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

Considered at the meeting of the
University Academic Council
Protocol № 15
«28» 05 2020

APPROVED
by First Vice Chairman of the Board
of «S.Seifullin Kazakh
AgroTechnical University»NCJSC
_____ A. M. Abdyrov
«___» _____ 2020

EDUCATIONAL PROGRAM

"FIELD CROPS BREEDING»

Education area code and classification: 7M08 Agriculture and bioresources
Code and classification training areas: 7M081 Crop
Code in the International standard classification of education: 0812
Awarded degree: master of agriculture in the educational program "Field crops breeding»
Duration of training: 2 years (scientific and pedagogical)

Nur Sultan, 2020

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Authors:

Name Place	Placeofwork	Position, academic degree, title
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The team of authors approved by the order of S. Seifullin KATU NCJSC No. 932-H of 12.12.2018.

The educational program "Field crops breeding" was reviewed at a meeting of the Department "Agriculture and Crop Production" Protocol No. 9 of "20" may2020, approved by the Council of the Agronomy Faculty Protocol No. 10A "26" may 2020.

The Dean of the faculty of agronomy Stybaev G. J.

Head of the Department Amantayev B. O.

Content

1 Passport of the educational program

1.1 Purpose of the educational program

The educational program "Field crops breeding" was created on the basis of the request of employers in connection with the increased need for specialists with General cultural and professional competencies contributing to its social mobility and demand in the labor market.

The purpose of the educational program is to train specialists with a high level of professional culture, able to formulate and solve modern scientific and practical problems in the educational sphere, to successfully carry out teaching, research and management activities.

Objectives of the educational program:

- formation of skills of independent research and teaching activities;

-study of theoretical and methodological foundations of agricultural Sciences;

-improvement of philosophical Outlook, including one focused on professional activity;

-improving knowledge of a foreign language, including for use in professional activities.

Graduates are the scientific and pedagogical personnel of the highest qualification capable to solve independently production problems by methods of scientific researches.

1.2 General characteristics of the educational program

The educational program "Field crops breeding" was developed in accordance with the classification of areas of training with higher and postgraduate education and agreed with the Dublin descriptors and the European qualifications framework. The educational program contains theoretical training, including the study of cycles of basic and major disciplines, as well as the final certification. The educational program is designed on the basis of a modular system of studying disciplines and contains 6 modules that form General cultural, special language and professional competence.

The relevance of the educational program is due, first of all, to the need to prepare highly qualified in an ever-increasing role of knowledge-based production in agriculture. This program is aimed at consolidation and expansion of theoretical knowledge of the undergraduate with their further use in practice.

Competitive advantages are the training of scientific and scientific-pedagogical personnel of higher qualification for science, education and agricultural production, having a complex of modern knowledge, skills and

abilities in the field of universal, professional competencies that contribute to its social mobility and demand in the labor market.

The uniqueness of the educational program is the training of personnel ready for independent research, teaching, methodological, organizational and managerial activities, able to make an effective contribution to the development of agricultural crops with a high level of General and professional culture through quality training of competent personnel through the creation of conditions for quality education, based on the implementation of innovative programs.

2 Competence model (portrait) of the graduate

2.1 Scope of professional activity

Graduates who have mastered the program of the educational program "Field crops breeding" can work in:

- research, production and production organizations in the field of agriculture, breeding and seed production, protection of agricultural plants, seed farms;
- local and Republican state institutions, as well as enterprises of various types of agricultural formations;
- educational spheres of higher, secondary special, vocational, agricultural and biological institutions;
- scientific and industrial institutions, in the apparatus of local, district, regional, national structures of the Ministry of agriculture of the Republic of Kazakhstan.

2.2 Professional activities

Masters of the educational program "Field crops breeding" can perform the following professional activities:

- industrial-technological;
- organizational and managerial;
- research;
- educational pedagogical activity.

2.3 Core competencies

Graduates of the educational program "Field crops breeding" must possess the following basic competencies:

know:

-the role of science and education in public life;

-on current trends in the development of scientific knowledge in the field of agriculture;

-on actual methodological and philosophical problems of natural (social, humanitarian, economic) Sciences;

-on the professional competence of the teacher of higher and special education, College.

know:

-methodology of scientific knowledge in the field of agriculture;

-principles and structure of the organization of scientific activity;

-psychological methods and means of improving the effectiveness and quality of training;

-psychology of cognitive activity of students in the learning process;

-chemical composition, properties of plant protection chemicals, organic and mineral fertilizers, their transformation into soil, migration and their biological cycle;

-classification and toxicity of pesticides, bases of resistance of harmful organisms to pesticides;

-features of the chemical composition of the most important crops and its impact on product quality;

-agrochemical properties of soils and ways to improve soil fertility;

-features of food and fertilizers of grain, leguminous, technical, fodder, vegetable, fruit, berry crops, hayfields and pastures, methods of calculation of economic and energy efficiency of fertilizers.

know:

-fluently speak a foreign language at a professional level, allowing to conduct research and carry out the teaching of special subjects in universities;

-summarize the results of research and analytical work in the form of a dissertation, scientific article, report, analytical note, etc.;

-use the acquired knowledge for professional development and application of ideas in the context of scientific research;

-critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena;

-integrate the knowledge gained in different disciplines to solve research problems;

-by integrating knowledge to make judgments and decisions based on incomplete or limited information;

-work with students and conduct with them training, research and other types of work;

-apply knowledge of pedagogy and psychology of higher and special education, College in their teaching activities;

