Non-Commercial Joint-Stock Company
«Kazakh National Agrarian Research University»

APPROVED
The Rector of Establishment
«SDU University»
_____ A. Igenbayev
« 01 »   03   2024

APPROVED
Chairman of the Board - Rector
_____ A.Kurishbaev
   03   2024

AGREED
General Director «Institute of Plant
Biology and Biotechnology» of the
Committee of Science of the Ministry
of Science and Higher Education of
the Republic of Kazakhstan
_____ K. Zhambakin
« 01 »   03   2024

EDUCATIONAL PROGRAM

«6B05104-Bioinformatics»

Awarded degree: bachelor of Natural Sciences under the educational program
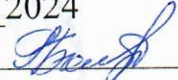«6B05104-Bioinformatics»

Approved at the meeting of the Department «Agronomy, breeding and biotechnology»
Protocol № _6_ « _16_ » _01_ 2024
Head of the department _____ Y.Zhanbyrbaev

Considered at meetings Academic Committee of the Faculty of «Agrobiology»
Protocol № _6_ « _30_ » _01_ 2024
Chairman of the AC of the faculty _____ G.Bayadilova

Reviewed by the Educational Methodological Council of the University and recommended to the Academic Council
Protocol № _4_ « _01_ » _02_ 2024
Chairman of the EMC of the University _____ A.Abdyrov

The educational program was approved at the meeting of the Academic Council of KazNARU
Protocol № _9_ « _01_ » _03_ 2024

Developers:
P.d. head of the department   E. Abildaev
Head of department   Y. Zhanbyrbaev
Associate Professor   K. Urazaliev
Associate Professor   G. Bayadilova

The Vice-Rector for Academic Affairs of Establishment
«SDU University»   A. Bogdanchikov

Senior lecturer, PhD   G. Baiseitova

Employer:
General Director
«Institute of Plant Biology and Biotechnology» of the
Committee of Science of the Ministry of Science and
Higher Education of the Republic of Kazakhstan   K. Zhambakin

Agreed:
Head of the Educational Programs Design Office   Zh. Kussainova

Application area

It is intended for the implementation of bachelor's degree education in the educational program «6B05104-Bioinformatics» in the NCJSC «Kazakh National Agrarian Research University» joint with the «SDU University» establishment.

Regulations

- «On Education» The Law of the Republic of Kazakhstan dated 27 July, 2007 No. 319-III;

Order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 №2;

Classifier of training programs for personnel with higher and post-graduate education. Order of the Minister of Education and Science of the Republic of Kazakhstan of October 13, 2018 No. 569;

Standard Rules for the activities of educational organizations implementing educational programs of higher and (or) postgraduate education. Order of the Minister of Education and Science of the Republic of Kazakhstan of October 30, 2018 No. 595;

Rules of the organization of the educational process on credit technology of training. Order of the Minister of Education and Science of the Republic of Kazakhstan dated 12.10.2018 No. 563;

Algorithm of inclusion and exclusion of educational programs in the Register of educational programs of higher and postgraduate education. Order of the Minister of Education and Science of the Republic of Kazakhstan No. 665 dated December 4, 2018;

Order No. 106 of the Minister of Science and Higher Education of the Republic of Kazakhstan dated October 12, 2022. Rules for keeping the register of educational programs, implemented by the organizations of higher and (or) postgraduate education, as well as the grounds for inclusion in the register of educational programs and exclusion from it

Professional Standard: http://atameken.kz/

1. Professional standard «Software maintenance support» Appendix № 5 to the Order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan «Atameken» dated 15.12.2022, № 222.

2. Professional standard «Creation and management of information resources» Appendix № 8 to the Order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan «Atameken» dated 17.07.2017, № 171.

3. Professional standard «Software development» Appendix № 7 to the Order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan «Atameken» dated 05.12.2022, № 222.

4. Professional standard «Database Administration» Appendix № 1 to the Order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan «Atameken» dated 15.12.2022, № 222.

5. Professional standard «Organization of interaction between science and innovators» Appendix № 1 to the Order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan «Atameken» dated 24.12.2019, № 259.

Atlas of new professions:
1. Biotechnologist in the field of synthetic biology https://www.enbek.kz/atlas/profession/226
2. Biotechnologist-microbiologist of aquatic systems https://www.enbek.kz/atlas/profession/210

1. Passport of the educational program

Code and classification of the education field	6B05 Natural Sciences, Mathematics and Statistics
Code and classification of training areas	6B051-Biological and Related Sciences
Code and name of educational program	6B05104 - Bioinformatics
Type of educational program	Innovative
The purpose of the educational program	Training undergraduate degrees in Bioinformatics skilled in the use of information technology in their professional activities in the biological sciences, annotation of genomic sequences, genome analysis, biodiversity assessment, and the basics of computational biology.
Level according to ISCED	6
Level according to NQF	6
Level according to SQF	6
The number of appendix to the licenses for the training direction	KZ89LAA00031870 05.08.2021
Accreditation of EP The name of the accreditation body The period of accreditation validity	№: AB 4884 IAAR 16.06.2023 – 15.06.2028
Degree awarded	Bachelor of Natural Sciences under the educational programme «6B05104-Bioinformatics»
Learning outcomes	Table 2
List of qualifications and positions	- Software Assurance Specialist; - Specialist in the creation and management of information resources (content manager) - Software designer; - Data Analysis specialist; - Junior Researcher; - Researcher; - Biotechnologist in the field of synthetic biology https://www.enbek.kz/atlas/profession/226; - Biotechnologist-microbiologist of aquatic systems https://www.enbek.kz/atlas/profession/210; - Bioinformatician; - Bioinformatics Engineer; - Software Engineer; - Biologist; - Bioinformatics of genomic selection; - Agroinformatician.
Field of professional activity	- production, study and application of various biological objects, primarily modified natural and artificial organisms (from viruses and unicellular to multicellular), as well as bio macromolecules; - processing and subsequent analysis of a large array of information on biological objects (decoded genomes, spatial structures of biomolecules, interactions of biological objects); - development of methods for molecular diagnostics and selection of new targets for drugs.
Scope and object of professional activity	- preventive, clinical, personalized medicine; - pharmacology and pharmacy; - research activities; - animal husbandry, IT; - genomic engineering; - biotechnology, biochemistry, biophysics;

	- data analysis.
Functions of professional activity	- on in the construction of modified or new biological objects; - participation in the control of input data of biological and bioengineered objects; - quality control and extraction of output data of biological and bioengineered objects; - use of bioinformatics and bioengineering methods in molecular diagnostics, selection of new targets for drugs, medical and genetic research.
Types of professional activity	**research activities:** - study of scientific and technical information, performing literary and patent searches on the subject of research; - application of modern approaches, typical for bioinformatics, to solve problems facing both fundamental and applied science; - use of the acquired knowledge and professional skills for competent analysis of a large array of information on biological objects (decoded genomes, spatial structures of biomolecules, interaction of biological objects); - participation in the construction of modified or new biological objects; - use of bioinformatics and bioengineering methods in molecular diagnostics, selection of new targets for drugs, medical and genetic studies; - participation in the implementation of research and development results; - preparation of data and preparation of reports, reviews, scientific publications; - participation in activities for the protection of intellectual property. **organizational and managerial activities:** - organization of the work of a team of performers; - participation in the preparation of technical documentation for the use of bioengineered objects (work schedules, technological structures, safety instructions, applications for materials and equipment, business correspondence documents); - participation in the collection and preparation of initial data for the selection and justification of scientific, technical and organizational solutions for the use of bioengineered objects; - participation in the preparation of documentation and implementation of the company's quality management system; - participation in the implementation of measures to prevent occupational injuries, occupational diseases and environmental violations. **production and technological activities:** - preparation of recommendations for the management of individual stages of processes using biological objects to ensure occupational health and environmental safety; - participation in the organization of workplaces, their technical equipment and placement of technological equipment to ensure labor protection and environmental safety;

	- participation in the control of input data and bioengineered objects; - participation in the quality and safety control of products and data received.
Be competent	- to solve the problems of professional activity on the basis of information and bibliographic culture with the use of information and communication technologies and taking into account the basic requirements of information security; - report orally and in writing in Russian and foreign languages to solve the problems of professional activity; - willingness to lead the team in the field of their professional activities, to tolerate social, ethnic, confessional and cultural differences; - apply bioinformatics methods to obtain new knowledge and to obtain biological objects with purposefully modified properties, apply modern research methods, determine the relevance of the goals and objectives and the practical significance of the research; - observations, descriptions, identification and scientific classification of biological objects (prokaryotes, fungi, plants and animals); - find and use the information accumulated in databases on the structure of genomes, proteins and other biological information, possession of the main bioinformatics means of analyzing genomic, structural and other biological information; - the ability to create computer programs, databases and other software products used in bioengineering and bioinformatics; - carrying out laboratory work, taking into account the requirements of safety and first aid techniques in case of accidents; - research and analysis of living systems, mathematical methods of processing the results of biological research; - organize your work on a scientific basis, on the basis of knowledge of labor legislation, rules and norms of labor protection, taking into account the existing administrative documents, methodological and regulatory materials in the field of your professional activity. - have professional competencies that correspond to the type (s) of professional activity that the program is focused on; - independently conduct theoretical and experimental research work in the field of bioengineering, bioinformatics and related disciplines, as well as formalize it in writing, present it orally and participate in various forms of discussions.

