

SYLLABUS
Fall semester 2023-2024 academic year
Educational program 6B05103 Биотехнология НИИШ, дневная,
2 course (Spring)

6B05103 Биотехнология, дневная, 3 Курс (Осенний)

ID and name of course	Independent work of the student (IWS)	Number of credits			General number of credits	Independent work of the student under the guidance of a teacher (IWST)
		Lectures (L)	Practical classes (PC)	Lab. classes (LC)		
Physiology and biotechnology of PBP 4312	The number of IWS is 5.	1		2		The number of IWST is 3. This is a teacher's guide. for the preparation of the IWS.

ACADEMIC INFORMATION ABOUT THE COURSE

Learning Format	Cycle, component	Lecture types	Types of practical classes	Form and platform final control
<i>Choose Offline/online/hybrid</i>	Selectable Component	Offline	Offline	Univer standart
Lecturer - (s)	Kenzhebayeva Saule Sagindykovna			
e-mail :	Saule.Kenzhabaeva@kaznu.edu.kz			
Phone :				
Assistant - (s)				
e-mail :				
Phone :				

ACADEMIC COURSE PRESENTATION

Purpose of the course	Expected Learning Outcomes (LO) *	Indicators of LO achievement (ID)
To acquaint students with the features of physiological basis of plants productivity and key physiological processes affecting crop plants productivity, to show their relationship with environmental conditions.	– 1. To demonstrate knowledge about the features of physiological basis of plants and key n and metabolism of the most important biological compounds of living organisms; the key processes occurring in the plant during growth and development, and their interaction, as well as the response of plants to adverse conditions.importance of increase in agricultural productivity in terms of optimisation of physiological processes affecting crop plants.	1.1. know the features of the structural organization and properties of the main classes of biological molecules; 1.2. analyze the biological functions of the most important cell compounds and the key mechanisms of plants during growth and development; 1.3. finds a correspondence between the properties of compounds and their biological functions; 1.4. demonstrates knowledge of the most important metabolic processes of a living organism 1.5. based on lecture material and information sources, can write chemical formulas and reactions of various biological molecules, describe the mechanism of their biochemical and physiological action on a living organism
	2. to . choose and apply in practice modern methods of biochemical and physiological research for the qualitative and quantitative analysis of biological material; and apply the basic methods used in various fields of plant physiology	2.1. conducts information search to solve research problems; 2.2. formulates research objectives and plans the process of its implementation; prepares equipment (instruments, apparatus) for conducting experiments; 2.3. selects and prepares samples (biological material) for the experiment; 2.4. conducts a qualitative and quantitative analysis of biological

		material, according to methodological recommendations in accordance with safety regulations;
	3. to interpret the results of biochemical and physiological experiments, evaluating the relationship between the structure of biomolecules and their physiological functions at the molecular level; interpret and analyze the results while conducting experiments with plants, contextualize the various approaches and methods used in plant physiology	3.1. fixes and draws up the results of experimental work in the required format (tables, graphs, diagrams, etc.) 3.2. evaluates the correctness of the laboratory test; 3.3. analyzes the data obtained during the experiment; 3.4. compares the obtained data with the expected results, confirming the correctness of the experiment; 3.5. makes final conclusions from the data obtained;
	4. to demonstrate knowledge of the structural and functional characteristics of the plant cell; describe the schemes used to characterize the basic processes of regulation of plant physiological processes;	4.24.1 explain the essence of the main processes of plant cells and their interaction, formulate conclusions obtained as a result of experiments, argue a different approach to the study
	5. analyze the features of the main physiological processes of plants under normal conditions and under different kinds of stresses (Drought, 2 Heat stress, cold stress, soil salinity and acidity stress floods, to apply theoretical knowledge of plant physiology in various fields of biology, determine the main factors that regulate the process under study.	5.1. explain the factors regulating the key processes occurring in the plant during growth and development, 5.2 demonstrate theoretical knowledge and practical skills in plant physiology, show knowledge of the regulation of cell responses as their practical application.
Prerequisites	Plant anatomy and morphology, Cytology and histology, Plants physiology	
Postrequisites	Regulation of physiological processes of plants productivity, Agronomy, Agriculture	
Learning Resources	<p>Literature: main,</p> <ol style="list-style-type: none"> Mechanisms of Plant Growth and Improved Productivity Modern Approaches: Modern Approaches Books in Soils, Plants, and the Environment) Edited by A. Basra, 2018 Plant Physiology: Photosynthesis, Transpiration, and Respiration 1. Nebraska University. Atabayeva S., Kenzhebayeva S., Blavanchinskaya L. Stress physiology. ISBN978-601-04-1098-5. 2015, 84 p Yakushkina N.I., Bakhtenko E.J. Plant physiology. 2018. 466 p. Plants And Crop Productivity. Edit. Rajaram Choyal (Author) Random Publications, 2015 <p>Additional: Kristiina Himanen (2015). Cell cycle regulation during plant growth and development, Jörg D. Becker (2012) Decision- Making in the Plant Cell Cycle. Canal BQ-n.9. Atkin OK, Bloomfield KJ, Reich PB, et al. (2015) Global variability in leaf respiration in relation to climate, plant functional types and leaf traits. New Phytologist 2016: 614–636.</p> <p>Research infrastructure</p> <ol style="list-style-type: none"> Laboratories and other locations where teaching and learning will take place <p>Professional scientific databases</p> <ol style="list-style-type: none"> <p>Internet resources (at least 3-5)</p> <ol style="list-style-type: none"> http://elibrary.kaznu.kz/ru <ol style="list-style-type: none"> MOOC / video lectures, etc. Optimization of photosynthesis for sustainable crop production CABI Agriculture and Bioscience Full Text (biomedcentral.com) https://doi.org/10.1016/j.envexpbot.2022.104950. https://cmg.extension.colostate.edu/Gardennotes/141.pdf https://cid-inc.com/blog/plant-respiration-its-importance-and-applications/ https://www.hindawi.com/journals/ijg/2014/70159_6/#abstract https://www.sciencedirect.com/science/article/pii/S_2666675820300175 	

