

AL-FARABI KAZAKH NATIONAL UNIVERSITY

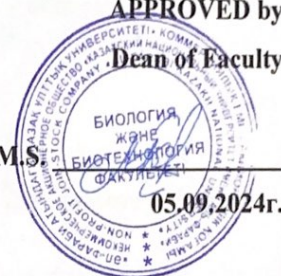
Faculty of Biology and Biotechnology

Biotechnology Department

APPROVED by

Dean of Faculty

Kurmanbayeva M.S.



EDUCATIONAL-METHODICAL COMPLEX OF DISCIPLINE

PMP 7304 «Polyfunctional microbiological preparations»

Educational program «8D05111 – Microbiology»

Course 1

Semester 1

Number of credits 5

Lecture 1.70

Laboratory 0

Seminars 3.30

ISWT 5

Almaty 2024

Educational-methodical complex of the discipline is prepared by F.Amutova, Lecturer of the Biotechnology Department.

Based on working curriculum on the educational program «8D05111 – Microbiology»

Considered and recommended at the meeting of the Department of Biotechnology from «02» 09 2024-year, protocol №1

Head of the department

A handwritten signature in blue ink, consisting of several loops and a long horizontal stroke extending to the right.

Kistaubayeva A.S.

SYLLABUS
 Fall semester 2024-2025 academic year
 Educational program "Polyfunctional microbiological preparations"

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)		
8D05111 Polyfunctional microbiological preparations	5	15	15	-	5	5
ACADEMIC INFORMATION ABOUT THE COURSE						
Learning Format	Cycle, component	Lecture types	Types of practical classes		Form and platform final control	
Offline	Elective disciplines	Presentations	Seminars, discussions,		Writing exam	
Lecturer - (s)	Amutova Farida Bakhtiyarovna, PhD					
e-mail :	amutovafb@gmail.com					
Phone :	+7 707 36 36 107 // +7 771 752 69 32					
ACADEMIC COURSE PRESENTATION						
Purpose of the course	Expected Learning Outcomes (LO) *				Indicators of LO achievement (ID)	
	1. Students will identify and describe the fundamental principles and terminology related to polifunctional microbiological preparations (PMPs) in agriculture, agro-industrial sectors, food industry, and environmental biotechnology				1.1 To identify and describe the fundamental principles and terminology related to polifunctional microbiological preparations in different biotechnological areas	
	2. Students will differentiate between various types of PMPs and their roles in enhancing crop productivity, food processing, and environmental sustainability.				2.1 To know and to understand how to differentiate between various types of PMPs and their roles in enhancing crop productivity, food processing, and environmental sustainability.	
	3. Students will critically explain the mechanisms of action of PMPs, including how they enhance soil fertility, protect plants from pathogens, promote plant growth, and aid in bioremediation and waste management.				3.1 To critically explain the mechanisms of action of PMPs, including how they enhance soil fertility, protect plants from pathogens, promote plant growth, and aid in bioremediation and waste management.	
	4. Students will evaluate the effectiveness of different PMPs in solving agricultural, industrial, or environmental challenges, using scientific methods to assess outcomes.				3.2 To be able to apply knowledge of microbial metabolic pathways and interactions in symbiosis, biocontrol, and bioremediation in various sectors.	
					4.1 To know and to get a basic knowledge of evaluating the effectiveness of different PMPs in solving agricultural, industrial, or environmental challenges, using scientific methods to assess outcomes.	
					4.2 To analyze scientific literature and case studies related to the application of PMPs in agriculture, food production, and ecological projects.	
Prerequisites	Biotechnology, Microbiology, Virology, Biochemistry					
Postrequisites	Industrial or laboratory practice					
Learning Resources	Literature: 1. Brock Biology of Microorganisms (11th edn). Michael T. Madigan, John M. Martinko (eds).2006 2. Prescott Harley and Klein Microbiology 7th 2008 3. Microbiology by Pelczar chan and Krieg. Fifth edition. 1993					

4. Roger Y. Stanier. General Microbiology/.1987. The fifth edition
5. ESSENTIALS OF INDUSTRIAL MICROBIOLOGY. Basanta K. Rai. 2012
6. Industrial Microbiology(second Edition) by Prescott, Samuel Cate
7. Лысак, В. В. Микробиология : электронный учебно-методический комплекс для специальностей: 6-05-0511-06 «Биотехнология», 1-31 01 04 «Биоинженерия и биоинформатика» / В. В. Лысак, В. Е. Мямин, С. Л. Василенко ; БГУ, Биологический фак., Каф. микробиологии. – Минск : БГУ, 2024. – 301 с. : ил. – Библиогр.: с. 300–301.
8. Микробиология: культивирование и рост бактерий.Практическое руководство для студ. биологич. спец. вузов /И. И. Концевая; М-во образования РБ, Гомельский гос. ун-т им. Ф. Скорины. – Чернигов: Десна Полиграф, 2017. – 44 с.
9. В. В. Белахов. ПОЛИФУНКЦИОНАЛЬНЫЕ ЛЕКАРСТВЕННЫЕ ПРЕПАРАТЫ: ПОИСК, РАЗРАБОТКА, ИСПОЛЬЗОВАНИЕ В МЕДИЦИНСКОЙ ПРАКТИКЕ И ЭКОЛОГИЧЕСКИЕ АСПЕКТЫ ИХ ПОЛУЧЕНИЯ И ПРИМЕНЕНИЯ/ Экологическая химия 2022, 31(2); 59–86
10. R.K. Naresh. Textbook on Agricultural Microbiology. 2022

