

Ministry of Agriculture of the Republic of Kazakhstan  
S.Seifullin Kazakh Agrotechnical University

Considered  
at the meeting of the Academic  
Council of the University  
Protocol no.\_\_\_\_  
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APPROVED  
Chairman of the Management Board  
non-profit joint stock company "  
S.Seifullin Kazakh Agrotechnical  
University "

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« \_\_\_\_\_ » \_\_\_\_\_ 2022 г.

**EDUCATIONAL PROGRAM**  
**"ADVANCED AGRONOMIC SCIENCE"**

Code and classification of the field of education: 6B08 Agriculture and  
bioresources

Code and classification of training areas: 6B081 Crop production

Code in the International Standard Classification of Education: 0812

Degree awarded: Bachelor of Agriculture in the educational program  
"Advanced Agronomic Science"

Duration of study: 4 years

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The educational program 6B08105 - "Advanced agronomic science" was considered at the meeting of the Department "Agriculture and Plant Growing" Protocol No. 1 of August 26, 2022, approved by the Council of the Faculty of Agronomy Protocol No. 1 of August 27, 2022.

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## **1 Passport of the educational program**

### **1.1 .Goal of the educational program**

The goal of the educational program is to prepare bachelors in the direction of "Agronomy" with in-depth study of fundamental disciplines (biology, chemistry, mathematics, physics, IT), for the development of professional competencies of the scientific direction, as well as for continuing studies in master's degree programs of world universities.

### **1.2 Objectives of the educational program:**

- implementation of fundamental education aimed at training highly qualified personnel in the professional field;
- introduction of innovative technologies in the education and training of competitive specialists in the field of Agronomy;
- the use of modern educational technologies, techniques, approaches and innovative methods in teaching disciplines;
- training of competent specialists with in-depth theoretical knowledge and practical skills for admission to the magistracy of world-class universities;
- formation of universal and socio-personal values of the graduate, as well as environmental, physical, ethical, legal culture, culture of thinking;
- education in the spirit of patriotism, friendship of the peoples of the Republic of Kazakhstan, respect for different cultures, traditions and customs;
- prepare the graduate for professional activity, mobility, continuous professional and moral improvement and growth throughout life;
- formation of graduates' competitiveness in the labor market to ensure the possibility of the fastest possible employment in the specialty.

### **1.3. Learning results**

**PO1** – Apply a foreign language in professional-oriented speech communication situations, study information from foreign sources in the original language. To write, describe, compare, discuss, explain thoughts, facts and opinions orally and in writing in the field of agronomy.

**PO2** – Apply economic and legal knowledge in the field of agriculture; Navigate in the branches of Kazakh law for state regulation of the economy and agricultural business. Analyze the economic state of industries, predict the prospects for the development of economic entities in the conditions of the domestic and world market, identify key elements and assess its impact on the organization, organizational structure. To determine the economic efficiency of the use of technological methods of production and processing of agricultural products. Evaluate and integrate the basic theories of motivation, leadership and power to solve strategic and operational management tasks, understand the importance of the principles and culture of academic integrity and anti-corruption culture;

**PO3** – Formulate an idea of the problems of sustainable development associated with anthropogenic and technogenic impacts. To evaluate the role of the

"human" factor in the work of increased danger, to analyze information about the state of the environment and working conditions in the workplace, to analyze phenomena and events of a natural, man-made and social nature, to choose solutions to the problem of ensuring optimal working conditions, industrial safety and life in emergencies, to integrate the results of scientific research in the field of occupational safety and security life activities;

**PO4** – Apply methods, technologies, methods of obtaining, storing and processing information. Classify basic information processing algorithms, develop programs and use application software packages in agronomy, apply modern information technologies in the production of crop products. To present and analyze basic information for solving specific tasks in crop production;

**PO5** – To approve the basic properties of the most important chemical and bioactive substances, to explain the equations of reactions, physico-chemical methods of analysis. Apply the properties of chemicals in the production of crop products, evaluate the equivalents of substances for the preparation of solutions of various concentrations. Plan and carry out an experiment on the use of chemicals in agronomy using methodological guidelines and literary sources;

**PO6** – Apply the basic laws and principles of physics, research methods for analyzing the results of the experiment and modeling the situation. Understand electrical, magnetic and optical phenomena in the production of crop products. To demonstrate the ability to work with measuring instruments and with application software packages, to solve applied problems with further generalization of the results obtained in crop production;

**PO7** – Solve mathematical problems and models, find the most acceptable solution methods for mathematical thinking and logic. Calculate and apply mathematical, statistical, informational and graphical methods of data analysis to study various processes in the production of crop products and management of agricultural technologies with further generalization of the results obtained;

**PO8** – Describe and distinguish the structure and diversity of plant forms, plant life processes, identify wild plants and agricultural crops of the region and their optimal placement taking into account land and soil-climatic resources. Classify the organization of hereditary material at the gene, chromosomal and genomic levels, interpret the molecular genetic and cellular levels of the organization of plant life;