2. Learning results of Educational Programs

Codes	Learning results
LO1	Analyze events and actions from the point of view of the field of legal regulation and be able to refer to the necessary regulatory acts. To be able to protect their rights and interests using the laws, to carry out professional activities based on developed legal awareness, legal thinking and legal culture.
LO2	To know the fundamental problems of the functioning of the economy, the mechanism of action and manifestation of economic laws, as well as the main features of the leading schools and areas of economics science; to apply the knowledge gained to build an effective system of business and entrepreneurship, to have the competence necessary to develop arguments and solve a problem in the field of study
LO3	Apply methods for the implementation of low-waste industries and assess the environmental efficiency of economic activities, establish cause-and-effect relationships between phenomena that occur in nature and society, apply environmental knowledge to solve and predict possible environmental problems.
LO4	To be able to organize scientific work, synthesize new knowledge, generalize research results and present them using knowledge and skills in the field of research. Know the main legislative acts on industrial safety, labor protection, environmental protection and civil protection in scientific research and labor organization.
LO5	Understand the principles and basis of natural phenomena and processes from a physical and chemical point of view. Explain the structure and properties of inorganic and organic compounds and the principles of work. Know the chemical composition of plants and the physical structure of biological objects.
LO6	Know the morphological features of plants, the basics of botany and zoology, biological systematics, physiological, biochemical and molecular mechanisms of processes occurring in cells. Be able to explain the structure and properties of cell organelles, cells, organs, organisms and populations and the principles of their interaction. Know the basics of the mechanisms of heredity and variability, as well as methods for their study and modification. Use research methods designed for different levels of process organization.
LO7	To know the theoretical and practical basis of plant growing, plant life factors, design and drawing up crop rotation schemes, tillage systems, etc. To use modern methods of selection and seed production with the participation and breeding of varieties of agricultural crops. To apply in practice the methods of the selection process and methods of reproduction.
LO8	Know the necessary basic mathematical concepts and laws of mathematical logic, statistics and probability theory. To be able to apply the methods of mathematical statistics to solve various agrobiological research problems. Possess the ability to apply knowledge in practice and the skills to build probabilistic models for the study of agrobiological processes and phenomena.
LO9	Know the basic laws of modern information and communication technologies, the types and purpose of applied IS, models and processes of the product life cycle, the stages of creating applied information systems, the principles of operation of various devices, their functional composition and subsystems. To know the methods of analysis of the field of information systems, the methodology and technology of development and design of information systems, the physical foundations of CT and data transmission devices. Possess skills in working in various operating systems and skills in working with technologies for searching, collecting, storing, processing and transmitting information.
LO10	Know the basics of bioinformatics and practical technologies used in bioinformatics, how to search, receive and analyze data. Be able to use various approaches and methods of bioinformatics to solve practical problems. Be able to apply the acquired knowledge in the field of molecular biology and genetics. Possess the skills of practical work with biological data banks and other data sources, the ability to search for bioinformation data in various databases.

3. Contents of the educational program

№пп	CC/UC/OC	Discipline code	The name of the discipline forming competencies	Academic loans	In the academic hours	Lectures	Practical class	Laboratory lesson	Another (practice)	IWST	IWS	1	2	3	4	5	6	7	8	Department	Control form
	OO		**Жалпы білім беретін пәндер циклі / Цикл общеобразовательные дисциплины / General education subjects cycle**	**56**	**1680**	**90**	**465**			**300**	**825**										
			Модуль 1/ Module 1. Гуманитарлық және тілдік/ Гуманитарный и языковой/ Humanities and language	**30**	**900**	**30**	**240**			**180**	**450**										
1	CC	KTM / IKG/ HK 1106	Қазақстан тарихы/ История Казахстана/ History of Kazakhstan	5	150	15	30			30	75		5							22	State exam
2	CC	Fil/ Phil 2103	Философия/ Philosophy	5	150	15	30			30	75				5					22	exam
3	CC	SHT / IYa/ FL 1105	Шетел тілі/ Иностранный язык/ Foreign Language	10	300		90			60	150	5	5							22	exam
4	CC	KOT/ KRYa/ KRL 1102	Қазақ (Орыс) тілі/ Казахский (Русский) язык/Kazakh (Russian) Language	10	300		90			60	150	5	5							22	exam
			Модуль 2. Кәсіби және коммуникативті модулі/ Профессионально-коммуникативный/ Professional and communicative	**10**	**300**	**30**	**60**			**60**	**150**										
5	CC	AKT/ IKT/ IACT 2122	Ақпараттық-коммуникациялық технологиялар/ Информационно-коммуникационные технологии/ Information and communication technologies	5	150	15	30			30	75				5					21	exam
6	CC	Eko/ Eco 2123	Экономика/ Economy																		
		KSZhKM/ PAK/ LAK 2118	Құқық және сыбайлас жемқорлыққа қарсы мәдениет/ Право и антикоррупционная культура/ Law and anti-corruption culture	5	150	15	30			30	75			5						14	exam
		Eko/ Eco 2114	Экология/ Ecology																		

№		Код/Code	Пән/Дисциплина/Subject																				
		TAK/BZh/ LS 2112	Тіршілік әрекетінің қауіпсіздігі/ Безопасность жизнедеятельности/ Life safety																				
		Kas/Pre/ Ent 2115	Кәсіпкерлік/Предпринимательство/ Entrepreneurship																				
		GZN/ONI/ FSR 2121	Ғылыми зерттеулердің негіздері / Основы научных исследований / Fundamentals of Scientific Research																				
		KSN/OFG/ BOFL 2116	Қаржылық сауаттылық негіздері/ Основы финансовый грамотности/ Basics of financial literacy																				
			Модуль 3. Әлеуметтік-саясаттану білім және салауатты өмір салты / Социально-политических знаний и здоровый образ жизни/ Socio-political knowledge and a healthy lifestyle	**16**	**480**	**30**	**165**			**60**	**225**												
7	CC	ASBMASMP/ MSPZSPKP)/ SAPKMSSSC SP 1107	Әлеуметтік-саясаттану білім модулі (әлеуметтану, саясаттану, мәдениеттану, психология)/ Модуль социально –политических знаний (социология, политология, культурология, психология)/ Social and political knowledge module (Social Studies , Political Studies, Cultural Studies, Psychology)	8	240	30	45			60	105		8									21	exam
8	CC	DSH/ FK/ PT 1109 2110	Дене шынықтыру/ Физическая культура Physical culture	8	240		120				120	2	2	2	2							23	exam
	БП КП		**Базалық және кәсіптендіру пәндер циклы Цикл базовых и профилирующих дисциплин Core and major subjects cycle**	**176**	**5280**	**435**	**600**	**420**	**170**	**930**	**2725**												
			Модуль 4. Жаратылыстану және математикалық пәндер/ Естественно-научные и математические дисциплины/ Natural science and mathematics disciplines	**35**	**1050**	**105**	**180**	**30**		**210**	**525**												
9	UC	Bio 3255	Биостатистика/ Biostatistics	5	150	15	30			30	75						5					1	exam
10	UC	ZhM/ VM/ HM 1238	Жоғары математика/ Высшая математика/ Higher mathematics	5	150	15	30			30	75	5										21	exam