Research infrastructure

1. Classes of Biology and Biotechnology department of KazNU
2. Co Research and Production Enterprise Antigen LLP

Internet resources

1. <http://elibrary.kaznu.kz/ru>
2. MOOC / video lectures, etc.
3. Google Scholar
4. Scencedirect.com
5. academia.edu
6. researchgate

Academic course policy

The academic policy of the course is determined by the Academic Policy and the Policy of Academic Integrity of Al-Farabi Kazakh National University.

Documents are available on the main page of IS Univer .

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.

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.

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.

Compliance with academic honesty during the period of theoretical training and at exams, in addition to the main policies, is regulated by 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".

Documents are available on the main page of IS Univer .

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.

All students, especially those with disabilities, can receive counseling assistance by phone / e- mail amutova@fb@gmail.com.

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.

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.

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	Fine	<table border="1"> <thead> <tr> <th>Formative and summative assessment</th> <th>Points % content</th> </tr> </thead> <tbody> <tr> <td>Activity at lectures</td> <td>5</td> </tr> <tr> <td>Work in practical classes</td> <td>20</td> </tr> <tr> <td>Independent work</td> <td>25</td> </tr> <tr> <td>Design and creative activity</td> <td>10</td> </tr> <tr> <td>Final control (exam)</td> <td>40</td> </tr> <tr> <td>TOTAL</td> <td>100</td> </tr> </tbody> </table>	Formative and summative assessment	Points % content	Activity at lectures	5	Work in practical classes	20	Independent work	25	Design and creative activity	10	Final control (exam)	40	TOTAL	100
Formative and summative assessment	Points % content																	
Activity at lectures	5																	
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Final control (exam)	40																	
TOTAL	100																	
B	3.0	80-84																
B-	2.67	75-79																
C+	2.33	70-74																
C	2.0	65-69	Satisfactorily															
C-	1.67	60-64	Unsatisfactory															
D+	1.33	55-59																
D	1.0	50-54																

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			
POLIFUNCTIONAL MICROBIOLOGICAL PREPARATIONS IN AGRICULTURE AND AGRO-INDUSTRIAL COMPLEXES			
1	L 1. Introduction to Polifunctional Microbiological Preparations for Agriculture	1	5
	PC 1. Definition and main functions of PMPs in agriculture. History of development and examples of early Polifunctional Microbiological Preparations in agriculture.	2	5
2	L 2. Polifunctional Microbiological Preparations for Improving Soil Fertility. Biofertilizers, nitrogen-fixing bacteria, phosphate-mobilizing microorganisms	1	5
	PC 2. Analysis of Existing Biofertilizers and Their Effectiveness. Review of specific biofertilizer examples and testing their effectiveness under different conditions	2	5
	IWST 1. Consultation on the implementation of IWS 1		5
3	L 3. Mycorrhiza and Symbiotic Relationships Between Plants and Microorganisms	1	5
	PC 3. Study of Symbiotic Relationships in Agroecosystems. Examination of practical examples of plant-microorganism interactions.	2	5
	IWS 1. Examination of practical examples of plant-microorganism interactions.		10
4	L 4. Biopesticides and Biocontrol: The Role of Microbes in Fighting Plant Pathogens	1	5
	PC 4. Planning Experiments on the Use of PMPs in Combating Phytopathogens. Development of experimental schemes to evaluate the effectiveness of biopesticides.	2	5
5	L 5. Polifunctional Microbiological Preparations as Plant Growth Stimulants	1	5
	PC 5. Practical Application of Plant Growth Stimulants	2	5
MODULE 2			
POLIFUNCTIONAL MICROBIOLOGICAL PREPARATIONS IN THE FOOD INDUSTRY			
6	L 6. The Role of Microbiological Preparations in the Food Industry	1	5
	PC 6. Microbiological Preparations in raw material processing, product quality improvement, and biosafety. Historical examples of microbial applications in the food industry.	2	5
	IWST 2. Consultation on the implementation of IWS 2		5
7	L 7. Microbial Enzymes and Their Use in the Food Industry	1	5
	PC 7. Study of the Use of Microbial Enzymes in Food Raw Material Processing		5
	IWS 2. Examples of application of Enzymes in food processing	2	10
	Midterm control		
Midterm control 1			100
8	L 8. Probiotics and Prebiotics in the Production of Functional Foods	1	
	PC 8. Study of the composition and effectiveness of probiotics in various products		5
	IWST 3. Consultation on the implementation of IWS 3	2	5
9	L 9. Biotechnologies of Fermentation in the Food Industry	1	5