-apply interactive teaching methods;

-to carry out information-analytical and information-bibliographic work with the involvement of modern information technologies;

-creative thinking and creative approach to solving new problems and situations;

-to use the method of drawing up an integrated plant protection system taking into account the influence of natural regulatory factors;

-to make models of chemical and integrated crop protection;

- use in practice the results of agrochemical research;

- to develop and justify the system of fertilizer application for the economy, crop rotation, land, culture;

have the skills:

- professional communication and intercultural communication in Kazakh, Russian and foreign languages;

- oratory, correct and logical design of their thoughts in oral and written form in the Kazakh, Russian and foreign languages;

- expanding and deepening the knowledge necessary for daily professional activities and continuing education in doctoral studies;

research activities, decision of standard scientific tasks;

- implementation of educational and pedagogical activity on credit technology of training in educational institutions of higher and special education, colleges;

- methods of teaching professional disciplines in the field of agriculture and crop production;

- use of modern information technologies in the educational process;

- formation of practical skills of teaching in higher school, secondary special, vocational schools for the necessary cycles of lectures and practical training in agronomic disciplines;

- expanding and deepening the knowledge necessary for daily professional activities and continuing education in doctoral studies;

- the method of drawing up a plan for the use of plant protection chemicals;

- methods of optimal selection of pesticides and biological means of plant protection in the development of integrated systems of plant protection from harmful organisms;

- agrochemical methods of soil analysis, organic and mineral fertilizers;

- methods of calculation of agronomic, economic and energy efficiency of fertilizers.

be competent:

- communication in the professional field in a foreign language;

- in ways to ensure constant updating of knowledge through, expanding professional skills and abilities;

-in the field of research methodology;

-in the implementation of research projects and research in the field of crop production and agriculture;

to conduct training sessions in institutions of secondary special and higher education, to develop and use educational and methodological support, to lead the research work of students;

-in matters of modern educational technologies;

-in ways to ensure constant updating of knowledge, skills and abilities.

2.4 Professional competences

Graduates of the educational program "Field crops breeding" must possess the following key competencies:

know:

-on modern methods of selection, the ways of its development and improvement on the basis of the latest discoveries in genetics and molecular biology;

-methods of creation of initial material for Field crops breeding;

-methods of testing of breeding material, varieties, hybrids and offspring of elite plants in the relevant breeding nurseries;

-requirements for zoning of varieties and hybrids;

-modern methods of research of structure and function of cells;

-structural and molecular organization of plant cells,

-mechanisms of cellular functioning;

-mechanisms of cell division and differentiation;

-mechanisms of intracellular regulation;

-basic principles of genome organization;

-structure and function of the Pro – and eukaryotic gene;

-chromosome structure and functions;

-the achievements of domestic and foreign scientists and practitioners in the field of breeding and seed;

-General theoretical bases of zonal systems of agriculture;

- factors of influence on the formation of soil fertility and methods of reproduction of soil fertility in different soil and climatic zones ;

-methods of regulation of living conditions of plants in zonal systems of agriculture;

- features of the farming system in Northern Kazakhstan;

- scientific basis of tillage, the principles of minimizing tillage;

- soil erosion and control measures;

-features of crop rotations in various modern farming systems;

- weed species and control measures in the soil protection system of agriculture;

-to know and understand the essence of the main stages of physiology of plant growth and development, physiological and biochemical processes during ontogenesis (embryonic, juvenile, reproductive, maturity, aging);

-features of the growth of cells and organs of the plant, the stages of their development;

-environmental aspects of the most important physiological processes and their features depending on the influence of external conditions;

-interaction of growth hormones and their application in crop production;

- modern methods of scientific agronomy;

- basic elements of the field experience methodology;

- basic principles of field experience data processing

- influence of the technique of field experience to his mistake;

- history of bioinformatics development, principles and methods of genetic, protein and cell engineering;

- methods of fundamental and applied research of biological Informatics;

- modern problems of molecular biology solved with the use of computer programming and modeling;

-fundamentals of fundamental and applied Sciences for solving research, information retrieval problems;

- actual problems and tendencies of development of agricultural Sciences;

- theoretical bases of Field crops breeding; bases of biometrics in selection and genetics of plants;

- modern methods and methods of breeding and seed production and their reasonable use in the creation of new varieties and reproduction of varieties;

- University pedagogy and psychology;

- methods of teaching agricultural disciplines.

know:

- determine the types and varieties of field crops;

- implement techniques of hybridization and crossing techniques;

-conduct selections;

-analyze the inheritance of traits and properties in a number of generations of hybrids of field crops;

-grow elite seeds of field crops;

-to use the knowledge gained in practice, to choose research methods that are adequate to the task.

-to analyze modern scientific literature on cell biology and scientific problems considered in this discipline;

-to identify the most important problem issues and predict their possible solutions;

- formulate and justify conclusions, justify their proposals in the field of breeding and seed;

-to regulate the conditions of plant growth in zonal systems of agriculture and features of the system of agriculture in Northern Kazakhstan;

- application of crop rotations in various modern farming systems;

- acquisition of practical skills in conducting experiments on the study of basic physiological processes|;

-to use methods of light microscopy in working with objects,

-use the methods of research and analysis of living systems (mathematical methods of processing the results of research);

- clearly and clearly communicate their findings and knowledge on the physiology of plant growth and development as a theoretical basis for increasing plant productivity.