№		Code	Discipline																	
11	UC	BOH/NOH/ IOCh 1204	Бейорганикалық және органикалық химия/ Неорганическая и органическая химия/ Inorganic and organic chemistry	5	150	15	15	15		30	75	5							2	exam
12	UC	FBN/ FOB/ PhFB 2239	Физика биофизика негіздерімен/ Физика с основами биофизики/ Physics with fundamentals of biophysics	5	150	15	15	15		30	75			5					21	exam
13	OC	BU/OB/BO 3256	Бизнесті ұйымдастыру/ Организация бизнеса/ Business organization	5	150	15	30			30	75						5		14	
14	OC	IAM/ MDI/ MCS 3263	Информатикаға арналған математика/ Математика для информатики/ Mathematics for Computer Science	5	150	15	30			30	75						5		21	
		SA/LA 3262	Сызықтық алгебра / Линейная алгебра/ Linear algebra																	
15	OC	DM/DM/DM 3265	Дискретті математика/ Дискретная математика/ Discrete Mathematics	5	150	15	30			30	75						5		21	
		MT/MA 3264	Математикалық талдау/ Математический анализ/ Mathematical analysis																	
		Модуль 5. Биологиялық пәндер / Биологические дисциплины / Biological disciplines		**54**	**1620**	**135**	**150**	**150**	**70**	**270**	**845**									
16	UC	OB/ BR/PB 1240	Өсімдіктер биологиясы / Биология растений/ Plant Biology	5	150	15	15	15		30	75	5							3	exam
		OP/ UP/ TP 1201	Оқу практикасы/ Учебная практика/ Training practice	2	60				20		40		2						1	diff. credit
17	UC	Zoo 1241	Зоология/ Zoology	6	180	15	15	30		30	90		6						16	exam
18	UC	OF/FR/PPh 2246	Өсімдіктер физиологиясы/ Физиология растений/ Plant physiology	6	180	15	15	30		30	90				6				1	exam
19	UC	Bio 2243	Биохимия/ Biochemistry	5	150	15	15	15		30	75			5					1	exam
20	UC	Cit/Cyt 2242	Цитология/ Cytology	5	150	15	15	15		30	75			5					1	exam
21	UC	OG/GR/PG GR 2244	Өсімдіктер генетикасы/ Генетика растений/ Plant genetics	5	150	15	15	15		30	75			5					1	exam
22	UC	MB 2302	Молекулалы биология/ Молекулярная биология/ Molecular Biology	5	150	15	30			30	75				5				1	exam
23	UC	OSH /Ras/CP 3247	Өсімдік шаруашылығы/ Растениеводство/ Crop production	5	150	15	15	15		30	75						5		1	exam
24	UC	OS/SR/PB 4248	Өсімдіктер селекциясы/ Селекция растений/ Plant breeding	5	150	15	15	15		30	75							5	1	exam

№		Code	Name																	
		OP/ PP 2202	Өндірістік практика/ Производственная практика/ Production practice	5	150				50		100			5					1	diff. credit
		Модуль 6. Информатика және бағдарламалау/ Информатика и программирование/ Computer Science and Programming		**30**	**900**	**90**	**105**	**75**		**180**	**450**									
25	UC	BN/ OP/ FP 3260	Бағдарламалау негіздері/ Основы программирования/ Fundamentals of Programming	5	150	15	15	15		30	75				5					exam
26	OC	DKBZh/ SUBD/ DMS 3355	Деректер қорын басқару жүйелері 1/ Системы управления базами данных 1/ Database Management Systems 1	5	150	15	15	15		30	75				5					exam
		MKA/ RMP/ MAD 3356	Мобильді қосымшаларды әзірлеу 1/ Разработка мобильных приложений 1/ Mobile Application Development 1																	
27	OC	YTMS/ TVMS/ PMS 3357	Ықтималдық теориясы және математикалық статистика / Теория вероятностей и математическая статистика/ Probability and Mathematical Statistics	5	150	15	15	15		30	75				5					exam
		VI/ WF 3358	Веб-интерфейс / Web front/ Веб-интерфейс																	
28	OC	AK/ VA/ IA 3261	Алгоритмдерге кіріспе / Введение в алгоритмы/ Introduction to Algorithms	5	150	15	30			30	75				5					exam
		DM 3261	3D модельдеу / 3D-моделирование/ 3D modeling																	
29	OC	DTAP/ PDAD/ PDA 3354	Деректерді талдауға арналған Python/ Python для анализа данных/ Python for data analysis	5	150	15	15	15		30	75				5					exam
		DTU/ DAD/ RDA 3353	R деректерді талдау үшін/ R для анализа данных/ R for data analysis/																	
30	OC	DN/ ODO/ FDO 3268	DevOps негіздері / Основы DevOps/ Fundamentals of DevOps																	
		DZhT/ SAD/ DCA 3269	Деректерді жинау және талдау / Сбор и анализ данных/ Data collection and analysis/	5	150	15	15	15		30	75				5					exam
			Модуль 7. Биоинформатиканың биологиялық	**57**	**1710**	**105**	**165**	**165**	**100**	**270**	**905**									

№		Код/Code	Пән атауы/ Название дисциплины/ Discipline name																			
			аспектілері/ Биологические аспекты биоинформатики/ Biological aspects of bioinformatics																			
31	UC	PBATT/ PBABP/ PBAOPS 4350	Практикалық биоинформатика: ақуыздар тізбегін талдау/ Практическая биоинформатика: анализ белковых последовательностей/ Practical bioinformatics: analysis of protein sequences	5	150			45		30	75								5	1	exam
32	UC	PBNTT/ PBAPN/ PBAONS 4348	Практикалық биоинформатика: НҚ тізбегін талдау/ Практическая биоинформатика: анализ последовательностей НК/ Practical bioinformatics: analysis of NC sequences	5	150			45		30	75								5	1	exam
33	OC	GPK/ VGP/ ITGAP 4346	Геномика және протеомикаға кіріспе/ Введение в геномику и протеомику/ Introduction to Genomics and Proteomics	5	150	15	30			30	75								5	1	exam
		GMN/ MOG/ MBG 4347	Генетиканың молекулалық негіздері / Молекулярные основы генетики / Molecular Fundamentals of Genetics																		
34	UC	BMB/ BBD/ BD 4349	Биоинформатикадағы мәліметтер базасы/ Биоинформационные базы данных/ Bioinformatic databases	6	180	15	15	30		30	90								6	1	exam
35	OC	BK/VB/ ITB 2340	Биоинформатикаға кіріспе/ Введение в биоинформатику/ Introduction to Bioinformatics	5	150	15	30			30	75				5					1	exam
		EBK/VVB/ ITCB 2341	Есептеу биологиясына кіріспе/ Введение в вычислительную биологию/ Introduction to Computational Biology																		
36	OC	GTA/MAG/ MOGA 4352	Геномды талдау әдістері/ Методы анализа генома/ Methods of genome analysis	6	180	15	15	30		30	90								6	1	exam
		AKTA/ MASB/ MFATSOP 4351	Ақуыздардың құрылымын талдау әдістері/ Методы анализа структуры белков/ Methods for analyzing the structure of proteins																		
37	UC	ZhB/OB/ GB 4336	Жалпы биоинженерия/ Общая биоинженерия/ General Bioengineering	5	150	15	30			30	75								5	1	exam
38	UC	GR/RG/GE 4257	Геномды редакциялау/ Редактирование генома/ Genome editing	5	150	15	30			30	75								5	1	exam

№		Код	Атауы / Название / Title	Credits	Hours							S1	S2	S3	S4	S5	S6	S7	S8		Form
39	OC	KB/PB/AB 4266	Қолданбалы биоинформатика/ Прикладная биоинформатика/ Applied Bioinformatics	5	150	15	30			30	75							5		1	exam
		BA/AB/AIB 4267	Биоинформатикадағы алгоритмдер/ Алгоритмы в биоинформатике/ Algorithms in bioinformatics																		
	UC	OP/PP 3316	Өндірістік практика/ Производственная практика/ Production practice/	5	150				50		100						5			1	diff. credit
		KP/PP 4317	Кәсіптік практика/ Профессиональная практика/ Professional practice/	5	150				50		100								5	1	diff. credit
			Қорытынды аттестаттау Итоговая аттестация Final assessment:	**8**	**240**				**80**		**160**										
			Қорытынды аттестаттау/ Итоговая аттестация/ Final examination	8	240				80		160								8		
			БАРЛЫҒЫ: ИТОГО: TOTAL:	**240**	**7200**	**525**	**1065**	**420**	**250**	**1230**	**3710**	**27**	**33**	**27**	**33**	**30**	**30**	**30**	**30**		

№	Факультет / Кафедра	
	ҚАЗАҚ ТІЛІНДЕ	**IN ENGLISH**
I	**Агробиология**	**Agrobiology**
1	Агрономия, селекция және биотехнология	Agronomy, breeding and biotechnology
2	Жеміс-көкөніс шаруашылығы, өсімдік қорғау және карантин	Horticulture, plant protection and quarantine
3	Топырақтану, агрохимия және экология	Soil science, agrochemistry and ecology
II	**Ветеринария**	**Veterinary**
4	Акушерлік, хирургия және өсіп-өну биотехнологиясы	Obstetrics, Surgery and Reproductive Biotechnology
5	Биологиялық қауіпсіздік	Biosecurity
6	Клиникалық ветеринариялық медицина	Clinical Veterinary Medicine
7	Микробиология, вирусология және иммунология	Microbiology, virology and immunology
8	Ветеринариялық санитариялық сараптау және гигиена	Veterinary sanitary examination and hygiene
9	Н.У.Базанова атындағы «Физиология, морфология және биохимия»	"Physiology, morphology and biochemistry" named after N.U. Bazanova
III	**Су, жер және орман ресурстары**	**Water, land and forest resources**
10	Орман ресурстары, аңшылықтану және балық шаруашылығы	Forest resources, hunting and fisheries
11	Жер ресурстары және кадастр	Land resources and cadastre
12	Су ресурстары және мелиорация	Water resources and melioration
IV	**«Бизнес және құқық» жоғары мектебі**	**Higher School "Business and Law"**
13	Есеп, аудит және қаржы	Accounting, audit and finance
14	Х.Д.Чурин атындағы «Менеджмент және агробизнесті ұйымдастыру»	"Management and organization of agribusiness" named after H.D. Churin
15	Құқық	Right
V	**Зооинженерия және тағам өндірісінің технологиясы**	**Zooengineering and food production technology**
16	Зооинженерия	Zooengineering
17	Тағам өнімдерінің технологиясы және қауіпсіздігі	Technology and food safety
VI	Инженерлік-техникалық	Engineering
18	Аграрлық техника және механикалық инженерия	Agricultural machinery and mechanical engineering
19	И.В.Сахаров атындағы «Машина пайдалану»	"Machine use" named after I.V. Sakharov
20	Энергия үнемдеу және автоматика	Energy saving and automation
21	IT-технологиялар және автоматтандыру	IT technologies and automation
VII	**Басқарма Төрағасы - Ректордың орынбасары**	**Deputy Chairman of the Board- Rector**
22	Жалпы білім беру пәндер	General university department
23	Дене тәрбиесі және спорт	Physical education and sports
24	Әскери кафедра	Military department