Academic course policy	<p>The academic policy of the course is determined by <u>the Academic Policy and the Policy of Academic Integrity of Al-Farabi Kazakh National University</u> .</p> <p>Documents are available on the main page of IS Univer .</p> <p>Integration of science and education. The research work of students, undergraduates and doctoral students is a deepening of the educational process. It is organized directly at the departments, laboratories, scientific and design departments of the university, in student scientific and technical associations. Independent work of students at all levels of education is aimed at developing research skills and competencies based on obtaining new knowledge using modern research and information technologies. A research university teacher integrates the results of scientific activities into the topics of lectures and seminars (practical) classes, laboratory classes and into the tasks of the IWST, IWS, which are reflected in the syllabus and are responsible for the relevance of the topics of training sessions and assignments.</p> <p>Attendance. The deadline for each task is indicated in the calendar (schedule) for the implementation of the content of the course. Failure to meet deadlines results in loss of points.</p> <p>Academic honesty. Practical/laboratory classes, IWS develop the student's independence, critical thinking, and creativity. Plagiarism, forgery, the use of cheat sheets, cheating at all stages of completing tasks are unacceptable.</p> <p>Compliance with academic honesty during the period of theoretical training and at exams, in addition to the main policies, is regulated by <u>the "Rules for the final control" , "Instructions for the final control of the autumn / spring semester of the current academic year" , "Regulations on checking students' text documents for borrowings"</u>.</p> <p>Documents are available on the main page of IS Univer .</p> <p>Basic principles of inclusive education. The educational environment of the university is conceived as a safe place where there is always support and equal attitude from the teacher to all students and students to each other, regardless of gender, race / ethnicity, religious beliefs, socio-economic status, physical health of the student, etc. All people need the support and friendship of peers and fellow students. For all students, progress is more about what they can do than what they can't. Diversity enhances all aspects of life.</p> <p>All students, especially those with disabilities, can receive counseling assistance by phone / e- mail Saule.Kenzhabaeva@kaznu.edu.kz <u>contacts</u> or via video link in MS Teams <u>enter a permanent link to the meeting</u>.</p> <p>Integration MOOC (massive open online course). In the case of integrating MOOC into the course, all students need to register for MOOC. The deadlines for passing MOOC modules must be strictly observed in accordance with the course study schedule.</p> <p>ATTENTION! The deadline for each task is indicated in the calendar (schedule) for the implementation of the content of the course, as well as in the MOOC. Failure to meet deadlines results in loss of points.</p>
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INFORMATION ABOUT TEACHING, LEARNING AND ASSESSMENT

Score-rating letter system of assessment of accounting for educational achievements				Assessment Methods	
Grade	Digital equivalent points	points, % content	Assessment according to the traditional system		
A	4.0 _	95-100	Great	<p>Criteria-based assessment is the process of correlating actual learning outcomes with expected learning outcomes based on clearly defined criteria. Based on formative and summative assessment.</p> <p>Formative assessment is a type of assessment that is carried out in the course of daily learning activities. It is the current measure of progress. Provides an operational relationship between the student and the teacher. It allows you to determine the capabilities of the student, identify difficulties, help achieve the best results, timely correct the educational process for the teacher. The performance of tasks, the activity of work in the classroom during lectures, seminars, practical exercises (discussions, quizzes, debates, round tables, laboratory work, etc.) are evaluated. Acquired knowledge and competencies are assessed.</p> <p>Summative assessment - type of assessment, which is carried out upon completion of the study of the section in accordance with the program of the course. Conducted 3-4 times per semester when performing IWS. This is the assessment of mastering the expected learning outcomes in relation to the descriptors. Allows you to determine and fix the level of mastering the course for a certain period. Learning outcomes are evaluated.</p>	
A-	3.67	90-94			
B+	3.33	85-89			
B	3.0	80-84	<p>Points % content</p> <p>The teacher enters his score into points in accordance with the calendar (schedule). <u>The exam does not change and the final score in the course.</u></p>		
B-	2.67	75-79	Satisfactorily	Activity at lectures	5
C+	2.33	70-74		Work in practical classes	20
C	2.0	65-69		Independent work	25
C-	1.67	60-64		Design and creative activity	10
D+	1.33	55-59		Unsatisfactory	Final control (exam)