**PO9** – Analyze agrometeorological information in crop production technology. Describe the main types and varieties of soils, assess the levels of its fertility, set doses and methods of applying organic and mineral fertilizers for the planned crop yield. To assess the phytosanitary condition of crops, to analyze the technologies of phytosanitary optimization of agroecosystems by phases of vegetation. Apply a system of agrotechnical measures to increase soil fertility, build crop rotations, tillage systems for crops taking into account soil and climatic conditions, develop modern technologies for cultivating field crops;

**PO10** – Interpret the main breeding and seed-growing processes, phenomena and patterns, demonstrate knowledge about seeds. Use modern laboratory equipment to perform qualitative and quantitative analysis of the characteristics

and properties of various crops. Generalize and combine knowledge about the creation of models, varieties and hybrids. Evaluate breeding materials with a set of useful traits based on knowledge of phenotypic, biochemical and molecular genetic techniques. Plan and organize the propagation of seeds of varieties of agricultural crops. Conduct field experiments and use scientific research methods.

## **1 General characteristics of the educational program**

The educational program 6B08105 "Advanced Agronomic Science" was developed to implement a cooperation agreement with AgroParisTech University aimed at improving the quality of educational services in the field of agriculture. The new educational program will allow you to gain in-depth knowledge in the academic environment with the possibility of applying them while continuing the postgraduate education program at domestic and world universities.

A feature of the implemented program is to provide training of specialists with in-depth fundamental knowledge, which is the basis of professional competencies in accordance with the requirements of employers in the field of agriculture and related industries in the direction of Agronomy.

A distinctive feature of the educational program: joint educational program with Agro Paris Tech - Paris Institute of Technology of Life Sciences, Food and Environment (France).

The uniqueness of the new educational program is the strengthening of basic knowledge using an interdisciplinary approach for the development of professional disciplines in the field of training.

The educational program "6B08105 Advanced Agronomic Science" was developed in accordance with the classifier of training areas with higher and postgraduate education (Approved by the Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 569 dated October 13, 2018) and agreed with the Dublin descriptors and the European Qualifications Framework.

The educational program is focused on the training of specialists and scientific and pedagogical personnel, and the transfer of scientific results to the relevant sector of the economy on the basis of scientific achievements, both the results of their own research and world science.

The educational program is developed on the basis of a modular system for studying disciplines and consists of 12 modules. The total volume of theoretical undergraduate education is 242 credits, including the cycle of general education disciplines includes 56 credits, the cycle of basic disciplines - 121 credits, the cycle of profile disciplines - 53 credits and the final certification is 12 academic credits.

## **3 Competence model (portrait) of the graduate**

### **3.1 Areas of professional activity**

Graduates who have mastered the educational program "Advanced agronomic science" can work in research institutions in the field of agriculture; secondary specialized educational institutions, regardless of the forms of ownership in the field of training, institutions for variety testing of agricultural crops; institutions of agrochemical service, quarantine services; plant protection stations.

### **3.2 Types of professional activity**

Bachelors of the educational program "Advanced Agronomic Science" can perform the following types of professional activities:

- experimental research;
- organizational and managerial;
- production and technological;
- - educational pedagogical activity in secondary vocational educational institutions in the field of crop production.

### **3.3 General education competencies**

To know the prerequisites for the formation of the statehood of modern Kazakhstan; general principles of being and cognition, human and world relations, patterns of formation of the personality of a specialist with higher professional education, patterns of the emergence of political phenomena (institutions, relations, processes), ways and forms of their functioning, methods of managing political processes, consciousness, the structure of society, norms and values, ways and the peculiarities of the functioning of the elements of society, the peculiarities of the processes of individuals and their role in the development of society; language and speech means, vocabulary, forms and types of speech/communication of the state, Russian and foreign languages; types of information and communication technologies; automation of information activities and their purpose, methods of measuring the amount of information; purpose and types of information models, purpose and functions of operating systems

Must show the ability to argue their own assessment of everything that is happening in the social and industrial spheres on the basis of ideological positions; make a choice of methodology and analysis in the field of such activities; assess situations in various areas of interpersonal, social and professional communication; operate with social, business, cultural, legal and ethical norms of Kazakh society; use various types of personal activities information and communication technologies; to build a personal educational trajectory throughout life for self-development and career growth.

Possess the skills of: practical application of knowledge in the field of social, social and humanitarian sciences; communication in oral and written forms in Kazakh, Russian and foreign languages, solving problems of interpersonal, intercultural and professional communication.