- choose the right land for the experience;

- to plan, establish and carry out multi-year univariate and multivariate experiments;

- maintain documentation and reporting on field experience;

have the skills:

- technology bookmarks field experience;

- methods of experiment planning;

- work with the methods of accounting crop;

- work with methods of preliminary processing of experimental data;

- working with the principles of processing long-term data of field experiments;

- processing of experimental data;

- demonstration of basic knowledge about the technology of bioinformatics and apply them in practice;

- critical analysis of the information received and presentation of research results;

-patent search in the field of research,

-to discuss problems, to argue conclusions and to operate correctly with information;

-on the use of methodological and methodical approaches, to present the developed materials, to conduct a constructive discussion, to finalize the materials taking into account the results of their discussion

-on the use of methods of selection and genetic analysis in the Field crops breeding;

- participation in scientific discussion;

- making independent judgments and independent decisions;

- freely navigate in the theoretical and methodological framework;

- defend your point of view;

- work with electronic resources of different levels;

- to acquire theoretical and practical skills of working with modern methods of selection.

- implementation in practice of hybridization techniques and crossing techniques, conduct individual and mass selection;

- weed control in the soil protection system of agriculture;

- in the preparation of zonal systems (agrolandscape) agriculture, taking into account the soil and climatic conditions of the economy;

- knowledge of methods for diagnosing the growth and development of different plant varieties;

- work with modern laboratory and breeding equipment;

- to the practical use of in-depth knowledge in the field of scientific agronomy;

- critical analysis and evaluation of modern scientific achievements, as well as the generation of new ideas in solving practical problems, including in interdisciplinary areas;

- creation of artificial genetic systems with specified properties;

-independent patent search in the field of research on topical issues of field crops breeding;

-work with scientific literature, methods of writing articles, analysis of methodological problems;

- methods of creating and using models to predict various processes and phenomena, while carrying out qualitative and quantitative analysis and synthesis;

- pedagogical skill.

be competent in:

-knowledge of the methodology of theoretical and experimental research in the field of genetics and plant breeding;

-application of plant protection methods and experimental studies in crop breeding;

-ownership of agricultural production methodology;

-knowledge of methods and techniques of breeding and seed-growing processes, the ability to develop and improve various methods of selection, intraspecific and distant hybridization;

- skills in isolation and cultivation of plant cells;

- knowledge of molecular genetic analysis methods;

- conducting aprobacion works crop varieties

- conduct qualified research in the field of breeding and seed production;

- the use of agricultural techniques that promote the conservation and improvement of soil fertility , protect the soil from erosion and allow higher yields of agricultural crops in different soil-climatic zones;

- development of new methods of research design and organization of agricultural production;

- practical use of knowledge in the field of scientific agronomy, plant breeding and genetics;

- analysis of scientific and experimental data in the field of crop breeding;

-development and implementation of management innovations in professional activities, to master and implement in the educational process innovative educational technologies.

3 Base the apprenticeship

The educational program "Field crops breeding" provides pedagogical and research practice – 9 credits and focused on professional and pedagogical training of undergraduates. Also the research work of the master student including performance of the master's thesis-24 credits is carried out.

It is planned to pass the practices of undergraduates during the spring sowing campaign and harvesting crops on the campus of the Kazakh agrotechnicalUniversity.S. Seifullina and experimental sites of research institutes in different regions of the Republic.

As a base of practice the stationary fields of "Kazakh research Institute of agriculture and plant growing, "Research and production center of grain economy" are used. A. I. Barayev", LLP "Kazakh research Institute of livestock breeding and fodder production", LLP "research Institute of Potato and vegetable growing", LLP "Pavlodar research Institute of agriculture" LLP "southwest research Institute of livestock and crop production", LLP "East Kazakhstan Institute of agriculture" LLP "Kazakh research Institute of rice production", LLP "North Kazakhstan Institute of agriculture"LLP "Kostanay agricultural research Institute" LLP, "Karabalyk agricultural experimental station" LLP, "Karaganda experimental station" LLP "experimental farm of oil crops", GU "Republican scientific – methodical center of agrochemical service", SI "virgin regional inspection for variety testing of agricultural crops" of the Ministry of agriculture of Kazakhstan, the campus of the Kazakh agrotechnicalUniversity.S. Seifullin.

Methods of professional practices: stationary, field-field.

For the disabled and persons with disabilities, the choice of places of practice is consistent with the requirement of their accessibility to the data of students and the state of health.

4 Structure of the educational program

№ п/п	Name of cycles of disciplines and activities	Totallaborintensity	
		inacademichours	academicloans
1	2	3	4
1.	Theoreticaltraining		
1.1	The cycle of basic disciplines (DB)	1050	35
	amongthem:		
1	Foreignlanguage (professional)	150	5
2	Englishforacademicpurposes	150	5
3	History and philosophy of science	150	5
4	Pedagogyofhighereducation	90	3
5	Managementpsychology	150	5
6	Integratedplantprotection	150	5
7	Optimizationofcropnutrition	150	5
8	Pedagogicalpractice	60	2
1.2	Cycle of major disciplines (PD)	1470	49
1	Theory and practice in breeding and seed production	150	5
2	Farming systems and crop production	150	5
3	Methodologyofexperimentalwork	150	5
4	Patenting and protection of intellectual property	150	5
5	Researchpractice	270	9
6	Genetics of plants with the basics of breeding	150	5
7	Plantcellbiology	150	5
8	Physiological aspects of plant growth and development	150	5
9	Bioinformatics	150	5
1.3	Research work of a master student, including internship and master's thesis (NIRM)	720	24
1.4	Finalcertification (IA)	360	12
	Design and defense of master thesis (Osmd)	360	12
	Subtotal	3600	120

