University of Life Sciences "Ion Ionescu de la Brad" Iaşi
Faculty: Veterinary Medicine
Specialty: Veterinary Medicine

Dean,
Prof. dr. Mihai Mareş

SUBJECT OUTLINE

1. Information on the programme

1.1. Higher education institution	University of Agricultural Sciences and Veterinary Medicine of Iasi
1.2. Faculty	Veterinary Medicine
1.3. Department	Exact Sciences
1.4. Field of study	Veterinary Medicine
1.5.Cycle of study[1]	Bachelor and Master (unitary study programme)
1.6.Specialization/ Study programme	Veterinary Medicine
1.7. Form of education	Full time

2. Information on the discipline

2.1. Name of the discipline	**Physics**							
2.2. Course coordinator				Lecturer PhD Iuliana Motrescu				
2.3. Seminar/ laboratory/ project coordinator				Lecturer PhD Iuliana Motrescu				
2.4. Year of study	**I**	2.5. Semester	**1**	2.6. Type of evaluation	Exam	2.7. Discipline status	Content[2]	FD
							Compulsoriness[3]	CD

3. Total estimated time (teaching hours per semester)

3.1. Hours per week – full time programme	4	out of which: 3.2. lecture	2	3.3. seminar/ laboratory/ project	2
3.4.Total number of hours in the curriculum	56	Out of which: 3.5.lecture	28	3.6.seminar/laboratory	28
Distribution of the time allotted					hours
3.4.1. Study based on book, textbook, bibliography and notes					30
3.4.2. Additional documentation in the library, specialized electronic platforms and field					16
3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays					14
3.4.4.Tutorials					2
3.4.5.Examinations					2
3.4.6. Other activities					

3.7. Total hours of individual study	64
3.8. Total hours per semester	120
3.9. Number of credits[4]	4

4. Prerequisites (is applicable)

4.1. curriculum-related	-
4.2. skills-related	-

5. Conditions (if applicable)

5.1. for the lecture	The course is interactive; students are encouraged to ask questions regarding the content of the presentation and actively participate to the discussions.
5.2. for the seminar/ laboratory/ project	Practical works require the study of materials previously provided to the students. The students must perform the required measurements and calculations working as a team and take their own notes to show the results obtained.

6. Specific competences acquired

Professional competenceis	Work effectively as a member of a multi-disciplinary team in the delivery of services. Be able to review and evaluate literature and presentations critically. Demonstrate ability to cope with incomplete information, deal with contingencies, and adapt to change.
Transversal competenceis	Ability to perform measurements, process data and discuss the results.

7. Course objectives (based on the list of competences acquired)

7.1. Overall course objective	During the course the students acquire basic and latest information in the field of physics that directly impact on their medical skills: learn about the basic principles of the physical phenomena governing the living organisms and the interactions of living organisms with the environment, principles of thermodynamics and energy transfer in living organisms, develop skills for operating different devices used for laboratory analysis of biological samples, and develop skills for data analysis and discussion of experimental results.
7.2. Specific objectives	1. Theoretical knowledge – knowing and understanding The students know and understand the physical laws governing the functions and behavior of living organisms and those on which specific measuring and imaging techniques used in biology and medicine are based on, understand and are able to interpret scientific nomenclature concerning physics. 2. Acquired skills – explaining and interpreting -explaining processes taking place in the living organisms such as capillarity, cell transport, which will support the understanding of specialty disciplines 3. Practical skills: -developing the ability to perform different analysis as well as the capacity to interpret and discuss the experimental results 4. Attitudinal: The students develop abilities of working by themselves or in teams.