### **3.4 Basic competencies**

**To know and understand:** To possess communication skills in a foreign language, to understand, express, interpret concepts, thoughts, feelings, facts and

opinions orally and in writing in the appropriate range of social and cultural contexts, terminology in agronomy, obtaining professional content information from foreign sources, to master the stylistic features of the vocabulary of a foreign language in the field of professional communication and be competent: in the use of a foreign language in professional-oriented speech communication situations, in a professional foreign language environment with awareness of the need to use appropriate speech patterns and tactics of speech professional behavior. Possess knowledge of economic and legal knowledge in the field of agriculture, the specifics of the functioning of agricultural production, the forms and consequences of state regulation in the agri-food sector, and the peculiarities of agribusiness, navigate the branches of Kazakh law, the goals and methods of state regulation of the economy. Analyze the state of industries, predict the prospects for the development of economic entities in the conditions of the domestic and world market, the external and internal environment of the organization, identify its key elements and assess its impact on the organization, organizational structure and be able to develop proposals for its improvement. Demonstrate knowledge on determining the economic efficiency of the use of technological techniques for the production and processing of agricultural products. Master the skills of using the basic theories of motivation, leadership and power to solve strategic and operational management tasks.

**To show skills:** to form professional ideas with critical reasoning; to coordinate professional activities at the assigned site with the activities of other sites; to assess the prospects for the development of the economy in market conditions.

**Possess skills:** Use basic methods, methods and means of obtaining, storing, processing information, information and communication technologies. Apply basic information processing algorithms to solving applied problems, develop programs in a programming language using basic control structures and standard data types, use application software packages. Be able to use theoretical knowledge in practice, use a system of knowledge about information technologies to solve specific problems in crop production, present and analyze basic information with the help of basic programs used in agricultural institutions.

### **3.5 Professional competencies**

**know and understand:** To form knowledge that allows solving a set of professional tasks taking into account the socio-ethnic norms accepted in society, to form knowledge of general physics, the basics of thermodynamics and electromagnetism, biophysics, to formulate basic concepts of basic knowledge, to solve physical problems in professional activity, to perform a physical experiment, to identify, compare, draw conclusions, formulate their own arguments in applied tasks of the future profession, work with modern information technologies, have the skills to calculate and process the received data, to use philosophical knowledge to form ideological positions, to strive for knowledge, pragmatism, competitiveness, which is the fundamental principle of the development of society in the conditions of modern reality. Memorize and reproduce the information



received, the main breeding terms, specific facts, list patterns in plant breeding and genetics. The ability to present the material in your own words. To know and understand the rules and principles in plant breeding and genetics, can explain facts, patterns and phenomena and interpret graphs and diagrams. Be able to solve practical problems using new methods, formulas and laws. Highlight the principles of data construction and can highlight the most effective research methods. The ability to generalize and combine their knowledge. Creation of new models, varieties and hybrids, identify problems and suggestions for their solution. Evaluate claims using criteria, requirements, or research methods. Logical accuracy of conclusions and argumentation of one's point of view. To know the concept of the variety model, the sources of hereditary variability, their role for breeding.

**be able to:** be able to apply the basic rules and laws of physics in solving physical problems and situations, work with measuring instruments and with application software packages, develop the ability to self-organize and self-education. Use modern laboratory equipment to perform qualitative and quantitative analysis of the characteristics and properties of various crops. To create various backgrounds for the selection of breeding material with a set of useful features, to carry out an assessment based on knowledge of phenotypic, biochemical and molecular genetic methods of marker analysis. The ability to generalize and combine their knowledge in plant breeding and genetics.

**have skills:** in solving organizational and economic issues; distribute labor resources, give clear and effective instructions. To operate with basic information methods of processing experimental studies to increase the level of reliability of experimental results.

#### **4 The base of passing professional practices**

The educational program provides educational practice in the discipline "General biology of organisms" - 2 credits, production (in the disciplines of agriculture, crop production) - 8 credits and pre-graduate practice - 2 credits, which is a university component.

The passage of professional practice of students is planned mainly during the spring sowing campaign and harvesting of crops, on the campus of the S.Seifullin Kazakh Agrotechnical University, in the fields of large agricultural enterprises and farms and in experimental fields of research institutes of various regions of the republic.

Stationary fields of A.I.Barayev Scientific and Production Center of Grain Farming LLP, State Administration "Virgin Regional Inspection for variety Testing of agricultural enterprises" are used as bases of production practice. Kazakh Research Institute of Agriculture and Plant Growing, LLP "East Kazakhstan Research Institute of Agriculture", LLP "North Kazakhstan Research Institute of Agriculture", LLP "Kostanay Research Institute of Agriculture", LLP "Karabalyk agricultural experimental Station", LLP "Karaganda experimental station", LLP "Experimental farm of oilseeds", Agrobiological Center of the Kazakh Agrotechnical University named after S.Seifullin, large firms, large

agricultural enterprises and farms, including TNK Agrofirma LLP, Bayserke Agro LLP, Farmer 2002 LLP, Maksimovskoye LLP, Rodina LLP, Atameken Agro LLP, etc..

Methods of conducting professional practices: stationary, field, field-field.