Annex 1. Academic calendar***

The schedule of educational process in 2020-2022 years

For the modular education program "Field crops breeding"

Direction of preparation: scientific and pedagogical

Degree: master of agricultural Sciences in the educational program "Field crops breeding"

Trainig period: 2 years

Mode of study: Full-time

Courses		September					October					November				December				January					February			
I	2020	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	1	8	15	22	1
	2021	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26	5
№ of week			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
I		P	·	·	·	·	·	·	·	M/·	·	·	·	·	·	·	M/·	::	::	=	=	=	=	=	=	=	·	·
II	2021	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24
	2022	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	1	8	15	22	29
№ of week			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
II			R/RP	RP	S/=	S/=	S/=	S/=	S/=	S/=	S/=	·	·	·	·	·	·	·	M/·	·	·	·	·	·	·	M/·	::	::

Courses		Mart				April					May				June				July					August			
I	2020	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	26
	2021	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	7	14	21	28	31
№ of week		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
I		·	·	M·	::	·	·	·	·	M/·	RP	RP	RP	RP	RP	::	·	·	·	·	M/·	::	R/RP	R/RP	R/RP	R/RP	R/RP
II	2021	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24
	2022	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29
№ of week		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
II		TP	TP	TP	R	R	R	R	R	R	R	/	/	X	X	X	X	//	//								

Presentation	Theoretical Course	Midterm Exam	Exams	Summer semester	Vacation	Research Practice	Teaching Practice	MSSRW	Final Exam	Master dissertation design	Master dissertation defence
P	·	M	::	S	=	RP	TP	R	/	X	//

Holydays

Day of knowledge	1 September	International Women's Day	8 Mart
Day of the first President of RK	1 December	The holiday "Nauryz"	21-23 Mart
Independence day	16 - 17 December	Day of Unity of People of Kazakhstan	1 May
New Year	1-2 January	Defender of the Fatherland Day	7 May
Constitution Day of Kazakhstan	30 August	Victory Day	9 May

*** Reviewed and approved at the beginning of the school year

Annex 2 working curriculum

WORKING CURRICULUM
For the modular education program "Field crops breeding"
In specialty M131 – -
Course years 2020-2022
Degree : Master's program by specialization (Scientific & pedagogical direction)
Form of education: Full-time (MS 2 years) trimester
Entry year : 25-05-2020

Module code	Module name	Discipline cycle	Discipline component	Code of subject	Subject name	Academic credits	Control by semesters			Volume of hours							Distribution of study hours by semester/terms/quarters					
							Exams	Differentiated test(practice)	Differentiated test(course paper)	Total	In-class learning	including			Self-study work of Ms student with teacher (office)	Self-study work of Ms student	1	2	3	4	5	6
												Lectures	Practice	Lab practicals			Number of weeks in the semester/term/quarter					
Modules of specialty/education programm																						
1	Modern bases of selection and seed growing of agricultural crops	AS	UC	TPSS 5302	Theory and practice in breeding and seed production	5	3			150	50	1/20	2/30		1/20	5/80			10			
2		AS	ES	Bio 6305	Bioinformatics	5	4			150	50	1/20	2/30		1/20	5/80				10		
3		AS	ES	MKBR 6306	Molecular and cellular biology of plants	5	4			150	50	1/20	2/30		1/20	5/80				10		
4		AS	ES	GOSS 6308	Genetics with the basics of selection and seed farming	5	5			150	50	1/20	2/30		1/20	5/80					10	
5	Social and pedagogical	BS	UC	IFN 5201	History and philosophy of science	5	1			150	50	1/20	2/30		1/20	5/80	10					
6		BS	UC	PVSH 5203	Pedagogics of higher school	3	1			90	30	1/20	0/10		0/12	3/48	10					
7		BS	UC	PU 5204	Psychology of management	5	1			150	50	2/30	1/20		1/20	5/80	10					
8		BS	UC	PP 5205	Teaching practice	2				0	0						10					
9	Crop production	AS	UC	SZPRP 5303	Farming systems and crop production	5	3			150	50	1/20	2/30		1/20	5/80			10			
10		AS	ES	FORRPK 6307	Physiological fundamentals of growth and development of field crops	5	4			150	50	1/20	2/30		1/20	5/80				10		
11	Nutrition and protection of plants	BS	ES	IZR 5209	Integrated plant protection	5	2			150	50	1/20	2/30		1/20	5/80		10				
12		BS	ES	OPSK 5210	Optimizing nutrition of crops	5	2			150	50	1/20	2/30		1/20	5/80		10				
13	Language of the discipline	BS	UC	IYaP 5202	Foreign language (professional)	5	1			150	50		3/50		1/20	5/80	10					
14		BS	UC	AYaDAC 5206	English for Academic Purposes	5	2			150	50		3/50		1/20	5/80		10				
15	Research techniques	BS	UC	IP 5207	Research practice	5				0	0								10			
16		BS	UC	IP 6208	Research practice	4				0	0									10		
17		AS	UC	MOD 5301	Methodology of research work	5	2			150	50	1/20	2/30		1/20	5/80		10				
18		AS	UC	PZIS 6304	Patenting and Intellectual Property Protection	5	5			150	50	1/20	2/30		1/20	5/80					10	
Scientifically research																						
19	Research	RW	UC	NIRMVVMD 5501	MS student's research work, incl. Master thesis	5				0	0								10			
20		RW	UC	NIRMVVMD 6502	MS student's research work, incl. Master thesis	1				0	0									10		
21		RW	UC	NIRMVVMD 6503	MS student's research work, incl. Master thesis	10				0	0										10	
22		RW	UC	NIRMVVMD 6504	MS student's research work, incl. Master thesis	8				0	0											10
Total of theoretical course						73	15	0	0	2190	730	270	460	0	292	1168						
AC	**Additional courses**					35				1050.0												
PP	Teaching practice					2	12		1		60											
RP	Research practice					9	54		3, 4		270											
MSSRW	MS student's research work, incl. Master thesis					24	144		3, 4, 5, 6		720											
FA	**Final attestation**					12				1260.0												
	Master dissertation design and defence					12		6		1260												
	Total					120				4500	730	270	460	0	292	1168						