	PC 9. Designing Experiments for the Production of Fermented Products	2	5
	IWS 3. Microorganisms in the production of fermented products		5
10	L 10. Quality Control of Products Using Polifunctional Microbiological Preparations	1	5
	PC 10. Development of quality control and biosafety methods based on Polifunctional Microbiological Preparations.	2	5
	IWS 4. Consultation on the implementation of IWS 4		5
MODULE 3 POLIFUNCTIONAL MICROBIOLOGICAL PREPARATIONS IN ENVIRONMENTAL BIOTECHNOLOGY			
11	L 11. Environmental Biotechnology and the Role of Microbial Preparations	1	5
	PC 11. Application of microorganisms for environmental restoration.		5
	IWS 4. Examples of bioremediation applications	2	5
12	L12. Microbial Preparations for Bioremediation of Contaminated Areas	1	5
	PC 12. Analysis of Bioremediation Examples Based on Microbes. Review of real-world cases and their effectiveness.	2	5
13	L 13. Bio-purification of Wastewater Using microorganisms	1	5
	PC 13. Examination of methods and technologies used for water bio-purification	2	5
	IWS 5. Consultation on the implementation of IWS 5		5
14	L 14. Biodegradation of Plastic and Other Synthetic Materials Using Microorganisms	1	5
	PC 14. Practical study of microbial potential for plastic degradation	2	5
15	L 15. Ecological and Economic Justification for the Use of PMPs in Environmental Biotechnology	1	
	PC 15. Comparative analysis of traditional and biotechnological methods of cleanup	2	5
	IWS 5. Study of methods and technologies used for biological water purification		5
	Midterm control 2		100
	Midterm control 2		100
	Final control (exam)		100
	TOTAL for course		100

Dean of the Faculty of Biology
and Biotechnology

Chair of the Academic Committee
on the Quality of Teaching and Learning

Head of Biotechnology Department

Lecturer



Kurmanbaeva M.S.

Baktybayeva L.K.

Kistaubaeva A.S.

Amutova F.B.

**RUBRICATOR OF THE SUMMATIVE ASSESSMENT
CRITERIA EVALUATION OF LEARNING OUTCOMES**

- ISW 1. Plant-microorganism interactions
 ISW 2. Enzymes in food processing
 ISW 3. Microorganisms in the production of fermented products
 ISW 4. Bioremediation
 ISW 5. Biological water purification
 (40% of 100% MC)

Criterion	"Excellent" 20-25%	"Good" 15-20%	"Satisfactory" 10-15%	"Unsatisfactory" 0-10%
Knowledge and understanding theories and concepts tasks	An "excellent" rating is given for an answer that contains an exhaustive explanation of the question, a detailed argumentation for each conclusion and statement, is constructed logically and consistently, and is supported by examples.	A "good" rating is given for an answer that contains a complete but not exhaustive coverage of the issue, an abbreviated argumentation of the main points, and allows for a violation of the logic and sequence of presentation of the material. The answer contains stylistic errors and inaccurate use of terms.	A "satisfactory" rating is given for an answer that contains incomplete coverage of the questions proposed in the ticket, superficially argues the main points, allows compositional imbalances in the presentation, violations of the logic and sequence of presentation of the material, and does not illustrate theoretical points with examples.	Incorrect coverage of the questions posed, erroneous argumentation, factual and verbal errors, assumption of an incorrect conclusion.
Application of the selected methodology and technology to specific tasks	Complete completion of the educational task, a detailed, reasoned answer to the question posed, followed by solving practical problems	Partial completion of the educational task, incomplete, sometimes reasoned answer to the question posed with incomplete solution of practical problems; illiterate use of scientific language norms in the course	The material is presented in fragments, in violation of logical sequence, factual and semantic inaccuracies are allowed, theoretical knowledge of the course is used superficially	An irrational method of solving a task or an insufficiently thought-out answer plan; inability to solve problems, perform tasks in general; making mistakes and omissions that exceeds the norm.
Evaluating and analyzing the applicability of the chosen methodology to the proposed task, justifying the result obtained	Consistent, logical and correct substantiation of scientific principles 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 that do not affect the generally correct conclusions (+ visualization of the results of the substantiation using graphical data)	3-4 inaccuracies in the use of conceptual material, minor errors in generalizations and conclusions are allowed, which do not affect the good overall level of task completion	Conclusions on the applicability of substantiated scientific provisions 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, answers to questions were incomplete, conceptual material and argumentation were poorly used
Presentation	Excellent, attractive presentation, excellent quality of visuals, slides, materials	Good quality visuals, slides or other materials	Satisfactory quality of materials	Low quality materials