For persons with disabilities, the choice of internship places is consistent with the requirement of their accessibility for these students and the state of health.<sup>5</sup>

### Structure of the educational program

№	Name of cycles and disciplines	Total labor		
		intensity in academic hours in academic credits	intensity in academic hours in academic credits	
1	The cycle of general education disciplines (OOD)	1680	56	
1.1.	is a mandatory component	1530	51	
	Kazakh (Russian) language	300	10	
	Foreign language	300	10	
	Political Science and Sociology	120	4	
	Cultural studies and psychology	120	4	
	Modern history of Kazakhstan	150	5	
	Philosophy	150	5	
	Physical Culture.	240	8	
1.2.	Information and communication technologies	150	5	
	University component	150	5	
1.3.	Occupational safety and the basics of life safety	150	5	
	Component of choice			
	Fundamentals of anti-corruption culture	150	5	
	Introduction to Leadership in Education	150	5	
2	Fundamentals of Economics and Law	150	5	
	Cycle of basic disciplines (BD)	5220	174	
	University component	1860	62	
	Data mining	240	8	
	Information technologies in crop production	90	3	
	Professionally-oriented foreign language	120	4	
	Inorganic and organic chemistry	120	4	
	Educational practice in the discipline "General biology of organisms"	60	2	
	2.1.	Fundamentals of physics	120	4
		Ecology and sustainable development	120	4
		Agrometeorology	150	5
		Analytical and physic colloidal chemistry	150	5
		Genetics, ontogenesis, phylogeny	150	5
Molecular and cellular biology		240	8	
Advanced Mathematics*		300	10	

	Component of choice	3360	112
	French	300	10
	English for special purposes	180	6
	Python language and data analysis	90	3
	Numerical methods	90	3
	Management in crop production	90	3
	Marketing in the agro-industrial complex	90	3
	Introduction to the specialty	60	2
	Fundamentals of land management	90	3
	Economics and organization of agricultural production	150	5
2.2.	Fundamentals of agribusiness and entrepreneurship	150	5
	Physiology and biochemistry of plants	150	5
	Fundamentals of Thermodynamics and Electromagnetism	150	5
	Programming of crop yields	150	5
	Plant compositions and floristics	150	5
	Applied Chemistry	150	5
	Accounting in agriculture	180	6
	General biology of organisms	210	7
	Biology of plant ontogenesis	210	7
	Culture of plant cells and tissues	210	7
	Biophysics	210	7
	Plant genetics	300	10
3	Cycle of profile disciplines (PD)	2880	96
	University component	990	33
	Agriculture	90	3
	Crop production	90	3
	Seed science	90	3
3.1.	Cellular technologies in crop production and breeding	90	3
	Soil science and agrochemistry	150	5
	Production practice	240	8
	Selection of agricultural crops	240	8
	Component of choice	1890	63
	Entomology and phytopathology	90	3
	Fundamentals of scientific research	90	3
	Herbology	90	3
	Seed production and varietal technology of agricultural crops	90	3
3.2.	Business statistics	90	3
	Protection of agricultural crops	90	3
	Probability and Application	120	4
	Statistical processing of experimental data	120	4
	Fundamentals of precision farming	120	4
	Methods of mathematical modeling	150	5
	Adaptive technologies in crop production	180	6

	Advanced Physics course	180	6
	Private breeding	240	8
	Advanced Chemistry course	240	8
4	Additional types of training (DVO)		
4.1.	Elective component (military training and other types of educational activities determined by the student independently)		
5	Final certification	360	12
5.1.	Writing and defending a thesis (project) or preparing and passing a comprehensive exam	360	12
	<b>Total</b>	<b>7200</b>	<b>240</b>















**Appendix 3. The interrelation of the achievability of the formed learning outcomes according to the educational program and academic disciplines (Matrix of the influence of disciplines on the formation of learning outcomes)**

№	Name of the discipline	Brief description of the discipline	Кол-во кредито в	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>Cycle of general education disciplines University component/Component of choice</b>																		
1	Introduction to Leadership in Education	Models of effective leader communication. Management methods in critical situations. Methods of work in the management team and the principles of distribution of roles in the team. Methods of effective control and motivation of learning. Theory of leadership qualities. Concepts of leadership behavior (three leadership styles (K.Levin), Ohio State University research, University of Michigan research, management systems (R. Likert), management grid (Blake and Mouton), the concept of reward and punishment, leadership substitutes (S.Kerr and J.Germier).	5		v													
	Occupational safety and the basics of life safety	Formation of students' knowledge and practical skills to create safe and harmless living conditions, to prevent the causes and conditions of dangerous situations, to protect the population and production personnel and national economy facilities from the possible consequences of emergencies. Features of labor protection of women and youth, supervision and control of the implementation of labor protection legislation and responsibility for violation of labor protection requirements.	5			v												
	Fundamentals of anti-corruption culture	Theoretical and methodological foundations of the concept of "corruption" Improvement of socio-economic relations of the Kazakh society as a condition for combating corruption Psychological features of the nature of corrupt behavior Formation of anti-corruption culture Features of the formation of anti-corruption culture of youth Ethnic features of the formation of anti-corruption culture Moral and ethical responsibility for acts of corruption in various fields. Legal liability for corruption offenses	5		v													
	Fundamentals of Economics and Law	The subject of economic theory and research methods. Fundamentals of social production and forms of social	5		v													