Annex 3

Description of compulsory subjects and University components

1. Basic information about the discipline:	
Nameofdiscipline	Foreignlanguage (professional)
2. Numberofcredits	5
3. Prerequisites:	Foreignlanguageundergraduateprograms
4. Post-requisites:	Englishforacademicpurposes
5. Competences:	*know:* fluent in a foreign language at a professional level, allowing to conduct research and carry out the teaching of special disciplines in universities; have the skills: - professional communication and intercultural communication in a foreign language; *be competent:* - in the communication zarubezhnymi the scientific community in the professional field;
6. The author of the course	Rakhimbekova G. O., associate Professor
7. Basicliterature	Yu. Golitsyn" Grammar. Collection of exercises", St. Petersburg, 2007 Jones L. and Alexander R. New International Business English teacher's Book. Updated edition communication skills in English for business purposes. United Kingdom: Cambridge University Press, 2000.-224 P. Dignen B., Flinders S., Sweeney S. For work and life. English 365. Personal Study Book with 3 Audio CD.- Dubai: Oriental Press, 2005.- 96 P. A. NogayevAdilbek The educational-methodical complex of the discipline "Professionally-oriented foreign language" for Bachelors on speciality 5B080100- "Agronomy" reflects all the necessary topics and terminology for the preparation of highly qualified specialists. Astana, 2016. 5. The Articles published in scientific Journals in the field of Agronomy. - http://www.cabdirect.org - http://www.sciencedirect.com - http://link.springer.com -http://portal.kazatu.kz/e-books/index.php?id=4&lang=ru&p=17 - http://elibrary.ru/rsci_press.asp
8. Contentofthediscipline	Communicative-adequate use of the rules of registration of oral and written texts of scientific and technical nature in the English language; familiarization with the requirements for documentation (within the program), adopted in the international

	environment in the field of professional and business communication; implementation of acquired speech skills in the course of coursework and other educational tasks, as well as final qualifying work in the English language.

Nameofdiscipline	Englishforacademicpurposes
2. Numberofcredits	5
3. Prerequisites:	Foreignlanguageundergraduateprograms
4. Post-requisites:	Special subjects with a foreign language of study
5. Competences:	*know:* -summarize the results of research and analytical work in the form of a dissertation, scientific article, report, analytical note, etc. in the state and foreign languages. have the skills: -oratory, correct and logical design of their thoughts in oral and written form in a foreign language; -expanding and deepening the knowledge necessary for daily professional activities and continuing education in doctoral studies. *be competent:* -in ways to ensure constant updating of knowledge through , expanding professional skills and abilities..
6. The author of the course	Kitaybekova S. O. PhD doctor
7. Basicliterature	Kathy Cox, David Hill English for Academic Purposes, Pearson Longman, 2011.231 p. Aghabekyan I. P., Kovalenko P. I. English for technical high schools. Series "Higher education". – Rostov n/D: McCarthy, Michael &O'dell, Felicity. (2008). Academic Vocabulary in Use (Edition with answers). Cambridge: CUP. Godman A. Explanatory dictionary of English scientific vocabulary / A. Godman, EMF Payne. - M.: Rus.yaz., 1989.-728 S.
8. Content of the discipline Complex theoretical and linguistic, practical and information-analytical training of the student in order to perform graduate functions related to the use of a foreign language in professional activities, scientific and practical work, in communication with foreign partners, for self-educational and other purposes. Mastering the advanced level of English for academic purposes (ear) will allow you to freely operate the scientific and conceptual apparatus of the specialty, to expand the scientific and information base, to master the skills of interpreting scientific information, arguments, beliefs, scientific controversy, academic writing. This will ensure a free exchange of views at the international level during discussions, scientific conferences and forums, as well as conducting classes with students in a foreign language on the profile of the specialty.	

