3		1:30	Pašić S.	P_fizika
28/10/2024	10:15	11:45	v01 Measurement and data processing	1E-1, 1E-2		1:30	Pašić S.	V_fizika
29/10/2024	10:00	11:30	v01 Measurement and data processing	1E-3		1:30	Pašić S.	V_fizika
30/10/2024	8:15	9:45	v02 Data processing and measurement units	1E-1, 1E-2		1:30	Pašić S.	V_fizika
30/10/2024	13:30	15:00	v02 Data processing and measurement units	1E-3		1:30	Pašić S.	V_fizika
04/11/2024	10:15	11:45	v03 Hydrodynamics	1E-1, 1E-2		1:30	Pašić S.	V_fizika
07/11/2024	12:00	13:30	v03 Hydrodynamics	1E-3		1:30	Pašić S.	V_fizika
11/11/2024	15:00	16:30	v04 Mechanics, waves and UV diagnostics, thermodynamics	1E-3		1:30	Pašić S.	V_fizika
12/11/2024	13:15	14:45	v04 Mechanics, waves and UV diagnostics, thermodynamics	1E-1, 1E-2		1:30	Pašić S.	V_fizika

Activities - Physics and biophysics (2/3)

Start Date	Start T	End Ti	Subject	Group	Note	Length	Instructor	Room
19/11/2024	8:00	9:30	v05 Optics, radioactive decay	1E-3		1:30	Pašić S.	V_fizika
19/11/2024	9:45	11:15	v05 Optics, radioactive decay	1E-1, 1E-2		1:30	Pašić S.	V_fizika
22/11/2024	12:00	13:30	v06 Radioactive decay, electricity and magnetism	1E-1, 1E-2		1:30	Pašić S.	V_fizika
26/11/2024	8:15	9:45	v06 Radioactive decay, electricity and magnetism	1E-3		1:30	Pašić S.	V_fizika
28/11/2024	8:15	9:45	v07 Data processing colloquium	1E-1, 1E-2		1:30	Pašić S.	V_fizika
28/11/2024	13:30	15:00	v07 Data processing colloquium	1E-3		1:30	Pašić S.	V_fizika
29/11/2024	9:00	10:30	v08 Laboratory exercises 1	1E-3		1:30	Pašić S.	V_fizika
29/11/2024	14:45	16:15	v08 Laboratory exercises 1	1E-1, 1E-2		1:30	Pašić S.	V_fizika
02/12/2024	14:30	16:00	v09 Laboratory exercises 2	1E-3		1:30	Pašić S.	V_fizika
03/12/2024	8:15	9:45	v09 Laboratory exercises 2	1E-1, 1E-2		1:30	Pašić S.	V_fizika
04/12/2024	8:00	9:30	v10 Laboratory exercises 3	1E-1, 1E-2		1:30	Pašić S.	V_fizika
05/12/2024	8:00	9:30	v10 Laboratory exercises 3	1E-3		1:30	Pašić S.	V_fizika
09/12/2024	10:00	11:30	v11 Laboratory exercises 4	1E-1, 1E-2		1:30	Pašić S.	V_fizika
09/12/2024	15:15	16:45	v11 Laboratory exercises 4	1E-3		1:30	Pašić S.	V_fizika
10/12/2024	13:30	15:00	v12 Laboratory exercises 5	1E-3		1:30	Pašić S.	V_fizika
11/12/2024	11:45	13:15	v12 Laboratory exercises 5	1E-1, 1E-2		1:30	Pašić S.	V_fizika
12/12/2024	8:15	9:45	v13 Laboratory exercises 6	1E-1, 1E-2		1:30	Pašić S.	V_fizika
12/12/2024	13:30	15:00	v13 Laboratory exercises 6	1E-3		1:30	Pašić S.	V_fizika
13/12/2024	12:00	13:30	v14 Laboratory exercises 7	1E-3		1:30	Pašić S.	V_fizika
16/12/2024	10:00	11:30	v14 Laboratory exercises 7	1E-1, 1E-2		1:30	Pašić S.	V_fizika

Activities - Physics and biophysics (3/3)

