

Al-Farabi Kazakh National University
Faculty of Biology and Biotechnology
Department of Biophysics, Biomedicine and Neuroscience

SYLLABUS
Fall semester 2022-2023 academic years
on the educational program ‘6B05103 – Biotechnology’

Discipline's code	Discipline's title	Independent work of students (IWS)	No. of hours per week			Number of credits	students' individual work with teacher (SIWT)
			Lectures (L)	Practical training (PT)	Laboratory (Lab)		
PB4304	Biophysics	98	15	15	15	3	6
Academic course information							
Form of education	Type of course	Types of lectures		Types of practical training	Number of SIW	Form of final control	
Full-time (hybrid)	Core discipline / university component	hybrid		hybrid	4	hybrid	
Lecturer	Gumarova Lyazzat Zhanbulatovna, PhD, professor						
e-mail	Lyazzat.Gumarova@kaznu.kz						
Telephone number	377 -36 -06; 377-33-33 (19-80)						
Laboratory	Syraiyl Sayagul						
e-mail	saya9144@mail.ru						
Telephone number	+7 700 440 1234						
Academic presentation of the course							
Aim of course	Expected Learning Outcomes (LO) As a result of studying the discipline the undergraduate will be able to:	Indicators of LO achievement (ID) (for each LO at least 2 indicators)					
The aim of the ‘ Biophysics ’ course is to introduce students to the basic concepts and laws of biophysics, the applicability of the laws of physics to living systems, provide a fundamental, theoretical basis for all modern biological sciences.	1. To become familiar with the basic concepts and laws of biophysics	1.1. Students should be able to demonstrate acquired knowledge in the field of biophysics and their understanding; 1.2. Demonstrate an understanding of the general structure of the field of study of biophysics and the links between its sections;					
	2. To learn and utilize standard tools, methods for academic study of the biophysics.	2.1 Students should be able to include new knowledge in the context of basic knowledge of specialty, and interpret its content; 2.2. Analyze the educational situations, and propose a direction for a possible solution; 2.3. Use biophysical methods used in various areas of biology for an individual or group educational and research activities;					
	3. To learn scholarly conventions for the biophysics.	3.1. Students should be able to generalize, interpret and evaluate obtained results of training in the field of biophysics; 3.2. Analyze the dynamics of scientific problems' solving, of the biophysics course; 3.3. Make an analysis of the study results of the biophysics course, summarize them in the form of a scientific essay, presentation, review, scientific review, etc.;					
	4. To develop practice skills in the biophysics field	4.1 Students should be able to conduct constructive educational and social interaction and collaboration in the group; 4.2. Propose a problem for consideration, and be able to defend its importance.					

	5. To describe, analyze and apply the use of main biophysical principles in any field of biology	5.1. Students should be able to be aware of the role of the course in the implementation of the individual learning path 5.2. Should be able to describe, analyze and apply the use of main biophysical principles in any field of biology												
Prerequisites	Physics.													
Post requisites	Diploma project.													
Information resources	<p>Literature:</p> <ol style="list-style-type: none"> 1. R.Glaser. Biophysics. // Berlin; New York: Springer. -2012, 361 p. 2. Gopal B. Saha. Physics and Radiobiology of Nuclear Medicine. Fourth Edition //Springer, 2013 3. Tuleukhanov S.T., Inyushin N.M., Gumarova L.Zh., Kulbayeva M.S., Shvetcova E.V. Manual for laboratory classes in biological physics: methodical development / comp.: S.T. Tuleukhanov, N.M. Inyushin, L.Zh. Gumarova [et al.]. – Almaty: Qazaquiversity, 2016. – 116 p. <p>Internet resources:</p> <p>www.univer.kaznu.kz</p> <p>https://link.springer.com/content/pdf/10.1007%2F978-3-642-25212-9.pdf</p> <p>https://link.springer.com/content/pdf/bfm%3A978-3-662-46777-0%2F1.pdf</p> <p>https://link.springer.com/content/pdf/bfm%3A978-1-4614-1531-2%2F1.pdf</p> <p>https://link.springer.com/book/10.1007/978-981-13-2158-0</p> <p>https://link.springer.com/content/pdf/bfm%3A978-1-60327-233-9%2F1.pdf</p>													
Academic policy of the course in the context of university moral and ethical values	<p>Academic Behavior Rules: Non-compliance with deadlines leads to loss of points! The deadline of each task is indicated in the calendar (schedule) of implementation of the content of the curriculum.</p> <p>The technique of avoiding attending classes. Absence or delay in a lesson without warning the teacher is estimated at 0 points Receive and timely complete tasks (SIW, temporary, control, laboratory, design, etc.), projects, exams. The student is assessed with penalty points, which are deducted in case of termination of the assignment.</p> <p>Academic values: - Practical trainings/laboratories, IWS should be independent, creative. - Plagiarism, forgery, cheating at all stages of control are unacceptable. - Students with disabilities can receive counseling at e-mail Lyazzat.Gumarova@kaznu.kz at 377-3606.</p>													
Evaluation and attestation policy	<p>Criteria-based evaluation: assessment of learning outcomes in relation to descriptors (verification of the formation of competencies in midterm control and exams).</p> <p>Summative evaluation: assessment of work activity in an audience (at a webinar); assessment of the completed task.</p> <p>The final score will be calculated by the formula Final score = (C1 +MT + C2)/3·0.6 + FEx0,4</p> <p>Below are minimum estimates percentage:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">95% - 100%: A</td> <td style="width: 33%;">90% - 94%: A-</td> <td style="width: 33%;">75% - 79%: B-</td> </tr> <tr> <td>85% - 89%: B+</td> <td>80% - 84%: B</td> <td>60% - 64%: C-</td> </tr> <tr> <td>70% - 74%: C+</td> <td>65% - 69%: C</td> <td>0% -49%: F</td> </tr> <tr> <td>55% - 59%: D+</td> <td>50% - 54%: D-</td> <td></td> </tr> </table>		95% - 100%: A	90% - 94%: A-	75% - 79%: B-	85% - 89%: B+	80% - 84%: B	60% - 64%: C-	70% - 74%: C+	65% - 69%: C	0% -49%: F	55% - 59%: D+	50% - 54%: D-	
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CALENDAR (SCHEDULE) THE IMPLEMENTATION OF THE COURSE CONTENT:

Schedule			
Week	Topic title	Hours	Maximum score
1	Lecture. Introduction to Biophysics	1	
	Seminar. Subject of Biophysics	1	1
	Lab. Personal and general laboratory safety	1	1
2	Lecture. Thermal Molecular Movement, Order and Probability.	1	

	Seminar. History of Biophysics.	1	5
	Lab. The sorption of water by plant seeds	1	1
3	Lecture. Some Fundamental Concepts of Thermodynamics. First law of thermodynamics in biological systems	1	
	Seminar. Thermal Molecular Movement, Order and Probability.	1	5
	Lab. pH-metry of various solutions and biological fluids	1	1
	SIW (students' individual work) 1. Energy of Activation, Theory of Absolute Reaction Rate		10
4	Lecture. Second law of thermodynamics	1	
	Seminar. Molecular and Ionic Interactions as the Basis for the Formation of Biological Structures	1	5
	Lab. Determination of the content of dissolved oxygen	1	1
	SIWT 1. Colloquium "Biothermodynamics"		10
5	Lecture. Interfacial Phenomena and Membranes	1	
	Seminar. Interfacial Phenomena and Membranes	1	5
	Lab. The temperature coefficient and the activation energy	1	1
6	Lecture. The electrical conductivity of living tissues	1	
	Seminar. Energetics and Dynamics of Biological Systems	1	5
	Lab. The electrical conductivity of living tissues	1	1
	SIW 2. Biomechanics of Blood Circulation		5
	SIWT 2 (lab works' theory)		25
7	Lecture. The Aqueous and Ionic Equilibrium of the living cell.	1	
	Seminar. Energetics and Dynamics of Biological Systems	1	2
	Lab. Basics of electrocardiography	1	1
	SIWT 3. Colloquium "Membrane biophysics"		15
	LEVEL CONTROL 1		100
8	Lecture. Electric Fields in Cells and Organisms		
	Seminar. Membrane Transport and Membrane Potential	1	5
	Lab. The properties of light	1	1
9	Lecture. Radio- and Microwave Electromagnetic Fields		
	Seminar. Low-Frequency Electromagnetic Fields	1	5
	SIW 3. The membrane potentials		10
	Lab. Low-intensity laser radiation.	1	1
10	Lecture. Visible and Nonvisible Optical Radiation	1	
	Seminar. Radio- and Microwave Electromagnetic Fields	1	5
	Lab. Photoelectrocolorimetry. Determination of biological fluids by optical density	1	1
11	Lecture. Visible Light: Photobiological Processes	1	
	Seminar. Visible and Nonvisible Optical Radiation	1	5
	Lab. Spectrophotometry	1	1
	SIWT 4 (lab works' theory)		9
12	Lecture. Ionizing Radiation	1	
	Seminar. Visible Light: Photobiological Processes	1	5
	Lab. Sorption activity of tissues depending on the action of various physical factors	1	1
13	Lecture. Primary Processes of Radiation Chemistry	1	
	Seminar. Ionizing Radiation	1	5
	Lab. Optical density measurements of different solutions	1	1
	SIW 4. Electroconductivity of living systems		10
14	Lecture. Radiobiological Reactions	1	
	Seminar. Primary Processes of Radiation Chemistry	1	5
	Lab. Basics of dosimetry	1	1
15	Lecture. Some Aspects of Radiation Protection	1	
	Seminar. Radiobiological Reactions	1	5
	Lab. Galvanizing. Electrophoresis of drugs	1	1
	SIWT 5 (lab works' theory)		8

	SIWT 6. Colloquium “environmental biophysics”		15
LEVEL CONTROL 2			100

Dean _____ **Zaydan B.K.**
Chairman of the Faculty Methodical Bureau _____ **Asrandina S.Sh.**
Head of the Department _____ **Kustubayeva A.M.**
Lecturer _____ **Gumarova L.Zh.**