DISCIPLINE GRID

1. Program:

1.1.	**CAROL DAVILA UNIVERSITY OF MEDICINE AND PHARMACY BUCHAREST**
1.2.	**FACULTY OF DENTISTRY / 1st DEPARTMENT**
1.3.	DIVISION: **Biophysics**
1.4.	STUDY DOMAIN: **Health, sectoral regulated within European Union**
1.5.	STUDY LEVEL: **LICENCE**
1.6.	STUDY PROGRAMME: **DENTAL MEDICINE IN ENGLISH**

2. Discipline:

2.1.	DISCIPLINE NAME: Biophysics						
2.2.	LOCATION: Faculty of Medicine, 8 Eroii Sanitari Blvd., Basement.						
2.3.	Lectures tenure: **Ion-Octavian DOAGĂ** (MD, PhD) – Lecturer **Claudiu Constantin MANOLE** (PhD) – Lecturer						
2.4.	Practical classes tenure: **Ion-Octavian DOAGĂ** (MD, PhD) – Lecturer **Claudiu Constantin MANOLE** (PhD) – Lecturer						
2.5. Study year	**I**	**2.6.** Semester	**I**	**2.7.** Evaluation	Exam	**2.8.** Type of discipline	**CD/FD**

3. Estimated total time (hours/semester)

No. hours/week	**4**	out of which	**Lectures: 2**	**Laboratory session: 2**
Total hours out of learning schedule	**56**	out of which	**Lectures: 28**	**Laboratory sessions: 28**

Time distribution	**hours**
Textbook study, lecture support, bibliography and notes	**30**
Supplementary documentation activity in the library, on online platforms	**6**
Practical activity support material, homework, portfolio and essays	**5**
Tutorial activity	**1**
Examinations	**1**
Other activities	**1**
Total hours of individual study	**44**
Total hours per semester	**100**
Credits	**4**

4. Preconditions

4.1. curriculum	Basic knowledge of mathematics, informatics, physics, chemistry and biology on a high school level
4.2. proficiencies	-

5. Conditions

5.1. for lecture activity	Electronic presentations with a digital video projection system
5.2. for laboratory activity	Laboratory equipment and consumables

6. Accumulated skills

6.1. Proficiencies ***(knowledge and abilities)***	**I. Knowledge (cognitive dimension)** 1. About the fundamental mechanisms of biological systems functioning and stages of energy transformations in the biosphere; 2. About the effects of major physical factors on biological systems 3. About the principles of physical methods of diagnosis and treatment used in dentistry **II. Abilities (functional dimension)** ability to use the concepts of physics and chemistry to explain biological phenomena involving the movement / exchange of matter or energy in living systems • the ability to use the basics of the information theory to explain the processes by which organisms adapt to environmental conditions • ability to use the concepts of physics and chemistry to explain the principles of operation of the methods and techniques used in the medical practice and dental practice • ability to use physics-chemical concepts to explain the effects of physical factors (electromagnetic radiation, ultrasound, etc.) on biological systems • the ability to design and carry out a scientific experiment and to process experimental data; ● the ability to explain and interpret correctly the experimental results;
6.2. Transversal skills ***(role, professional and personal development)***	**III. Role skills** ability to work in a team **IV. Professional and personal development skills** ability to form own conception about the role of understanding the basic knowledge with the perspective of accumulating more complex knowledge and forming specific medical language

7. Objectives **(based on the grid of acquired specific skills)**

7.1. General Objective	Presentation of the general notions necessary to understand the fundamental mechanisms underlying the normal functioning of biological systems
7.2. Specific Objectives	1. presentation of the notions necessary to understand the mechanisms of energy conversion in biological systems 2. presentation of the notions of informatics necessary to understand the mechanisms of adaptation of the organism to the environmental conditions 3. presentation of the notions necessary to understand the properties of the material environment in which biological processes take place 4. studying the effects of some physical factors on biological systems 5. presentation of the principles of operation of some techniques and methods used in medical and dental practice.