Start Date	Start T	End Ti	Subject	Group	Note	Length	Instructor	Room
17/12/2024	8:15	9:45	v15 Laboratory exercises 8	1E-1, 1E-2		1:30	Pašić S.	V_fizika
19/12/2024	8:15	9:45	v15 Laboratory exercises 8	1E-3		1:30	Pašić S.	V_fizika
08/01/2025	10:00	11:30	v16 Laboratory exercises 9	1E-3		1:30	Pašić S.	V_fizika
09/01/2025	10:15	11:45	v16 Laboratory exercises 9	1E-1, 1E-2		1:30	Pašić S.	V_fizika
10/01/2025	8:15	9:45	v17 Laboratory exercises 10	1E-1, 1E-2		1:30	Pašić S.	V_fizika
13/01/2025	8:15	9:45	v17 Laboratory exercises 10	1E-3		1:30	Pašić S.	V_fizika
14/01/2025	14:00	15:30	v18 Laboratory exercises 11	1E-1, 1E-2		1:30	Pašić S.	V_fizika
17/01/2025	8:15	9:45	v18 Laboratory exercises 11	1E-3		1:30	Pašić S.	V_fizika
20/01/2025	10:00	11:30	v19 Laboratory exercises 12	1E-3		1:30	Pašić S.	V_fizika
20/01/2025	12:00	13:30	v19 Laboratory exercises 12	1E-1, 1E-2		1:30	Pašić S.	V_fizika
Total: 46						69:00		

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 minimal 3 points (8 lessons x 0.375 units ≈ 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 minimal 8 points (26 lessons x 0.316 units = 8 points). A student can gain maximal 12 points (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, it can gain maximally 0.8333 points per exercise. The maximal number of point 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 fife evaluation elements to have right to take the final exam. The final exam is in written form and it consists of 20 tasks, between them are about 40% calculation exercises. Each correctly solved task in the test carries out 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)	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 of processing of the data and 12 entry preliminary exams for each lab exercise. Each exercise consists of 5 questions. Each correct answer on the question carries 0.4 points. The maximal number of points per one entry exam is 2 points (5 questions x 0.4 points = 2 points). The maximal number of points is 26 ((12 lab exercises + an exam of processing 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. Student which doesn't achieve minimum points from this evaluation element has right on tree repeated preliminary exams, which will be hold during the semester. The repeated preliminary exam contains of two parts: measuring units correction preliminary exam and correction entry preliminary exam of the all 12 exercises. The student must gain minimal 4 points to achieve a minimum measurement units preliminary exam score and 16 points from exercises preliminary exam in order to achieve right to take the final exam. The right to take the repeated preliminary exam does not have the student who didn't gain the minimal point from the two evaluations elements: attending lectures and attending exercises.
Final exams (dates)	04. 02. 2025., 17. 02. 2025.
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
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. PAŠIĆ, S., N. POPARA (2023): Osmosis-fatal dehydration of a cell surrounded by water, Matematičko-fizički list, 73, 188-189. 3. PAŠIĆ, S., N. POPARA (2023): Hydrostatics and blood pressures, 73, 247-249. 4. PAŠIĆ, S., A. KLOBUČAR (2023): How does an ultrasound diagnostic device measure distances in tissue? Matematičko-fizički list, 74, 82-85.

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

GRADING SCHEME

Points	Grade
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

Head of Department:

dr. Selim Pašić, associate professor

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

GRADING AND EVALUATION OF STUDENT WORK ON COURSES WITH LECTURES, SEMINARS and PRACTICALS

Type of activity	Minimum number of points	Maximum number of points
Lectures attendance	3	6
Seminar attendance	4	6
Practicals attendance	4	6
Active participation in seminars and practicals	5	10
Continuous knowledge checking (mid-terms)	20	32
Final exam	24	40
TOTAL	60	100

GRADING AND EVALUATION OF STUDENT WORK ON COURSES WITH LECTURES and SEMINARS

Type of activity	Minimum number of points	Maximum number of points
Lecture attendance	3	6
Practicals attendance	8	12
Active participation in practicals	5	10
Continuous knowledge checking (mid-terms)	20	32
Final exam	24	40
TOTAL	60	100

GRADING AND EVALUATION OF STUDENT WORK ON COURSES WITH SEMINARS and EXCERCISES

Type of activity	Minimum number of points	Maximum number of points
Seminar / practicals attendance	11	18
Active participation in seminars and practicals	5	10
Continuous knowledge checking (mid-terms)	20	32
Final exam	24	40
TOTAL	60	100