History and philosophy of science	History and philosophy of science

2. Numberofcredits	5
3. Prerequisites:	HumanitiesandnaturalSciences
4. Post-requisites:	Disciplines of the cycle of major disciplines
5. Competences:	*know:* -methodology of scientific knowledge in the field of agriculture; -principles and structure of the organization of scientific activity; *know:* -use the acquired knowledge for professional development and application of ideas in the context of scientific research; -critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena; -integrate the knowledge gained in different disciplines to solve research problems; -by integrating knowledge to make judgments and decisions based on incomplete or limited information; have the skills: -research activity, decision of standard scientific tasks; be competent: -in the field of research methodology; -in the implementation of research projects and research in the field of crop production and agriculture.
6. The author of the course	Bekmaganbetov W. J., associate Professor
7. Basicliterature	Oprysko, p. P. Introduction to philosophy / p. P. Opryshko, A. P. Poyarkov. - Moscow: Republic, 2012. - 656 p. Buchilo, N. F. Philosophy: textbook / N. F. Buchilo. – M.: Prospekt, 2013. – 325 p. Kanke, VA Fundamentals of philosophy. / V. A. Kanke. – M.: Logos, 2013.- 288 p.
8. The content of the discipline is the Subject of philosophy. Philosophical foundations of science. Function of science. The emergence and formation of science. Science in the Ancient world, the middle Ages and the Renaissance. New European science is a classical stage of science development. The main concepts and directions of non-classical and post-non-classical stage of development of science. Structure and levels of scientific knowledge. Science as a profession. Ideals and norms of science. Philosophical foundations of science and scientific picture of the world. Scientific tradition and the scientific revolution. History and philosophy of natural and technical Sciences. History and philosophy of social Sciences and Humanities. Philosophical problems of development of modern global civilization.	

1. Basic information about the discipline:	
Nameofdiscipline	Pedagogyofhighereducation
2. Numberofcredits	3
3. Prerequisites:	Psychological and pedagogical disciplines under the bachelor's program

4. Post-requisites:	Disciplines of the cycle of major disciplines
5. Competences:	*know:* -professional competence of the teacher of higher and special education, College; know: -psychological methods and means of improving the effectiveness and quality of training; *know:* -work with students and conduct with them training, research and other types of work; -apply knowledge of pedagogy and psychology of higher and special education, College in their teaching activities; -apply interactive teaching methods; -to carry out information-analytical and information-bibliographic work with the involvement of modern information technologies; *have the skills:* -implementation of educational and pedagogical activity on credit technology of training in educational institutions of higher and special education, colleges; -methods of teaching professional disciplines in the field of agriculture and crop production; -use of modern information technologies in the educational process; *be competent:* -to conduct training sessions in institutions of secondary special and higher education, to develop and use educational and methodological support, to lead the research work of students; -in matters of modern educational technologies; Have practical skills of teaching in agricultural disciplines - formation of practical skills of teaching in higher school, secondary special, vocational schools to conduct the necessary cycles of lectures and practical training in agronomic disciplines.
6. The author of the course	Mukhanbetkaliyev E. E., associate Professor
7. Basicliterature	Kochkorbayeva E. sh. Pedagogy and psychology. Textbook. Astana. 2010. Kochkorbaev E. S. General pedagogy OK Astana, 2012 BekbayevaZh. S. "General psychology" Astana. 2010j Slastenin V. A. pedagogy. Part 1, M.: 2003 Kubrushko, P. F. Didactic design. textbook M.: 2001
8. The content of the discipline As a result of the study of this discipline should be able to effectively use modern methods and techniques of teaching in higher education; be able to use the necessary psychological and methodological resources for the preparation and conduct of	

activities (lectures, seminars, Holy and great, CP and exams); Have the skills: - be able to apply the appropriate psychodiagnostic techniques Management of training in various aspects of communication in the professional sphere; professional reflection; possession of the main methods of psychological influence; professional communication.

Nameofdiscipline	Managementpsychology
2. Numberofcredits	5
3. Prerequisites:	Psychological and pedagogical disciplines under the bachelor's program
4. Post-requisites:	Disciplines of the cycle of major disciplines
5. Competences:	*know:* -psychology of cognitive activity of students in the learning process; *know:* -to carry out information-analytical and information-bibliographic work with the involvement of modern information technologies; -creative thinking and creative approach to solving new problems and situations; *have the skills:* -professional communication and intercultural communication; -oratory, correct and logical design of their thoughts in oral and written form; -expanding and deepening the knowledge necessary for daily professional activities and continuing education in doctoral studies. *be competent:* -in ways to ensure constant updating of knowledge, skills and abilities.
6. The author of the course	Mukhanbetkaliyev E. E., associate Professor
7. Basicliterature	Kochkorbayeva E. sh. Pedagogy and psychology. Textbook. Astana. 2010. Kochkorbaev E. S. General pedagogy OK Astana, 2012 BekbayevaZh. S. "General psychology" Astana. 2010j Slastenin V. A. pedagogy. Part 1, M.: 2003 Kubrushko, P. F. Didactic design. textbook M.: 2001
8. The Role of science and education in public life; modern trends in the development of scientific knowledge. Knowledge for the development and application of ideas in the context of scientific and pedagogical research; apply knowledge of pedagogy and psychology of higher education in their teaching activities; the use of interactive teaching methods; creative thinking and creative approach to solving new problems and situations; summarize the results of research and analysis in the form of abstracts, scientific articles, reports, analytical notes, etc.; Methodology; in the field of scientific and scientific - pedagogical activity in higher educational institutions; possession of modern educational technologies and in the implementation of	

scientific projects and research in the professional field.