4. Modules Competency Map

Codes	Module	Educational competence	Learning outcomes
MC1	Module 1. Humanities and language	aimed at the formation of fundamental source and historiographic materials, as well as for the achievement of modern historical science of Kazakhstan; to determine the role of the history of Kazakhstan in the system of humanitarian knowledge; on revealing the specifics of the object and subject of history of Kazakhstan for the analysis of topical problems of the modern stage of development; on creation of scientifically grounded concept of history of Kazakhstan based on integral and objective coverage of the main stages of ethnogenesis of the Kazakh people, evolution of forms of statehood and civilization in the Great Steppe; on systematization of knowledge of the main events of the modern history of Kazakhstan.	- demonstrate knowledge and understanding of the main stages of development of the history of Kazakhstan - correlate the phenomena and events of the historical past with the general paradigm of world-historical development of human society through critical analysis; - possess the skills of analytical and axiological analysis in the study of historical processes and phenomena of modern Kazakhstan - be able to comprehend objectively and comprehensively the immanent features of the modern Kazakhstan model of development - to systematize and give a critical assessment of historical phenomena and processes in the history of Kazakhstan.
		form a system of general competencies that ensure the socio-cultural development of the personality of the future specialist based on the formation of his ideological, civic and moral positions;	- to evaluate the surrounding reality on the basis of ideological positions, formed by the knowledge of the fundamentals of philosophy, which provide scientific understanding and study of the natural and social world by methods of scientific and philosophical knowledge; - to interpret the content and specific features of the mythological, religious and scientific worldview; - to give assessment to everything happening in the social and industrial spheres;
		develop the ability to interpersonal social and professional communication in the state, Russian and foreign languages;	- implement the use of language and speech tools based on a system of grammatical knowledge; analyze information in accordance with the situation of communication; - to carry out the use of linguistic and speech means based on the system of grammatical knowledge; analyze information in accordance with the communication situation;
MC2	Module 2. Professional and communicative	The development of information literacy through the mastery and the use of modern information and communication technologies in all areas of life and work;	- evaluate the actvities and actions of communication participants. - to use in personal activities various types of information and communication technologies: Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information;

		Have an intolerant attitude toward corrupt behavior, respectful of legislation and law.	- analyze events and actions from the point of view of the area of legal regulation and be able to refer to the necessary regulatory acts; - to be guided in the current legislation; using the law, to protect their rights and interests, - to carry out professional activities on the basis of a developed legal awareness, legal thinking and legal culture; - to acquire a sufficient level of legal awareness; - be able to assess the facts and phenomena of professional activity from an ethical point of view; - apply moral rules and norms of behavior in specific life situations
		Be competent to analyze and obtain information in accordance with the basic knowledge of the economy; use the basics of economic knowledge in various fields;able to apply this knowledge in solving situational and practical problems.	- to know the fundamental problems of the functioning of the economy, the mechanism of action and manifestation of economic laws, as well as the main features of the leading schools and areas of economic science; - to be aware of economic terms and categories, use them in their educational activities; - to understand and know the main events of the world and domestic economic history, the course of ongoing reforms in the light of the strategy "Kazakhstan - 2050", development trends in the field of modern business; - to distinguish and compare the behavior of market agents in different types of market structures; - to explain the interaction of economic agents in macroeconomic markets; - to compare the impact of macroeconomic policies in different countries; - to argue their own views on modern macroeconomic phenomena; - to use the knowledge gained in practice to assess the results of economic reforms in Kazakhstan
		To be competent in the application of methods for the implementation of low-waste production and the assessment of the environmental efficiency of economic activity.	- know the contents of the basic terms in the field of ecology, environmental management; modern global and regional environmental problems and their solutions; - be able to apply environmental knowledge to solve and predict possible environmental problems; - apply methods for the implementation of low-waste production and assess the environmental performance of economic activity. - establish causal relationships between phenomena occurring in nature and society, - apply environmental knowledge to solve

			and predict possible environmental problems.
		Contribute to the ability to apply this knowledge to address the issues of safety and reliability of operation of machinery and equipment and knowledge of the issues of social protection of workers.	- to know the main legislative acts on industrial safety, labor protection, environmental protection and civil protection; - apply the knowledge gained to address the safety and reliability of the operation of machinery and equipment; - ability to evaluate machinery and process equipment in terms of exposure to abnormal situations.
MC3	Module 3. Socio-political knowledge and a healthy lifestyle	form the skills of self-development and education throughout life;	-to assess situations in various spheres of interpersonal, social and professional communication, taking into account the basic knowledge of sociology, political science, cultural studies and psychology; - to synthesize knowledge of these sciences as a modern product of integrative processes; - to use scientific methods and approaches of research of a specific science, as well as the entire socio-political cluster; - develop their own moral and civic position; - operate with the social, business, cultural, legal and ethical norms of Kazakhstan society; - demonstrate personal and professional competitiveness; - to put into practice knowledge in the field of social sciences and humanities, having international recognition; - to make a choice of methodology and analysis; - summarize the results of the study; - to synthesize new knowledge and present it in the form of humanitarian socially significant products;
		form a personality capable of mobility in the modern world, critical thinking and physical self-improvement.	- to build a personal educational trajectory throughout life for self-development and career growth, focus on a healthy lifestyle to ensure full social and professional activities through methods and means of physical culture.
	Core and major subjects competencies		**Learning outcomes**
MC4	Module 4. Natural science and mathematics disciplines	They form general theoretical and experimental principles and methods of the environment, natural phenomena, physics, and chemistry. Formation of basic mathematical concepts about quantitative relations and spatial forms. Perception of the properties of the objects under study formulated in the form of axioms. Obtaining knowledge on the development of methods for recording, describing and analyzing observational and experimental data in order to build probabilistic	- understand the principles and basis of natural phenomena and processes from the physical and chemical points of view; - explain the structure and properties of inorganic and organic compounds and the principles of operation; - know the chemical composition of plants - the necessary basic mathematical concepts and laws of mathematical logic; - basic concepts of the idea of mathematical statistics and probability theory; - use mathematical statements, clearly and clearly in terms that are understandable

		models of natural phenomena.	for professionals; - formulate, using understandable terms, tasks set in a mathematical language; - apply mathematical statistics methods to solve various agrobiological research problems.
MC5	**Module 5. Biological disciplines**	They form general theoretical and experimental principles and methods of biological processes occurring at different levels, from populations to extracellular ones.	- know the morphological features of plants, the basics of botany, plant systematics; - explain the structure and properties of cellular organelles, cells, organs,
			organisms and populations and the principles of their interaction; - use research methods designed for different levels of process organization.
MC6	**Module 6. Computer Science and Programming**	The module is aimed at preparing students for software development, working with hardware and software tools of the ICT, owning Internet technologies, modeling biotechnological processes. He instills the skills of using digital technologies to solve practical agrobiological problems and analyze large genomic data.	To know: - basic laws modern information and communication technologies; - types and purpose of applied ICS, models and processes of the product life cycle, stages of creation of applied information systems, principles of operation of various devices, their functional composition and subsystems; - methods of analysis of the field, information systems, formation of requirements for information systems, methodology and technology of development and design of information systems; - the physical basis of CT and data transmission devices, the purpose and types of IS. Be able to: - use ICT, various resources and bibliographic databases in solving problems; - carry out work on installing software and loading databases. Hold: - skills in working with technologies for searching, collecting, storing, processing, and transmitting information; - skills of working with the IS of the subject area, applied and information tasks; - skills of working in various operating systems; - skills of working with IS modeling of applied processes.
MC7	**Module 7. Biological aspects of bioinformatics**	As a result of the training, the student will be able to participate in research activities, analyze data and scientific literature using special computer programs. It will be able to formalize and present the results of its work on the use of ICT, as well as to search for the necessary relevant information. It will also be able to create and control requirements and	To know: - fundamentals of bioinformatics and practical technologies used in bioinformatics; - methods of searching, receiving and analyzing data. Be able to: - describe application processes and organize information support for applied tasks; - use various approaches and methods of

		regulatory documents, search, extract, store, analyze and visualize large volumes of biological and other data. Will be able to evaluate the correctness of the methods used.	bioinformatics to solve practical problems; - apply the acquired knowledge in the field of molecular biology and genetics; Have the ability to: - apply a systematic approach, as well as mathematical methods in solving applied bioinformatics problems; Hold: - practical skills of working with biological data banks and other data sources; - the ability to search for bioinformatics data in various databases.
	Professional Internship	Use theoretical knowledge in relation to their specialty and future profession, get acquainted with the activities of research teams and professional teams in the workplace to assess real issues and compare them with theoretical knowledge to solve them.	As a result, the bachelor will: - possess knowledge on the organization and staging of experiments in the field of bioinformatics; - have the ability to analyze the results of experiments; - use the knowledge of physical and chemical theories and laws for the interpretation of experimental data; - apply knowledge in solving practical research problems.