D	1.0	50-54	TOTAL	100	
Calendar (schedule) for the implementation of the content of the course. Methods of teaching and learning.					
A week	Topic name			Number of hours	Max. ball
MODULE 1 <i>Physiological processes in on plants</i>					
1	L 1. Theme Introduction to Plant physiology. Physiology of the plant cell. Structure and functions of plant cell wall.			1	0
	LC 1. Effect of anion and cation salts on the form and time of plasmolysis			2	10
	L.2 . Plant Water exchange of plant cell. Main mechanisms and their regulations. Mechanisms and regulations of water exchange of whole plant			1	0
	PC 2. Theme				
	LC 2. Theme Observing the cap plasmolysis.			2	10
IWS P 1. Consultations on the implementation of IWST 1 ATTENTION. Number of IWST (6-7), IWS (2-5) for 15 weeks Multitarget manipulation of photosynthetic carbon assimilation, Simultaneous manipulation of the Calvin–Benson cycle and photorespiration, Improving the efficiency of responses to the fluctuating light environment.			2	15	
3	L 3. Theme Photosynthesis. Photosynthetic apparatus plants. Structure, functions, classification of main photosynthetic pigments. Dark phase of photosynthesis. Determination of potential osmotic pressure of the cell sap by plasmolysis.			2	0
	PC 3 Theme				
	LC 3. Theme Changes in the permeability of the cytoplasm under damage			1	10
	IWST 1. Control work, test, individual / group project, essay, situational task, testing, portfolio, etc. at the teacher's choice.				
4	L 4. Theme . Significance of respiration. Substrates of respiration. Energy yield of respiratory			1	0
	PC 4. Theme				
	LC 4. Theme Determination of relative turgidity and water deficit. to compare the indicators of the tension of the water regime in leaves of plants grown under various composition of Knopp Nutrient medium.			2	10
5	L 5. Theme... The importance of plant mineral nutrition			1	0
	PC 5. Theme				
	LC 5. Theme Extraction of leaf pigments. Quantitative determination of the pigments. Photosensitizing effect of chlorophyll on the reaction of hydrogen transfer ...			2	10
MODULE 2 Title . Environmental factors affecting key precesses of plant physiology.					
6	L 6. Theme... The growth and development of plants. Plant hormones. Regulation of cell cycle			1	0
	PC 6. Theme..				
	LC 6. Theme. Determination of respiration in a closed vessel. Determination of physiological parameters of plants related to respiration			2	10
	IWST 2. Consultations on the implementation of IWS 2 Drought Resistance by Engineering Plant Tissue-Specific Responses. Stomatal-Mediated Drought Responses. Cuticular Wax Production. Carbon Allocation. Root Traits. Transforming C3 crops into C4. Effects of climatic conditions on crops productivity. Heat stress			1	15
7	L 7. Theme Introduction on physiology of stress. Abiotic stresses. Overall mechanism of adaptations Major Traits Contributing to drought and salt tolerance			1	0
	PC 7. Theme				
	LC 7. Theme. Microchemical analysis of the plant ash. Midterm control 1			2	10
	IWST 2. Screening Techniques for Drought resistance in plants. Main photosyntetical parameters used for evaluation the tolerant genotypes			NT	
8	L 8. Theme Introduction on physiology of stress. Biotic stresses (pathogens). Overall mechanism of adaptations Major Traits Contributing to resistance to pathogens.			1	0
	PC 8. Theme				
	LC 8. Theme. Microchemical analysis of the plant ash. Midterm control 1			2	10
	IWST 2. Screening Techniques for Drought resistance in plants. Main photosyntetical parameters used for evaluation the tolerant genotypes			NT	
Midterm control 1				100	