8. Content

8.1. Lectures	No. hrs/topic	Teaching method	Obs.
1. Fundamental concepts of thermodynamics (part 1)	2	Oral presentation with PPT support – whiteboard or electronic board	
2. Fundamental concepts of thermodynamics (part 2)	2		
3. Basic notions of Biocybernetics	2		
4. Dispersion systems - solutions	2		
5. Dispersion systems – physical phenomena	2		
6. Dispersion systems – molecular transport	2		
7. Fluids biomechanics	2		
8. Biophysics of cell membranes	2		
9. Biophysics of cellular excitability	2		
10. Biophysics of the locomotor system	2		
11. Interaction of physical factors with biological systems (part 1)	2		
12. Interaction of physical factors with biological systems (part 2)	2		
13. Interaction of physical factors with biological systems (part 3)	2		
14. Basic knowledge of medical radiology and imaging technology	2		

8.2 Laboratory Sessions	No. hrs/topic	Teaching method	Obs.
1. reviewing general notions of physics (thermodynamics and electricity)	2	Oral presentation and practical demonstration	
2. presentation of standard methods for experimental data processing	2		
3. Determination of the viscosity of biological liquids	2		
4. Determination of the surface tension of the solutions	2		
5. Optical microscopy. Measurement of the red blood cell diameter	2		
6. Polarimetric method. Measurement of the concentration of a glucose solution	2		
7. Refractometric method. Measurement of the concentration of a glycerin solution	2		
8. Spectrophotometric analysis. Measurement of concentrations and marking of the absorption spectra.	2		
9. The eye lenses as a centered optical system. Study of convergence defects	2		
10. Oscilloscope study - visualization and measurement of electrical signals	2		
11. Determination of background radiation level	2		
12. ECG - principles and standard interpretation	2		
13. Recap seminar	2		
14. Final evaluation	2		

8.3. Bibliography for lectures and laboratory/practical sessions
1. Ramona M. Babeş, Irina Băran, Diana Ionescu, Biophysics: practical sessions and seminars, Ed. "Carol Davila", Bucharest, 2018 2. Popescu I. Aurel, Biophysics – Current status and future trends, Ed. Romanian Academy, 2016 3. Roland Glaser, Biophysics: An Introduction, 2nd ed., Springer-Verlag, 2012 4. William C. Parke, A Student's Guide to the Physics of the Life Sciences and Medicine, Springer Nature Switzerland AG, 2020

9. Corroborating the contents of the discipline with the expectations of epistemic community representatives, professional associations and employers in the fields representative for the program

The acquired notions ensure the formation of a minimum set of knowledge necessary to go through the more complex subjects of the following years of study. The practical activity carried out in the laboratory ensures the formation of the necessary skills for the clinical activities within the disciplines of the following years of study.

Evaluation

10.1 Evaluation			
Activity type	**Evaluation Criteria**	**Methods of evaluation**	**% out of final grade**
Lecture	**A. Knowledge for mark 5:** 13 correct answers in the multiple-choice quizz **B. Additional knowledge for mark 10** More than 35 correct answers in the multiple-choice quizz	Written multiple-choice quiz - 40 questions - working time 45 minutes	80%
Laboratory Sessions	**A. Knowledge for mark 5:** - Ability to identify the equipment used in the laboratory sessions - Knowledge of basic functioning principle **B. Additional knowledge for mark 10** -Knowledge of the related theoretical aspects, operating principle and work technique and result interpretation	**Practical assessment** **Oral examination**	20%
Minimum performance standards			
Knowledge of the principles of thermodynamic, cybernetic model of the neuronal channel, diffusion and osmosis laws, muscular contraction mechanism and bone reshaping, ionizing radiations effects on biological systems. To identify the equipment and to know the working technique for the respective method.			

Date: 07/09/2024

Chair of Biophysics Division,
Ion-Octavian Doagă, MD, PhD

Date of the approval in Department Board:

Department director,
Marina IMRE, Professor