		economy. The mechanism of functioning of the market system. Production, costs and income of the company. National economy. Economic growth and instability of the market economy. Inflation and unemployment are manifestations of economic instability. Financial and monetary system in the national economy and economic security. Fundamentals of the theory of state and law. Fundamentals of constitutional, administrative, civil, labor, family, and criminal law.																
<b>Cycle of basic disciplines University component</b>																		
2	Analytical and physico-chemical chemistry	The course forms students' ideas about the theoretical foundations of analytical chemistry, its connection with other applied sciences and practical significance. Introduces the latest achievements in the field of analytical and physico-chemical chemistry, with modern methods of detection, separation and determination of chemicals. The discipline gives the student a holistic view of the analysis methods used for express and holistic assessment of the content of chemicals in environmental objects.	5					v										
	Inorganic and organic chemistry	Knows the basic laws of chemistry, the structure and properties of matter, patterns and features of chemical processes, thermodynamics, solutions, properties of elements; understands saturated and unsaturated aliphatic hydrocarbons, aromatic hydrocarbons, halogen-derived hydrocarbons, oxygen-, nitrogen-containing organic compounds: alcohols and esters, aldehydes and ketones, carboxylic acids; applies general concepts about oxo- and amino acids, amines and diazo compounds.	4					v										
	Genetics, ontogeny, phylogeny	Knows the field of genetic information and its meanings; understands the molecular nature and way of expressing genetic information, development, determinism of development with its genetic aspects; analyzes its crucial importance at the cellular level and its central role in heredity, the growth and development of the organism, from fertilization to adulthood, and to the end of life, the study of changes in genetic information ranging from the molecular nature of various mutations to the evolution of living organisms, including changes in the genome of individuals and populations; evaluates	5										v					

		population genetics models and speciation mechanisms.																
	Data mining	The discipline studies NumPy linear algebra functions, mathematical algorithms and SciPy functions for data processing and visualization, Matplotlib — a library for creating 2D graphs in Python, R and RStudio environments, data access operators, functions and arguments, loops and conditional operators, R DBMS, parameter, statistical calculations and graphs in R.	6				v											
	Advanced Mathematics*	The course covers all the necessary sections of mathematics: elements of mathematical logic and number theory, the theory of complex numbers, linear algebra for the finite-dimensional case; differential and integral calculus of functions of one variable, ordinary differential equations of the first and second order, numerical series, introduction to probability theory, as well as numerical solution of mathematical problems	10						v									
	Professionally-oriented foreign language	The course provides for the formation of students' ability to communicate in a foreign language in specific professional, business, scientific fields and situations, taking into account the peculiarities of professional thinking, when organizing motivational and motivational and research activities.	4	v														
	Introduction to the specialty	The course introduction to the specialty studies the basics of agronomy, the history and development of agronomy, soil fertility and yield, plant living conditions and methods of their regulation. To acquaint students with farming systems, crop rotation, weed control measures, tillage techniques and systems, features of the use of fertilizers to increase the yield and quality of crops, crop cultivation technology	4								v							
	Molecular and cellular biology	Knows the structures of molecules in living organisms before their functioning inside cells; understands the functioning of living organisms at the micro-level, using the concepts of chemistry and physics; applies the properties of membranes and their molecular organization in connection with the organization of cells; analyzes the laws of kinetics and thermodynamics with the main features of cellular bioenergetics; evaluates the problems of heredity and variability at the level of molecular organization the body.	8							v								
	Information technologies in crop production	The discipline is aimed at studying the role and tasks of information technologies in crop production, knowledge of the	3				v		v									

		main directions of agricultural informatization, the use of geoinformation technologies in crop production, the creation of databases for the production of crop products, the study of statistical and applied programs for agriculture.																
	Fundamentals of Physics	Knows the branch of physics that studies the motion of material bodies and the interaction between them, the basics of thermodynamics; understands the elements of mechanics of liquids and gases, mechanics of solid and elastic bodies, mechanical vibrations and waves; applies dynamic and kinematic methods of describing mechanical systems, conservation laws in mechanics, basic laws of hydrodynamics, laws of statistical physics; analyzes ideal gases, physics of real gas, atmospheric air	4					v										
	Python language and data analysis	The course is dedicated to an in-depth study of the Python data structure, introduces classical programming paradigms and examines the Numpy library for an approach to linear algebra and its algorithms; students use these in-depth studies to solve specific problems. An introduction to SQL queries and Web database applications completes the year.	3				v											
<b>Цикл базовых дисциплин</b> <b>Cycle of basic disciplines</b> <b>Компонент по выбору</b>																		
	Fundamentals of agribusiness and entrepreneurship	The course examines the concept, essence and economic content of agribusiness. Features of agricultural production. The content of agribusiness in the Republic of Kazakhstan. Features of agribusiness. The structure of agriculture and agribusiness. Natural-biological and socio-economic features of the formation of agribusiness and agricultural production. Prospects for the organization of small and medium-sized businesses in the agro-industrial complex.	5		v													
	Economics and organization of agricultural production	The purpose of the course is to form students' comprehensive understanding of the content of the economy and the organization of production. Course	5		v													