Dean _____ **Kurmanbayeva M.S.**

Head of Department _____ **Kistaybayeva A.S.**

Lecturer _____ **Kenzhebayeva S.S.**

RUBRICTOR FOR CRITERIAL ASSESSMENT OF FINAL CONTROL

Discipline: «Plants Physiology» **Form:** written exam, standard form, offline

Platform: IS Univer

№	Criterion/score	Дескрипторы				
		Great	Fine	Satisfactorily	UnSatisfactorily	
		90–100% (27-30 баллов)	70–89% (21-26 баллов)	50–69% (15-20 баллов)	25–49% (8-14 баллов)	0–24% (0-7 баллов)
1 question 33 scores	Understanding the theoretical basis of Plants Physiology	The answer contains an exhaustive disclosure of the question, a detailed argumentation of each conclusion and statement, is built logically and consistently, supported by examples	The answer contains a full, but not exhaustive coverage of the issue, a shortened argumentation of the main provisions, allows violation of the logic and sequence of the presentation of the material. Stylistic errors and inaccurate use of terms are allowed in the response.	The answer contains incomplete coverage of the issue, the main provisions are superficially reasoned, violations of logic and sequence of presentation of the material are allowed in the presentation, theoretical provisions are not illustrated with practical examples	The answer contains incorrect coverage of the question posed, erroneous argumentation, factual errors, incorrect conclusions.	Ignorance of basic concepts. Violation of the Rules of the final control
2 question 33 scores	Application of physiological methods to solve problems of productivity of agricultural plants. Based on specific examples, present regulations for physiological processes/or explain the use of specific methods and practical applications	Full completion of the task, a detailed, reasoned answer to the question, followed by the solution of a practical problem. Consistent, logical and correct justification of scientific provisions and the applied methodology and technology, literacy, compliance with the norms of scientific language, 1-2 inaccuracies in the presentation	Partial completion of the task, incomplete, sometimes reasoned answer to a question with an incomplete solution of a practical problem; illiterate use of the norms of scientific language. 3-4 inaccuracies in the use of conceptual material, minor errors in	The material is presented in fragments, with a violation of logical sequence, factual and semantic inaccuracies are allowed, theoretical knowledge of the course is used superficially. Conclusions on the applicability of sound scientific provisions are vague and unconvincing, there are stylistic and grammatical errors, as well as inaccuracies in	An irrational method of solving a task or an insufficiently thought-out response plan; inability to solve tasks, perform tasks in general; assumption of more than 4 errors and shortcomings; the presence of gross errors; conceptual material and argumentation are poorly used.	The task has not been completed, there are no answers to the questions posed, materials and analysis tools have not been used. Violation of the Rules of the final control.

№	Criterion/score	Дескрипторы				
		Great	Fine	Satisfactorily	UnSatisfactorily	
		90–100% (36-40 баллов)	70–89% (35-28 баллов)	50–69% (27-20 баллов)	25–49% (19-10 баллов)	0–24% (0-9 баллов)
3 question 34scores	Analysis of the applicability of the key physiological methods to the proposed practical task, justification of the result obtained	Consistent, logical and correct justification of scientific positions and the applied methodology and technology, literacy, compliance with the norms of scientific language, 1-2 inaccuracies in the presentation of the material are allowed, which do not affect the generally correct you - water (+visualization of justification results using graphical data).	Allowed 3-4 неточности в использовании понятийного материала, незначительные погрешности в обобщениях и выводах, которые не влияют на хороший общий уровень выполнения задания.	Conclusions on the applicability of well-founded scientific principles are vague and unconvincing, there are stylistic and grammatical errors, as well as inaccuracies in processing the results of a practical solution	The task was completed with gross errors, the answers to the questions were incomplete, the conceptual material and argumentation were poorly used.	The task has not been completed, there are no answers to the questions posed, materials and analysis tools have not been used. Violation of the Rules for conducting final control.

Exam tickets consist of 3 questions. For correctly completed tasks, the maximum is 100 points, of which 33 points for the first question, 33 points for the second question, and 34 points for the third question.

Formula for calculating the final grade:

Final grade = score for question 1 + score for question 2 + score for question 3

Additional Information:

Letter Grade	Grade Point Value	Percentage	Conventional Grade
A	4,0	95-100	Excellent
A-	3,67	90-94	
B+	3,33	85-89	Good
B	3,0	80-84	

B-	2,67	75-79	Satisfactory
C+	2,33	70-74	
C	2,0	65-69	
C-	1,67	60-64	
D+	1,33	55-59	
D	1,0	50-54	
FX	0,5	25-49	Failure
F	0	0-24	
I (Incomplete)	-	-	Incomplete (shall not be taken into account when calculating GPA)
AU (Audit)	-	-	Audit (shall not be taken into account when calculating GPA)
Cert.	-	30-60 50-100	"Certification" (shall not be taken into account when calculating GPA)
Uncert.	-	0-29 0-49	"Uncertification" (shall not be taken into account when calculating GPA)
R-difference	-	-	"Discipline difference on curriculum" (shall not be taken into account when calculating GPA)

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