8. Content semester I

8.1. LECTURE	Teaching methods	Notes
Number of hours – 28 **Phenomena in liquids.** Surface and contact phenomena: surface tension and capillarity. Applications. Fluid flow and flow regimes. The continuity law. Bernoulli's equation and its implications. Transport phenomena: viscosity, diffusion, osmosis. Fick's laws. Applications. **Electricity and bioelectricity**. Electrostatics. Electric currents. Electrical phenomena at cell membrane level. Membrane transport. Bioelectrogenesis. Resting potential. Action potential. Nervous influx and its transmission. **Thermodynamics.** Thermodynamic systems, states, and processes. Laws of thermodynamics and applications. Open systems. Applications in biology. Heat transfer. Thermogenesis and thermoregulation. **Oscillations and waves.** Oscillations. Waves.	Presentation Explanations Debate Demonstration Modelling	A two-hour lecture weekly

The electromagnetic spectrum. Effects of non-ionizing radiations upon the living organisms. Applications. Natural and artificial radioactivity. The effects of ionizing radiations on living organisms. Radioactive isotopes and applications. Radioprotection. **Analysis techniques.** Methods of separation (sedimentation; liquid and gas chromatography, etc.) Methods based on the absorption of optical radiation (spectrophotometry, IR spectroscopy, etc.), X-Ray based analysis and electron beams (Energy Dispersive X-Ray Spectroscopy, ESCA, Scanning Electron Microscopy, and Transmission Electron Microscopy).		

8.2. PRACTICAL WORK **Number of hours – 28** 1. Interpretation of experimental data. 2. Measurement of the surface tension for biological liquids. 3. Measurement of the dynamic viscosity based on Stoke's law 4. Measurement of the relative dynamic viscosity of a liquid 5. Measurement of the liquid conductivity using Kohlrausch bridge 6. Measurement of the refractive index of solids using a microscope 7. Measurement of focal length of lenses 8. Measurement of the sugar concentration using Laurent polarimeter 9. Study of the Stefan-Boltzmann's law 10. Measurement of the heat capacity of water 11. Study of the thermocouple 12. Measurement of the adiabatic index by Clement-Desormes method 13. Detection of nuclear radiation 14. Scanning Electron Microscopy analysis (frontal practical work) **14. Practical examination - pharmacodynamics**	Theoretical presentation of the practical work, followed by measurements, data processing and interactive discussions based on the approached theme and execution of the work	A 2-hour session weekly

Bibliography:

1. Stefanescu C., Rusu V., Medical Biophysics. An introduction for students, Ed. Tehnopress, Iasi, 2008.
2. Davidovits P., Physics in Biology and Medicine 3rd edition, Elsevier, 2008.
3. Amadir Kane S., Introduction to Physics in Modern Medicine second edition, CRC Press Taylor & Francis Group, LLC, 2009.
4. Sybesma Chr., Biophysics, Kluwer Academic Publishers, Dordrecht, Boston, London, 1989.

9. Coroborating the course content with the expectations of the epistemic community representatives, of the professional associations and of the relevant employers in the corresponding field

The discipline content is developed in correlation with necessary requirements for "day one skills" and "year one skills"

10. Assessment

Type of activity	10.1. Assessment criteria	10.2. Assessment methods	10.3. Percentage of the final grade
10.4. Lecture	The notions assimilated during the lectures will be evaluated writing in the exam session.	Written examination	70 %
10.5. Seminar/Laboratory	Laboratory work assessment must highlight the assimilation degree	Evaluation of laboratory activity	

	(theoretical and practical) obtained by the student.		30 %
10.6. Minimum performance standards			
Knowing the basic concepts of physics presented in the lecture and laboratories such as to achieve 50% of the grades.			

[1] Cycle of studies- choose of the three options: Bachelor/Master/Ph.D.

[2] Discipline status (content)- for the undergraduate level, choose one of the options:- **FD** (fundamental discipline), **BD** (basic discipline), **CS** (specific disciplines-clinical sciences), **AP** (specific disciplines-animal production), **FH** (specific disciplines-food hygiene), **UO** (disciplines based on the university's options).

[3] Discipline status (compulsoriness)- choose one of the options – **CD** (compulsory discipline) **OD** (optional discipline) **ED** (elective discipline).

[4] One credit is equivalent to 25-30 hours of study (teaching activities and individual study).

Date
12.09. 2021

Course coordinator
Assoc. Prof.. Iuliana Motrescu

Laboratory work/seminar coordinator
Assoc. Prof.. Iuliana Motrescu

Head of the Department,
Lecturer Chiruță Ciprian

17.09.2021

Approved in Faculty Council