4.Summary table reflecting the volume of disbursed credits in the context of the educational program:

Training course	Semester	The number of studied disciplines			The number of academic credits						Total hours	Military training	Quantity	
		CC	UC	OC	Theoretical training	Training practice	Professional internship	Professional Internship	Final asessment	Total			exam	differentiated credit
I	1	3	3		27					27	810		6	
	2	5	1		31	2				33	990		6	1
II	3	1	4	1	27					27	810		6	
	4	3	2	1	28		5			33	990		6	1
III	5		1	5	30					30	900		6	
	6		3	2	25		5			30	900		5	1
IV	7		4	2	30					30	900		6	
	8		2	1	17			5	8	30	900		3	1
Итого		12	20	12	215	2	10	5	8	240	7200	588	44	4

6. Information about the disciplines

№	Name of the discipline	Brief course description (30-50 words)	Amount of credits	Formed competencies (codes)
Cycle of general education disciplines / Mandatory component			
1	History of Kazakhstan (SE)	The study of the course is aimed at forming the students' concept of the modern history of the Fatherland, based on a holistic and objective coverage of the problems of the ethno genesis of the Kazakh people, the evolution of forms of statehood and civilization on the territory of the Great Steppe and the totality of the most significant historical facts and events. Systematization of historical knowledge about the main events of history that form the scientific worldview.	5	MC1,
2	Philosophy	The study of the course "Philosophy" is aimed at forming students ' understanding of philosophy as a special form of knowledge of the world, its main sections, problems and methods, as well as skills of self-analysis and moral self-regulation, the development of research abilities and the formation of intellectual and creative potential. Special attention is paid to the problems of preserving national identity, assimilation of such key worldview concepts as justice, dignity and freedom, and the role of philosophy in the modernization of public consciousness and solving global problems of our time.	5	MC1
3	Foreign language	Teaching a foreign language sets tasks for the development of foreign language communicative competence in the totality of its components: - speech competence - development of communication skills in the four main types of speech activity; - language competence-mastering new language means (phonetic, spelling, lexical, grammatical; - socio-cultural competence-the formation of the ability to represent your country, its culture; - educational and cognitive competence-familiarization with the methods and techniques available to students for self-study of languages and cultures.	10	MC1
4	Kazakh (Russian) language	The discipline is designed to develop the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, and intercultural communication in the context of the implementation of state programs of trilingualism and spiritual modernization of national consciousness. The discipline involves successful mastery of the types of speech activity in accordance with the level of training.	10	MC1
5	Information and Communication Technologies	Formation of the ability to critically evaluate and analyze the processes, methods of searching, storing and processing information, methods of collecting and transmitting information through digital technologies. Students learn the conceptual foundations of the architecture of computer systems, operating systems and networks. Formation of knowledge about the concepts of development of network and web applications, tools for ensuring information security.	5	MC2
Social and political knowledge module (Social Studies, Political Studies, Cultural Studies, Psychology)			
6	Social Studies	Studies society, revealing the internal mechanisms of its structure and development of its structures (structural elements: social communities, institutions, organizations	2	MC3

		and groups); patterns of social actions and mass behavior of people, as well as the relationship between the individual and society sociology explains social phenomena, collects and summarizes information about them.		
7	Political Studies	The science of politics, the laws of the emergence of political phenomena (institutions, relations, processes), the ways and forms of their functioning and development, the methods of managing political processes, political consciousness, culture, etc.	2	MC3
8	Cultural Studies	The doctrine of culture, its history, essence, laws of functioning and development, which can be found in the works of scientists who present various ways of understanding the phenomenon of culture. In addition, the cultural sciences study the system of cultural institutions through which the upbringing and education of a person is carried out and which produce, store and transmit cultural information.	2	MC3
9	Psychology	Psychology is a science whose purpose is to study the mechanisms of the functioning of the human psyche. She examines the patterns of human behavior in various situations, the resulting thoughts, feelings and experiences. Psychology is what helps us to know ourselves deeper, to understand our problems and their causes, to realize our weaknesses and strengths. Its study contributes to the development of moral qualities and ethics in a person.	2	MC3
10	Physical Training	The discipline covers a range of issues related to physical culture as a part of universal culture, a healthy lifestyle, its main components, the socio-biological basis of adaptation of the human body to physical and mental activity, preparation for independent physical culture and sports, age-related physiology, self-control of the physical condition, the psychophysical basis of physical culture and sports, hygiene.	8	MC3
General education subjects cycle / Optional component				
11	Law and anti-corruption culture	The course program provides for the disclosure of such issues as the basic theory of the origin of state and law, the identification of features, subject, methods, principles, branches of law of Kazakhstan, as constitutional, administrative, labor, civil law, criminal, family, land, financial, tax, banking, insurance law of the Republic of Kazakhstan, improving the legal literacy of students in the field of anticorruption legislation, the formation of an anticorruption outlook, the anticorruption standard of eniya, intolerance of any manifestation of corruption.	5	MC2, LO1
12	Economy	The content of the "Economics" course is aimed at mastering the basic knowledge of the economic life of the society, in which the economic activities of individuals, different enterprises and the state are carried out. The course contributes to the development of economic thinking among students and the ability to make rational decisions with limited natural resources. This discipline contributes to the formation of readiness to use the acquired knowledge about the functioning of the economy to guide the choice of profession and further education.	5	MC2, LO2
13	Ecology	Formation of natural-scientific system knowledge about the ecological laws of the existence of individuals,	5	MC2, LO3

		populations and communities of living organisms, which are the theoretical foundation of all environmental measures to ensure human environmental safety, preserve his health, ecological culture, allowing the use of environmental knowledge not only in narrow professional interests, but also to promote the exit of society from the ecological crisis and movement towards sustainable development and apply theoretical knowledge for solving environmental problems.		
14	Life safety	The course forms a professional safety culture, which is understood as the willingness and ability of an individual to use in professional activity the acquired set of knowledge, skills and abilities to ensure safety in the field of professional activity.	5	MC2, LO4
15	Entrepreneurship	The discipline is aimed at forming students' understanding of the basics of entrepreneurship, developing key skills and competencies for successful business. The purpose of the course is to familiarize students with the main aspects of entrepreneurship, including the creation of a business idea and the development of a business plan. As a result of the training, students gain the ability to develop and analyze business plans, apply strategic and tactical approaches to managing an entrepreneurial project, as well as effectively solve business problems.	5	MC2, LO1
16	Fundamentals of Scientific Research	In this discipline, students study the basic approaches to scientific research in the electrical power industry, including choosing a research topic, developing a hypothesis, choosing methods for collecting data and analyzing results. They also learn the basics of statistics and experimental research, which help them analyze data and draw conclusions based on research results.	5	MC2, LO4
17	Basics of financial literacy	Personal finance management. Formation of own funds and choice of bank, Financial risks and investment strategies, Types of taxes paid by individuals in the Republic of Kazakhstan, Insurance market of the Republic of Kazakhstan, Creation of own business, Financial fraud, Pension savings opportunities	5	MC2, LO2
Core subjects cycle / University component			
18	Biostatistics	Studies methods of grouping primary biological data, analysis of types of distribution of traits, as well as work on biometric processing of the obtained biostatistical data.	5	MC4, LO6
19	Higher Mathematics	The course of higher mathematics is the foundation of mathematical education and includes such topics as linear and vector algebra, analytical geometry, mathematical analysis, differential equations, probability theory, and mathematical statistics. Mastering the theoretical foundations of mathematics and acquiring practical skills in solving practical problems is a necessity for further study of basic and specialized disciplines and for applying mathematical methods in various fields of science and technology.	5	MC4, LO8
20	Inorganic and organic chemistry	The discipline considers the basic laws and concepts of chemistry, patterns of interconversions, general chemical properties, and the structure of inorganic compounds. He also studies the classification of organic compounds, their physical and chemical properties, reactions occurring between classes of organic compounds.	5	MC4, LO5
21	Physics with fundamentals of	"Physics with the basics of biophysics" will allow students to gain knowledge of fundamental physical laws	5	MC4, LO5