		objectives: Study of methods, rules and techniques of rational organization of the production process in space and time																
Marketing in the agro-industrial complex		The main provisions of the theory of marketing. The structure of agribusiness and features of marketing in the agro-industrial complex. Marketing management in the agro-industrial complex. Agromarketing technology. Informational agromarketing. Marketing strategy of the enterprise. Price marketing in agribusiness. Sales marketing in agribusiness. The effectiveness of marketing activities in agribusiness.	3		v													
English for special purposes		The discipline is aimed at studying general scientific terminology and terminology for the language of the relevant specialty in English, forms skills in four types of communicative activity: reading with a full understanding of authentic texts in the specialty, the ability to write an essay on a specialty problem, the ability to listen to authentic messages containing professional information, the ability to discuss specialty issues	6		v													
Programming of crop yields		This course examines the issues of crop yield programming, various methodologies for designing computer decision support systems in agronomy, as well as data analysis of the projected crop yield based on a balance model.	5									v	v					
Accounting in agriculture		Features of accounting in agriculture : IFRS 41 "Agriculture". Features of accounting for biological assets. Accounting for seeds, feed and other materials. Accounting of animals on cultivation and fattening. Accounting of agricultural products and their sale. Calculation of the cost of crop production and animal husbandry. Preparation of financial statements and formation of financial results in agriculture.	6		v													
Biophysics		Biophysics considers the physico-chemical phenomena occurring in living organisms that underlie elementary life processes, as well as the effects of physical factors on the body. The main task of biophysics is to study the processes associated with the transformation of the chemical energy of the components of living matter into other types of energy - mechanical and osmotic work, electrical and radiation energy.	7						v		v							

Culture of plant cells and tissues	The discipline gives students an idea of modern methods of non-traditional agriculture and plant growing - obtaining economically useful product by cultivating cells, tissues, organs of higher plants. This discipline introduces students to the molecular biological foundations of biotechnology, experimental morphogenesis, and the practical application of biotechnological techniques. The discipline helps students acquire the skills they will need in the practical work of modern production.	7								v							
Fundamentals of land management	The discipline forms knowledge on the methodological foundations and the general theory of the laws of development, contents, types, principles, tasks of land management in agriculture. Considers the land fund, land ownership and land use as a subject of land management, its natural, economic and social factors, the historical report of land management, agrarian policy and land management in modern conditions, the development of land management science.	3								v							
Applied Chemistry	In the course of applied chemistry, students deepen their theoretical knowledge and form new practical skills. For example, the regularities of formal kinetics studied in the first year are applied to open reactors, redox processes are supplemented by the study of E-pH diagrams. The following issues are also considered: high-molecular compounds and radicals, examples of production of chemical technologies.	5				v											
Methods of mathematical modeling	The discipline will allow students to use mathematical methods to study various processes. The course contains the following sections: fundamentals of power series; application of power series to generating functions and discrete variables, integration on intervals; numerical	5							v								



		algorithms in linear algebra, diagonalization of endomorphism and square matrices, mathematical modeling.																
General biology of organisms		Knows the general biology of organisms and the general laws of the phenomena of life of all organisms; understands the biology of living organisms, plant ecology, animal ecology, biology of bacteria and fungi, their interactions with other organisms and soil biocenosis; analyzes the mechanisms of living organisms on specific examples of biological functions related to zoology, botany, animal physiology and plant physiology; evaluates scientific and practical (for example, agronomic) importance of the topics under consideration.	7								v							
Plant compositions and floristics		The history of the formation of flower arrangements. Stylistic directions of floristry and phytodesign. The art of flower arrangement. The basics of building flower arrangements. Basics of working with fresh flowers and dried flowers. Compositions in the European style. "Shapes" in a floral arrangement. Construction of a planar and three-dimensional composition for offices and residential interiors. Types of floristry.	5								v							
Management in crop production		The course examines the basic concepts and categories of management, theory and practice of developing and making managerial decisions in economic entities of various forms of ownership in the areas of managing functional processes in the organization, implementing investment projects, managing small groups and collectives, improving the efficiency of the organization and interaction with the external environment.	3		v					v								
Biology of plant ontogenesis		The discipline is aimed at familiarizing students with the laws of reproduction and individual development of organisms as the fundamental basis of life processes. The course gives an idea of the macro- and	7								v							