Nameofdiscipline	Theory and practice in breeding and seed production
2. Numberofcredits	5 creditstheory, 5 creditspractice
3. Prerequisites:	Plant protection, Phytopathology, entomology, Herbology, breeding and seed production of agricultural crops
4. Post-requisites:	disciplinesofprofessionalactivity
5. Competences:	*know:* -the achievements of domestic and foreign scientists and practitioners in the field of breeding and seed; *know:* - theoretical and practical bases of selection and seed production, modern methods of selection, ways of its development and improvement on the basis of the latest discoveries in biology, concept: variety, organization of variety testing and zoning, system of placement and introduction in production of varieties and hybrids. know: formulate and justify conclusions, bring their proposals in the field of breeding and seed *have the skills:* - acquisition of theoretical and practical skills in working with modern methods of selection. - to practice hybridization techniques and crossing techniques, to conduct individual and mass selection, *be competent:* - in carrying out testing of crops, filling in documentation on selection and seed production. have practical skills of teaching in agricultural disciplines -acquaintance with theoretical, methodological and technological achievements of domestic and foreign science, with modern methods of scientific research in the field of breeding and seed crops, processing and interpretation of experimental data: -planning and carrying out own research works on the subject

	of research
6. The author of the course	Djataev S. A. C.b.n
7. Basicliterature	1. Nikolai Vavilov.And. The theoretical basis of selection. M.: Science, 1987. 2. Gulyaev G. V., Guzhov Yu. L. Selection and seed production of field crops. M.: Agropromizdat. 3. Konovalov Yu. B., Berezkin A. N. and others. Workshop on breeding and seed production of field crops. M.: Agropromizdat: 1987. 4. Shvidchenko V. K., Zotikov V. I., isenova A. K. Selection of spring wheat in the North of Kazakhstan. Astana. 1999. 5. Shvidchenko V. K. Selection of agricultural plants, Astana, 2006. 6. Berezkin A. N. and other Ways to improve the efficiency of seed crops. M., 1989. 7. Issues of selection of agricultural crops (selected works of V. P. Kuzmin), Alma-ATA: Kainar, 1978. 8. Guzhov Yu. L. Genetics and selection to agriculture. M.: Education, 1984. 9. Kuptsov A. I. elements of the General plant breeding. Novosibirsk: Science, 1971. 10. Wheat in the world. Under. Red. Dorofeeva V. F. L.: Agropromizdat, 1987. 11. Selection and seed production of grain crops. Ed Craft V. N. Kiev: Vintage, 1978. 12. Selection of spring wheat. Under the editorship of Turbine N.In. M.: Kolos, 1977. 13. Suleimenov A. A. Guide to the approbation of agricultural crops common in Northern and Central Kazakhstan, Akmola,1997.
8. scipline Theoretical foundations of plant breeding. Genetic methods of creating the source material. Types and methods of plant breeding, analytical selection, selection. Initial material in plant breeding. Doctrine N. I. Vavilova on the source material and its practical significance for breeding and seed production. Matching plant breeding: intraspecific and distant hybridization. Distant hybridization in plant breeding. The role of mutation and polyploidy in plant breeding. Creation of heterosis hybrids of plants. Modern methods of evaluation of breeding material. The theoretical basis of seed growing. Modern seed production system. The organizational structure of the seed industry in Kazakhstan. Primary seed production and production of original seeds. Cortosone, seed of new varieties. Modern achievements of biotechnology of agricultural plants, modern molecular genetics in plant breeding.	

Nameofdiscipline	Farming systems and crop production
2. Numberofcredits	Five
3. Prerequisites:	Disciplines under the bachelor's program

4. Post-requisites:	disciplines of professional activity
5. Competences:	*know:* - on the methods of rational and efficient use of land, increase soil fertility and increase crop productivity. *know:* -General theoretical bases of zonal systems of agriculture; factors of soil fertility and methods of reproduction of soil fertility in different soil and climatic zones ; -scientific basis of tillage, the principles of minimizing tillage, soil erosion and measures to combat it; *know:* -to regulate the living conditions of plants in zonal systems of agriculture and features of the system of agriculture in Northern Kazakhstan; -apply crop rotations in various modern farming systems ; *have the skills:* - weed control in the soil protection system of agriculture. - drawing up of zonal systems (agrolandscape) of agriculture taking into account soil and climatic conditions of economy; be competent: - the use of agricultural techniques that contribute to the preservation and improvement of soil fertility, soil protection from erosion and allow increasing the yield of agricultural crops in various soil and climatic zones of Northern Kazakhstan.
6. The author of the course	Karipov R. H., associate Professor
7. Basicliterature	1.Prigunov F. B. grain Yield at the alternative farming system. // W. "Information materials" UNITAI 1991 C23 2.Prigunov F. B. soil Fertility in alternative agriculture. . // W. "Information materials" UNITAI 1991 with 22. 3.Agriculture. Under. edited by A. I. Poponin.- Moscow: 2004. – 552 p. 4.Karipov R. H. Workshop on agriculture – Astana, 2009 -258 p. 5.Karipov R. H. Basics of agriculture.- Astana,2012.-268 p. 6.State register of selection achievements admitted to use in the Republic of Kazakhstan. – Astana, 2018.

8. The content of the discipline As a result of the training of this discipline undergraduate should know modern advanced technologies of agriculture, taking into account the achievements of domestic and foreign science, methodological foundations of innovative agriculture: the principles of a systematic approach, reproduction and preservation of soil fertility, soil fertility factors and methods of soil reproduction in the zonal agrolandscape agriculture, plant life conditions and methods of their regulation, taking into account soil conditions and functional relationships between the components of the territory, an integrated approach in the design of the soil treatment system on different elements of the terrain, minimizing tillage, energy-saving methods of tillage, soil erosion and principles of soil conservation processing technology, taking into account environmental adaptation, the scientific basis of crop rotations, agroecological principles of their construction, taking into account specific soil and climatic conditions and the main priorities of cultivation of crops in a particular area, to organize primary seed production and improvement of varieties in the process of primary seed.