	biophysics	aimed at understanding the physical foundations of biological laws and regularities and their application in veterinary medicine, biotechnology, agronomy and ecology. Form ideas, concepts and knowledge about the basic regularities of classical and modern physics and biophysics and give skills in applying them in professional activities, as well as for physical methods of measurement and research.		
22	Business organization	Discipline forms professional competencies in the field of own business and business organization in various organizational and legal forms. The course helps to develop specific knowledge and practical skills for future specialists that allow them to manage their business using the employee motivation system and make scientifically based management decisions.	5	MC4, LO2
23	Plant Biology	The discipline " Plant Biology" reveals the essence of the physiological processes of plant life, such as the water regime, photosynthesis and respiration of plants, their ontogenesis, organization in order to control the course of growth and development, and also allows you to gain knowledge on the basics of cytology and histology, organography, reproduction and systematics of plants, their role in the biosphere and life a person.	5	MC5, LO6
24	Zoology	The discipline studies the internal and external structure of animals, their species diversity, distribution, development, origin, relationship with the environment, importance in nature, environmental protection problems, and also forms an evolutionary worldview. As a result of the training, students form ideas about the diversity of vertebrate animals, the diversity of biological objects; about the main directions and patterns of evolution based on animal material; the role of animals in nature and in human life as an integral part of knowledge of the basics of rational nature management.	6	MC5, LO6
25	Plant physiology	The course «Plant Physiology» introduces students to the basics of plant life, the functional significance of various substances synthesized in plants during respiration and photosynthesis. Fundamentals of mineral nutrition of plants. The growth and development of plants, depending on the ongoing biochemical and biophysical processes, the path of development and morphogenesis of plants. Genotype-environment interaction.	6	MC5, LO6
26	Biochemistry	The discipline "Biochemistry" is intended for the formation of basic knowledge of the student, knowledge about the structure and chemical properties of the molecules that make up a living organism, the patterns of metabolic processes in it, as well as various mechanisms of regulation and features of animal life, the formation of a theoretical basis for the subsequent study of special disciplines.	5	MC5, LO6
27	Cytology	The course «Cytology» introduces students to the main microscopic structures at the tissue, cellular and subcellular levels, their structure, functions and development, cells of animals, plants, fungi and microorganisms and single-celled organisms. Instills skills in working with magnifying equipment and microscopic objects.	5	MC5, LO6
28	Plant genetics	The discipline studies the heredity and variability of agricultural plants. The purpose and objectives of plant genetics, objects and methods of research. Cytological bases of heredity. The plant cell is the basic structural and	5	MC5, LO6

		functional unit. Methods of plant cell division. Mitosis, meiosis. Classification of mutation. Induced mutagenesis. Practical significance of mutational variability. In the implementation of research, the application of the laws of heredity and methods of hybridological analysis in experimental work in agronomic branches of science.		
29	Molecular biology	The course forms ideas about the theoretical foundations and basic methods of molecular biology. Molecular biology studies the structure and properties of nucleic acids with proteins, matrix (normal) synthesis, the structure and functioning of genetic material, the molecular basis of the structure and functioning of cells and their organelles, the phenomena of growth, development, division and cell death. The main purpose of the course is to understand the logic of the chemical process occurring in a living cell, to explain their regulation and protein synthesis in the cell.	5	MC5, LO6
30	Plant growing	The discipline "Plant growing" combines agriculture, horticulture, grassland, forestry, and as a subject - field crops, cereals, legumes, root crops, fodder production, melon growing and spinning crops. He studies the technology of cultivation of the above crops, as well as the influence of agricultural practices on the yield and quality of plants.	5	MC5, LO7
31	Plant breeding	The course «Plant Breeding» introduces students to the basics of breeding new varieties and hybrids of plants. Studies the methods of creating the source material (hybridization, mutagenesis, etc.), variability and heredity, selection of the best samples for obtaining new lines and their evaluation. The variety is one of the main tools of agricultural production that contributes to increasing productivity and improving the quality of products.	5	MC5, LO7
32	Fundamentals of Programming	The course "Fundamentals of Programming" gives students knowledge in the field of programming modern computer technology and for solving practical problems of data processing, knowledge of basic algorithms and basic programming languages for solving practical problems, modeling various tasks of bioinformatics in the field of their professional duties.	5	MC6, LO9
33	Genome editing	The course «Genome Editing» introduces students to the basics of DNA editing and the analysis of the results obtained. Skills will be instilled in the use of technologies for editing the genome of microorganisms, plants and animals, the use of computer modeling in scientific research, the identification of various events leading to changes in the genome.	5	MC7, LO10
34	General Bioengineering	The course «General Bioengineering» introduces students to modern achievements of bioengineering and biotechnology. Scientific knowledge will be given on the use of the achievements of fundamental sciences to solve bioengineering and biotechnological problems in practice. Skills will be instilled to discuss and solve numerous tasks that arise as a result of professional activity.	5	MC7, LO10
Core subjects cycle / Optional component				
35	Introduction to Bioinformatics	The course «Introduction to Bioinformatics» introduces students to the current state of bioinformatics and computational and mathematical methods and approaches to solving them. The review of information, mathematical, and statistical technologies in genomics and proteomics, as well as the study of computational	5	MC7, LO10

		biology and dynamics of entire systems of organisms is carried out.		
36	Introduction to algorithms	The course «Introduction to Algorithms» introduces students to the basics of algorithmization of problems, classification of programming languages, data types and classification of operators of the R and Python languages, script development using standard modules. The objectives of the discipline are to study the basic principles of the development and analysis of algorithms and data structures using OOP.	5	MC7, LO10
37	Mathematics for Computer Science	Mathematics for Computer Science covers the basic concepts of discrete mathematics, logic, graph theory, and algorithms. In this discipline, students study the mathematical methods and data structures needed to design and analyze algorithms, computer networks, cryptography, and other areas of computer science. Key topics include logical expressions, sets, functions, algebraic structures, combinatorics and probability theory.	5	MC4, LO8
38	Linear algebra	Linear algebra is a branch of mathematics that studies vector spaces, linear mappings, systems of linear equations and their solutions. As part of this discipline, students study operations with vectors and matrices, such as multiplication, addition, finding the determinant and inverse matrix. Linear algebra plays an important role in various fields, including physics, engineering, computer graphics, and economics.	5	MC4, LO8
39	Discrete Mathematics	Discrete mathematics deals with the study of mathematical structures and objects that are discrete rather than continuous in nature. This discipline includes topics such as combinatorics (permutations, combinations), graph theory (vertices and edges), logic (mathematical statements and their properties), set theory and logical algebra. Discrete mathematics is the basis for a number of fields, including computer science, cryptography, probability theory, and others.	5	MC4, LO8
40	Mathematical analysis	Mathematical analysis is a branch of mathematics that studies limits, derivatives, integrals, and series of functions. It is used to analyze and understand changes and trends in various mathematical models.	5	MC4, LO8
41	Introduction to Algorithms	The course «Introduction to Algorithms» introduces students to the basics of algorithmization of problems, classification of programming languages, data types and classification of operators of the R and Python languages, script development using standard modules. The objectives of the discipline are to study the basic principles of the development and analysis of algorithms and data structures using OOP.	5	MC6, LO8
42	3D modeling	3D modeling is the process of creating three-dimensional digital models of objects using specialized software. These models can be utilized in various fields such as gaming industry, architecture, medicine, design, and engineering.	5	MC6, LO9
43	Fundamentals of DevOps	DevOps fundamentals refer to the methodology of combining software development (Dev) and operational activities (Ops) to improve the speed and quality of software delivery. It involves automating deployment processes, testing, monitoring, and infrastructure management, as well as fostering strong collaboration and cooperation between developers and operational teams.	5	MC6, LO9
44	Data collection and	Data collection and analysis involve gathering	5	MC6,