		micromorphological, physiological-biochemical, molecular and genetic processes occurring in developing organisms, as well as the factors and mechanisms governing the processes of development at all stages of plant organisms' ontogenesis.																
Physiology and biochemistry of plants		Plant physiology and biochemistry studies the processes of vital activity, functions of the plant organism, chemical composition, transformation of substances and energy in plants throughout their ontogenesis under all possible environmental conditions. Intensive use of mineral fertilizers, herbicides, physiologically active substances, chemicals to protect plants from diseases and pests requires a deep and comprehensive study of their effect on the growth and metabolism of plant organisms in order to significantly increase the productivity of agricultural plants. Plant physiology is the basis of all agronomic sciences (agriculture, plant growing, vegetable growing, etc.), creates the theoretical basis of agrotechnical systems aimed at increasing the yield and quality of agricultural crops.	5								v							
Plant genetics		The discipline studies cytological, molecular cytoplasmic bases of heredity, chromosomal theory of heredity, variability of genetic material, fundamentals of population genetics, cellular and genetic engineering, types of hybridological analysis.	10								v		v					
Numerical methods		The course covers the basics of numerical modeling, solving applied problems leading to simple differential equations (DDC) and differential equations with separate	3				v			v								

		derivatives (DGD), integration of three diagonal systems of algebraic equations, DCK and GDT (scipy.integrate). In Python, DCC and GPD are taught to use numerical solutions, finite difference methods.																	
	Fundamentals of Thermodynamics and Electromagnetism	Knows the basic concepts, research methods and parameters of thermodynamic systems; understands equilibrium and non-equilibrium processes, reversible and irreversible processes, polytropic processes, entropy, the second principle of thermodynamics, transfer phenomena, the main task of electrostatics, electromagnetism; applies the Gauss Theorem, capacitors, electric and magnetic fields, Ohm's laws; analyzes elements of geometric and wave optics, quantum optics, atomic and nuclear physics.	5																
	French	The discipline is aimed at mastering the vocabulary and linguistic features of the French language by students and the formation of intercultural and communicative competence of students in the process of foreign language education.	10																
<b>Cycle of profile disciplines</b> <b>University component/Component of choice</b>																			
	Agrometeorology	The course of the discipline contains agrometeorological observations and instruments for measuring agrometeorological indicators, methods of agrometeorological assessment of the growing season of crops, agro-climatic assessment of the territory for crop production purposes, agrometeorological forecasts, adverse weather phenomena and ways to mitigate their	5																

		harmful effects on agricultural plants.																
	Selection of agricultural crops	The discipline is designed to give the student knowledge about breeding as a science and branch of agricultural production, about the source material for breeding, about methods of creating populations for selection, about the use of biotechnology methods in plant breeding, about methods of selection from crops with various methods of pollination and reproduction, about varietal studies as a science of varieties, about methods of evaluation of breeding material, about methods of creating heterosis hybrids, about State testing of varieties, about the regulatory framework, theoretical foundations of seed production, ways to maintain the genetic structure of the variety, propagation, certification of seeds, preparation of relevant documentation.	8								v							
	Agriculture	The discipline studies the laws of agriculture, ways to increase soil fertility, optimization of agricultural regimes, scientific foundations of crop rotation, classification, zonal features, introduction and development of crop rotations, scientific foundations of tillage, zonal features of tillage, agrotechnical assessment of the quality of tillage.	3									v						
	Crop production	The discipline "Crop production" introduces students to the morphological and biological features and agrotechnics of cultivating crops that allow for maximum yield per unit area, helps in solving organizational and economic issues for making adjustments to agrotechnical techniques in the production of crop products, taking into	3							v								

		account the prevailing weather conditions of a particular year, taking into account world scientific achievements.																
Cellular technologies in crop production and breeding		The course studies methods of cultivation of plant cells and tissues depending on experimental tasks for targeted use in breeding; genetic engineering and cellular technologies in plant production, documentation on registration of experimental data, international databases of genetic resources NCBI, GenBank, Cell selection; identification of transgenic insertion in plant biomaterial; experimental haploidy of agricultural plants, achievements of cellular technology engineering and cell selection for solving practical problems of crop production	3								v		v					
Soil science and agrochemistry		The course studies the general scheme of the soil-forming process and factors of soil formation, mineralogical, granulometric and chemical composition of soils, general physical and physico-mechanical properties of soil, etc. The student masters the methods of plant diagnostics of conditions of mineral nutrition of plants, varieties of mineral and organic fertilizers and their composition, as well as the basics of fertilizer application.	5									v						
Seed science		The study of the discipline "Seed Science" provides agronomic knowledge about modern issues of seed science: morphology, physiology and biochemistry of seeds; features of the formation of their different quality, the sowing - germination period: swelling of seeds, formation of seedlings, emergence of seedlings, adaptive properties acquired by seeds in the process of swelling and formation of seedlings, methods of harvesting and methods of drying seeds, modern methods evaluation of the quality of seeds and seed material.	3											v				
Protection of agricultural crops		In the course of mastering the discipline, the student knows the systematic organization of measures to combat pests, diseases and weeds of agricultural crops, to preserve and increase the yield and quality of agricultural crops, taking into account the relationship of pests and pathogens of agricultural crops with plants, biological characteristics, factors limiting harmfulness.	3										v					
Business statistics		The subject and methods of statistics. Statistical observation, systematization of data and their presentation. Statistical grouping, tables. Absolute and relative indicators, their	3		v					v								

		graphical representation. Average values and indicators of variation. Selective method in statistical studies of business processes. Statistical hypothesis testing. Random variables and probabilistic models. Statistical study of the dynamics of business processes. Economic indices. Statistical study of the interrelation of social phenomena. Software tools for statistical processing and data analysis (IBM SPSS, STATISTICA, MS Excel).																
	Herbology	The course provides for the formation of in-depth professional knowledge in the field of studying the patterns of weed plant associations and their harmfulness in the cultivation of major crops. Methods of selection and analysis of weed plant samples, identification and description of weed plant diversity, assortment of herbicides of domestic and foreign production, methods of evaluating the effectiveness of plant protection products and methods.	3									v						
	Fundamentals of scientific research	The concept of science. The content of science. Methodology, methodology and research process. General information about science. Methodological foundations of scientific knowledge. Empirical and theoretical levels of scientific knowledge. Organization of research. General information about R&D. Organization of research work of students. Experimental research in economics. Processing of experimental data.	3										v					
	Fundamentals of precision farming	Familiarization with precision farming technologies; - study of agricultural machines for precision farming technologies; study of the latest laboratory equipment, GPS systems that ensure the implementation of precision farming technologies; Conducting an analysis of the economic efficiency of parallel and automated driving systems and the formation of practical skills to work with GIS technologies.	4					v					v					
	Private breeding	The course is aimed at developing students' skills in using ideas and knowledge, the peculiarities of conducting the breeding process of individual crops of agricultural plants,	8										v					

		taking into account zonal features and environmental orientation.																
Adaptive technologies in crop production		The course Adaptive technologies in crop production is aimed at studying soil and climatic conditions, features of the development of field crops, requirements for environmental factors and the creation of technological processes for managing growth, development and formation of a high-quality crop.	6									v						
Seed production and varietal technology of agricultural crops		The discipline "Seed production and varietal technology of agricultural crops" forms the theoretical and practical knowledge necessary for the organization of the production of varietal seeds and develops organizational forms and technological techniques for obtaining high-quality seeds of varieties and hybrids of agricultural crops. The study of the discipline course is based on basic knowledge of other biological sciences, especially such as genetics, physiology, cytology, biochemistry, breeding, etc.	3									v						
Advanced Physics course		An advanced course in physics forms ideas about the picture of the world, natural phenomena and processes, and ways to describe them. In the course of mastering the content of the discipline, students have the opportunity to develop ideas about natural phenomena and processes, laws, relationships and interactions, as well as get an idea of models of physical processes and phenomena that explain their essence.	6							v								
Advanced Chemistry course		The knowledge gained in the first and second courses is being deepened. The course consists of three parts: general, inorganic and organic chemistry. The general chemistry section discusses reaction mechanisms, binary diagrams, and colloidal systems. In the section of inorganic chemistry, attention is paid to redox reactions, electrochemical systems. Additions to the structure of molecules, spectroscopy issues are considered in the section of organic chemistry.	8															
Probability and Application		The course is a continuation of the advanced mathematics sections in the field of probability theory. The discipline will	4															

		allow students to use mathematical methods to study various processes. The course contains the following sections: discrete random variables, continuous random variables, regression analysis, correlation analysis, variance analysis, nonparametric methods of analysis between quantitative and qualitative variables.																
	Ecology and sustainable development	The discipline is aimed at studying the ecological foundations and laws of the development of nature and humanity, analyzing global environmental problems and solving them within the framework of sustainable development of society and the environment. The acquired knowledge of natural laws is aimed at preserving a favorable environment in the interests of present and future generations.	3			v												
	Statistical processing of experimental data	This course is devoted to statistical and graphical methods of data analysis using application software packages. The course includes such sections as numerical methods for solving linear differential equations; Euclidean structures; theory of functions of several variables, examples of dynamic systems in modeling, statistical data, descriptive and graphical methods of data analysis.	3						v									
	Entomology and phytopathology	Types of plant diseases. The harmfulness of diseases. Types of pathogens. Phytopathological bacteria, viruses. Pathological flowering plants. Mycoplasma. Phytopathogenic nematodes. Fungi as pathogens. Biological and ecological features of insects. Fundamentals of plant protection from harmful insects (biological, forestry, chemical, physical, accounting methods, etc.).	3								v							

Dean of the Faculty \_\_\_\_\_ G.Zh. Stybaev

Chairman of SFAK

Faculty of Agronomy \_\_\_\_\_ S.O. Kenzhegulova



Head of the Department \_\_\_\_\_ B.O. Amantaev