	analysis	information from various sources and subsequently analyzing the collected data to identify patterns, trends, or insights. This process may involve the use of specialized tools and methods such as databases, statistical analysis, machine learning, and data visualization tools.		LO9
45	Introduction to Genomics and Proteomics	The discipline "Introduction to Genomics and Proteomics" is intended to teach students the basic principles of genomics and proteomics. In this course, students study the structure and function of genomes and proteomes, methods for studying them, and their applications in medicine, biotechnology, and other fields. The course includes topics such as DNA sequencing, gene expression analysis, protein structure and function, and bioinformatics.	5	MC7, LO6, LO10
46	Molecular Fundamentals of Genetics	The discipline "Molecular Fundamentals of Genetics" provides students with an understanding of the basic molecular mechanisms underlying heredity and the transmission of genetic information from one generation to another. This includes the study of the structure of DNA, RNA and proteins, mechanisms of replication, transcription and translation, mutations, regulation of gene expression, and methods of genetic analysis and engineering.	5	MC7, LO6, LO10
47	Applied Bioinformatics	The course «Applied Bioinformatics» introduces students to the basics of bioinformatics, the possibilities of applying bioinformatics methods to solving theoretical and applied problems of molecular genetics and biology in general using mathematical and digital technologies. The skills of working with protein data banks and protein structures using bibliographic databases and bioinformatic programs are instilled.	5	MC7, LO10
48	Algorithms in bioinformatics	The course «Algorithms in Bioinformatics» introduces students to the types of information problems that arise in the process of analyzing bioinformatic data and with methods and algorithms for their application in molecular biology, including algorithms for sequence alignment, motif selection, gene recombination, search for specific gene sites, analysis of gene expression, selection of genetic patterns.	5	MC7, LO10
Major subjects cycle / University component				
49	Bioinformatic databases	The discipline "Bioinformation Databases" studies the creation, maintenance and use of specialized information resources containing data on biological molecules and processes. This discipline studies methods for storing, organizing, accessing, and analyzing biological data for bioinformatics research and development.	6	MC7, LO10
50	Practical bioinformatics: analysis of protein sequences	The course «Practical bioinformatics: analysis of protein sequences» introduces students to the basics of the organization and functioning of living systems. Algorithmic and computational methods of bioinformatics, (analysis and prediction of the structure and properties of proteins). The study and use of special computer programs for the analysis of the spatial structures of protein molecules.	5	MC7, LO10
51	Practical bioinformatics: analysis of NC sequences	The course «Practical bioinformatics: analysis of NC sequences» introduces students to the basics of NC sequence analysis. The study and use of special computer programs for the analysis of genomic databases and their comparison with experimental data. The study of various genetic variants and genetic variability.	5	MC7, LO10
Major subjects cycle/ Optional component				

52	Database Management Systems 1	The course «Database Management Systems» introduces students to the basics of using DBMS (a set of software and linguistic tools for general or special purposes that provide management of the creation and use of databases) to bookmark, store and extract data into various databases and algorithms for working with databases.	5	MC6, LO9
53	Mobile Application Development 1	Mobile app development is the process of creating software for mobile devices such as smartphones and tablets. It involves designing the user interface, programming the functionality of the app, testing, and optimizing for various platforms like iOS and Android.	5	MC7, LO10
54	Probability and Mathematical Statistics	The course "Probability Theory and Mathematical Statistics" introduces students to the basic concepts and methods of probability theory. Introduces the tasks of the mat. statistics, forms students' probabilistic thinking, and skills in building statistical and probabilistic models.	5	MC6, LO9
55	Web front	A web interface is a part of a web application or website through which users interact with content and functionality via a browser. It includes design elements, buttons, input fields, and other components to provide ease of use.	5	MC6, LO9
56	Python for data analysis	The "Python for data analysis" course introduces students to the use of the Python language for use in applied bioinformatics problems. Python (in Russian there are the names python or python), a high-level general-purpose programming language with dynamic strong typing and automatic memory management, focused on increasing developer productivity, code readability and quality, as well as ensuring the portability of programs written in it. The language is completely object oriented.	5	MC6, LO9
57	R for data analysis	The "R for data analysis" course introduces students to the use of the R language for use in applied bioinformatics problems. R is a programming language for statistical processing of data and working with graphics, as well as a free open source computing environment within the framework of the GNU project. It is widely used as statistical software for data analysis and has become the de facto standard for statistical software.	5	MC6, LO9
58	Methods of genome analysis	The course "Methods of genome analysis» introduces students to the methods of analyzing the genomes of various organisms, determining the type and order of experimental research depending on the type of organism, conducting laboratory experiments and information analysis of experimental data, formulating conclusions and summarizing the results.	6	MC7, LO10
59	Methods for analyzing the structure of proteins	The course «Methods of protein structure analysis» introduces students to the basics of structural biology and methods of studying the spatial three-dimensional structure of proteins, molecular modeling, prediction of the structure of proteins by their amino acid sequence. Instills practical skills in the processing of experimental data and their analysis.	6	MC7, LO10

Appendix 1

Practice base

№	Name of companies, enterprises, organizations	Contacts Tel, e-mail
1	Kazakh Research Institute of Agriculture and Crop Production LLP»	kazniizr@mail.ru, +7 72771 53130, +7 7273883925
2	Kazakh Research Institute of Animal Husbandry and Feed Production, LLP»	givotnovodstvo@mail.ru, +77273036333.
3	Kazakh Scientific Research Institute of Rice Growing named after I. Zhakhayev, LLP»	Kz_ris@mail.ru,+7724223-05-63
4	East Kazakhstan Agricultural Experimental Station LLP»	Vkniish@mail.ru, +7723229-68-59
5	South-West Research Institute of Animal Husbandry and Crop Production, LLP»	+7 (725) 240-83-97
6	Karaganda Scientific Research Institute of Crop Production and Breeding, LLP.	10092003@bk.ru, 87213851555

Рецензия

на образовательную программу высшего образования по направлению подготовки
«6В05104 - Биоинформатика»

Образовательная программа (ОП) по специальности «6В05104 - Биоинформатика», представленная на рецензирование, была разработана кафедрой «Агрономии, селекции и биотехнологии» на основании Положения о бакалавриате КазНАИУ и ключевых документов, включая Закон РК «Об образовании», Закон РК «О науке» и ГОСО, утвержденный приказом МОН РК от 31 октября 2018 года № 604.

Целью ОП «6В05104 - Биоинформатика», соответствующей 6 уровню квалификационной рамки НРК, является подготовка бакалавров-биоинформатиков, обладающих навыками применения информационных технологий в биологических науках. Это включает аннотацию геномных последовательностей, анализ геномов, оценку биоразнообразия и основы вычислительной биологии. Программа нацелена на методологическую, образовательную и исследовательскую подготовку специалистов для научно-педагогической деятельности.

Эта образовательная программа имеет прикладной характер, ориентированный на удовлетворение потребностей неакадемического сектора в специалистах с фундаментальной образовательной подготовкой для производственной и исследовательской деятельности.

В ОП представлена характеристика вида деятельности и сопровождающие документы: нормативные документы, база разработки ОП бакалавриата, общая характеристика бакалаврской программы, область профессиональной деятельности, сфера и объект профессиональной деятельности, функции профессиональной деятельности, виды профессиональной деятельности и другие. Перечень профессиональных компетенций предполагает высокий уровень знаний в изучаемой области. Определены общие и специальные компетенции, приобретаемые в процессе обучения.

ОП имеет модульную структуру, включающую 7 модулей, из которых два, а именно Модуль 6 «Информатика и программирование» и Модуль 7 «Биологические аспекты биоинформатики», сосредоточены на профессиональной подготовке биоинформатиков.

Качество содержания данной программы не вызывает сомнений. Включенные в ОП дисциплины полностью отражают суть современной биоинформатики, науки на стыке биологии и информатики. Выпускник, освоивший программу бакалавриата, готов решать профессиональные задачи в научно-исследовательской, производственной, научно-технической, инженерной и других областях деятельности.

Учитывая изложенное, считаю, что ОП по специальности «6В06104 - Биоинформатика» кафедры «Агрономии, селекции и биотехнологии», реализуемая в КазНАИУ, полностью соответствует требованиям государственного образовательного стандарта и другим нормативным требованиям.

Рецензент,
Председатель правления КазНИИПО
д.с.-х.н., профессор, академик НАН РК   Айтбаев Т.Е.

Рецензия

на образовательную программу «6В05104 - Биоинформатика»

Образовательная программа (ОП) по специальности «6В05104 - Биоинформатика» соответствует требованиям государственного образовательного стандарта высшего образования и полностью удовлетворяет квалификационным характеристикам должностей специалистов в сфере педагогической деятельности.

Представленный комплект документов включает характеристику профессиональной деятельности выпускника, формируемые компетенции, регламентирующие содержание и организацию образовательного процесса документы, а также ресурсное обеспечение ОП (учебно-методическое, материально-техническое и информационное). В разработке и реализации ОП принимали участие работодатели.

Изучив материалы, эксперт сделал следующие выводы. В связи с потребностями республиканского рынка труда и научно-исследовательских ресурсов, НАО «КазНАИУ» определил профильную направленность подготовки студентов.

Выпускник, освоивший программу бакалавриата, готов решать профессиональные задачи, такие как:

Научно-исследовательская деятельность:

- Изучение научно-технической информации, выполнение литературного и патентного поиска.
- Применение современных подходов биоинженерии и биотехнологии для решения научных проблем.
- Анализ информации по агробиологическим объектам.
- Конструирование модифицированных или новых биологических объектов.
- Использование методов биотехнологии и биоинженерии в молекулярной диагностике и генетических исследованиях.
- Внедрение результатов исследований и разработок.
- Подготовка отчетов, обзоров и научных публикаций.
- Участие в мероприятиях по защите интеллектуальной собственности.

Организационно-управленческая деятельность:

- Организация работы коллективов исполнителей.
- Составление технической документации при использовании биоинженерных объектов.
- Сбор и подготовка данных для обоснования научно-технических решений.
- Подготовка документации и реализация системы менеджмента качества.
- Подготовка к сертиф12 птикации технических средств и оборудования.
- Предупреждение производственного травматизма и экологических нарушений.

Производственно-технологическая деятельность:

- Управление биотехнологическими процессами с использованием биоинженерных объектов.
- Организация рабочих мест и технологического оборудования для обеспечения охраны труда.
- Контроль качества сырья и биоинженерных объектов.
- Контроль качества и безопасности выпускаемой продукции.

Объектами профессиональной деятельности выпускников являются разнообразные биологические объекты, включая измененные природные и искусственные организмы, а также базы данных, описывающие структуру и свойства биологических объектов.

Анализ документов ОП (рабочие программы дисциплин, практик, фонды оценочных средств, критерии оценок, программа итоговой аттестации, требования к выпускной квалификационной работе) подтверждает, что у выпускника будут сформированы необходимые компетенции.

Сотрудничество с работодателями способствует улучшению содержания дипломных работ, что повышает профессионализм и конкурентоспособность выпускников. Итоговая аттестация соответствует требованиям государственного образовательного стандарта, а привлечение работодателей в качестве экспертов на защите дипломной работы увеличивает конкурентоспособность выпускников.

На основании проведенной экспертизы можно сделать вывод, что ОП по специальности «6В05104 - Биоинформатика» полностью соответствует требованиям государственного образовательного стандарта и современным требованиям рынка труда, что позволит выпускникам успешно реализовать свои компетенции в профессиональной деятельности.

Генеральный директор
РГП «Институт биологии и
биотехнологии растений» КН МНВО РК   К.Ж. Жамбакин

АГРОБИОЛОГИЯ ФАКУЛЬТЕТІ
АГРОНОМИЯ, СЕЛЕКЦИЯ ЖӘНЕ БИОТЕХНОЛОГИЯ КАФЕДРАСЫ

№ 6 ХАТТАМАСЫНАН КӨШІРМЕ

Алматы қаласы   16 қаңтар 2024 жыл

Агрономия, селекция және биотехнология кафедра мәжілісінің отырысы

Төрағасы - Е. Жанбырбаев
Хатшы - Қ. Құланбай
Қатысқандар: 20 адам

КҮН ТӘРТІБІ:

1. 2024-2028 оқу жылына арналған 6В05103-«Биоинженерия», 6В05104–«Биоинформатика», 2024-2026 оқу жылына 7М08112-«Ауылшаруашылығы дақылдарының селекциясы және тұқым шаруашылығы», 2024-2027 оқу жылына 8D08113 – «Өсімдіктер селекциясы» білім беру бағдарламаларын талқылау, бекіту

ТЫҢДАЛДЫ:

Кафедраның меңгерушісі Е.А. Жанбырбаев жаңа талаптарға сәйкес етіп жасалған 2024-2028 оқу жылына арналған 6В05103-«Биоинженерия», 6В05104–«Биоинформатика», 2024-2026 оқу жылына 7М08112-«Ауылшаруашылығы дақылдарының селекциясы және тұқым шаруашылығы», 2024-2027 оқу жылына 8D08113 – «Өсімдіктер селекциясы» білім беру бағдарламаларын талқылауды ұсынды.

СӨЗ СӨЙЛЕГЕНДЕР:

Оқу-әдістемелік жұмыстарға жауапты кафедра меңгерушісінің орынбасары қауымдастырылған профессор Г. Баядилова: 2024-2028 оқу жылына арналған білім беру бағдарламалары кафедрада барлық деңгей бойынша жауапты комитетшісі Г. Байсеитованың профессорлық-оқытушылар құрамымен, жұмыс беруші мекемелерімен бірігіп, қаралып келісілгенін мәлімдеді. Қарастырылып отырған ББ барлық деңгейдегі білім алушылардың қазіргі заман талабына сай академиялық дәрежесінде білім беруге бағытталған пәндер енгізілген. Барлық деңгей бойынша оқу нәтижелері дискрипторларды қолдана отырып өзгертілді және жаңа оқу бағдарламасына сай кейбір пәндер өзгертілді.

Кафедраның меңгерушісі Е. Жанбырбаев 2024-2028 оқу жылына арналған 6В05103-«Биоинженерия», 6В05104–«Биоинформатика», 2024-2026 оқу жылына 7М08112-«Ауылшаруашылығы дақылдарының селекциясы және тұқым шаруашылығы», 2024-2027 оқу жылына 8D08113 – «Өсімдіктер селекциясы» білім беру бағдарламаларын барлық деңгейіндегі білім алушыларды сапалы дайындауға бағытталғаны туралы атап өтті.

Білім беру бағдарламасын талқылау барысында кафедраның профессорлық-оқытушылар құрамының және жұмыс берушілердің ұсыныстары ескерілді, барлық ұсыныстар ескеріле отырып, қорытынды жасалынды.

ҚАУЛЫ ЕТТІ:

2024-2028 оқу жылына арналған 6В05103-«Биоинженерия», 6В05104–«Биоинформатика», 2024-2026 оқу жылына 7М08112-«Ауылшаруашылығы дақылдарының селекциясы және тұқым шаруашылығы», 2024-2027 оқу жылына 8D08113 – «Өсімдіктер селекциясы» білім беру бағдарламалары «Агробиология» факультетінің Академиялық комитетіне жіберілсін.

Төрағасы: Е. Жанбырбаев
Хатшы: Қ. Құланбай

Ү ҚазҰАЗУ 403-02-21. Хаттама. Сегізінші басылым

Коммерциялық емес акционерлік қоғамы
«Агробиология» факультетінің
Академиялық комитеті мәжілісінің

№ 6 ХАТТАМАСЫНАН КӨШІРМЕ

Алматы қаласы   30 қаңтар 2024 жыл

ҚАТЫСҚАНДАР:
Төрайымы - Г. Баядилова
Хатшы - А. Ешенгалиева
Қатысқандар: 9 адам
Е. Жанбырбаев, М. Есеналиева, Ж. Бакенова, К. Караева, Г. Байсеитова, Э. Куандыкова, Г. Байсеитова

КҮН ТӘРТІБІ:

1. «Агробиология» факультетінің 2024-2028 оқу жылына арналған білім беру бағдарламаларын талқылау, бекіту

ТЫҢДАЛДЫ:

Факультеттің Академиялық комитетінің төрайымы Г. Баядилова және Академиялық комитеттің мүшелері, 2024-2028 оқу жылына арналған 6В05103-«Биоинженерия», 6В05104–«Биоинформатика», 2024-2026 оқу жылы 7М08112-«Ауылшаруашылығы дақылдарының селекциясы және тұқым шаруашылығы», 2024-2027 оқу жылына арналған 8D08113 – «Өсімдіктер селекциясы» білім беру бағдарламаларын талқылау.

СӨЗ СӨЙЛЕГЕНДЕР:

Факультеттің Академиялық комитетінің төрайымы Г. Баядилова, сөз кезегін Академиялық комитеті отырысының мүшесі Г. Байсеитоваға берді.

Академиялық комитет мүшесі Г. Байсеитова өз сөзінде 2024-2028 оқу жылына арналған 6В05103-«Биоинженерия», 6В05104–«Биоинформатика», 2024-2026 оқу жылына 7М08112-«Ауылшаруашылығы дақылдарының селекциясы және тұқым шаруашылығы», 2024-2027 оқу жылына арналған 8D08113 – «Өсімдіктер селекциясы» БББ кафедрада қаралып, жұмыс берушілермен бірігіп дайындалғаны туралы атап өтті. БББ қазіргі заман талабына сай академиялық дәрежесінде білім беруге бағытталған пәндермен толықтырылған.

Білім беру бағдарламасына МЖМББС сай ЖБП міндетті пәндер компоненттеріне өзгерістер жасалынып, БП, КП циклінің таңдау пәндеріне заман талабына байланысты толықтырулар жасалынды. Жаңа оқу бағдарламасына сай кейбір пәндер жаңартылды. Аталған оқу бағдарламалары жұмыс берушілермен келісілген.

Қорыта келгенде жоғарыда аталған білім беру бағдарламалары білім алушыларды сапалы дайындауға бағытталған. Білім беру бағдарламаларын жан-жақты қаралып енгізілген және кафедра отырысында қорытындыланған.

ҚАУЛЫ ЕТТІ:

2024-2028 оқу жылына арналған 6В05103-«Биоинженерия», 6В05104–«Биоинформатика», 2024-2026 оқу жылына 7М08112-«Ауылшаруашылығы дақылдарының селекциясы және тұқым шаруашылығы», 2024-2027 оқу жылына арналған 8D08113 – «Өсімдіктер селекциясы» білім беру бағдарламалары факультеттің Академиялық комитеті комиссиясының ұйғарымымен бір ауыздан бекітілсін.

Дайындалған білім беру бағдарламасы Университтеттің оқу-әдістемелік Кеңесінде қарастыру үшін «Агробиология» факультетінің Кеңесіне жіберілсін.

Төрайымы: Г. Баядилова
Хатшы: А. Ешенгалиева