Nameofdiscipline	Methodologyofexperimentalwork
2. Numberofcredits	5
3. Prerequisites:	Disciplines under the bachelor's program
4. Post-requisites:	Researchpractice, writingthesis
5. Competences:	*know:* - on modern methods of scientific agronomy. *know:* - basic elements of the field experience methodology; - basic principles of field experience data processing - on the impact of field experience techniques on his mistake. *know:* - to plan, establish and carry out univariate and multivariate experiments; - maintain documentation and reporting on field experience; -conduct phenological and other related observations of the growth and development of agricultural crops during their growing season; *have the skills:* - bookmarks of field experience, experiment planning; - crop accounting and pre-processing of experimental data; - processing of long-term data of field experiments. be competent: - practical use of in-depth knowledge in the field of scientific agronomy.
6. The author of the course	Amralin A. U., associate Professor
7. Basicliterature	1.Mr. Kostanay, St. Industrial, 41.I., Kostanay, Ul. Industrial, 41.A., Ust-Kamenogorsk, Almaty Fundamentals of scientific research in agronomy. Astana, 2010. 2.Mr. Kostanay, St. Industrial, 41.I., Kostanay, Ul. Industrial, 41.A. Forage Production. - Moscow: Higher school, 2007. 3.Mr. Kostanay, St. Industrial, 41.I., Kostanay, Ul. Industrial,

	41.Workshop on forage production. - Moscow: Higher school, 2007. 4.Methods of state variety testing of Agricultural crops. M., 1961. 5.S. Ivannikova V., Tomilov V. P. Workshop on biometrics. – Astana: Publishing House. In the dictionary implemented two-way transfer. = 112 P. 6.S. Ivannikova V. Lectures on biometrics, 2004-2005 academic year (electronic version). -112 p. 7.- M.: Science, 1978.С. жүргізудің методикасы. Алматы 1990ж.
8. Course content Introduction (course review). General idea of the content and composition of the course. The content of the concepts of scientific agronomy, methodology, history methodology. Increasing the volume and quality of primary crop production without harming the environment as a target function of agriculture. The goal of scientific agronomy is to gain new knowledge about methods and means of increasing the productivity of products. Philosophical and theoretical basis of agronomic research methodology. The structure of modern scientific agronomic research. Logical foundations of scientific research. General scheme of transfer of agronomic innovation in agriculture.	

Nameofdiscipline	Patenting and protection of intellectual property
2. Numberofcredits	5
3. Prerequisites:	Disciplines under the bachelor's program
4. Post-requisites:	Disciplinesofprofessionalactivity
5. Competences:	*know:* -protection of intellectual property in the field of agricultural science; *know:* -fundamentals of fundamental and applied Sciences for solving research, information retrieval problems; *know:* -conduct a patent search in the field of research, discuss problems, argue conclusions and competently operate with information; *have the skills:* -self-conducting patent search in the conduct of research on topical issues of direction; -work with scientific literature, methods of writing articles, analysis of methodological problems. be competent: -analyze and evaluate the data obtained.
6. The author of the course	Baldi, Y. A., associate Professor
7. Basicliterature	1.Zaytsev G. N. Mathematical statistics in experimental botany. M.: Science, 2008. -424 p. 2.Dmitriev, E. A. Mathematical statistics in soil science. –M

	Ed. Mosk. UN-TA, 2007. -320 PP. 3.Minkevich, N. And. Zakharov, T. I. Mathematical methods in Phytopathology, Leningrad: Kolos, 2007. 47 PP. 4.Terentjev P. V. Rostov, N. With. Workshop on biometrics. L.: Izd. LSU 2007. -152 p. 5.Ivannikov A.V. Biometrics (statistical processing of quantitative indicators). Textbook. – Astana: publishinghouseofKazATU, 2005. (Electronictextbook)
8. The content of the discipline Copyright, related rights, intellectual industrial property. Features of regional systems. International patent system. European regional patent system. Eurasian regional patent system. World intellectual property organization. Paris Convention for the protection of industrial property of 20.03.1883, Madrid agreement concerning the international registration of marks of 14.04.1891, patent cooperation Treaty (PCT) of 19.06.1970, Berne Convention for the protection of literary and artistic works of 09.09.1886, World (Geneva) copyright Convention of 06.09.1952, Agreement on trade-related aspects of intellectual property rights (trips). Intellectual property. Invention. The rights of innovators and the legal protection of inventions. Application for invention and its examination. Legal protection of the utility model. Trademark. Application and examination of the trademark application. Rights of owners and legal protection of trademarks. Industrial design. Application for industrial design and its examination. Rights of owners and legal protection of industrial designs. Authors ' rights. Agreement on the assessment of technology. Cooperation agreement. The contract on patent purity. Types of license agreements. Franchise. Commercial concession agreement. Exclusive license. Impact on the course of socio-economic and spiritual progress.	

Annex 4

Description of elective courses

Nameofdiscipline	Integratedplantprotection
2. Numberofcredits	5
3. Prerequisites:	Plant protection, Phytopathology, entomology, Herbology, breeding and seed production of agricultural crops
4. Post-requisites:	Agricultural system and crop production
5. Competences:	*know:* -chemical composition, properties of chemical means of plant protection, their transformation into soil, migration and their biological cycle; -classification and toxicity of pesticides, bases of resistance of harmful organisms to pesticides; *know:* -to use the method of drawing up an integrated plant protection system taking into account the influence of natural regulatory factors; -to make models of chemical and integrated crop protection; *Possess skills:* - drawing up a plan for the use of plant protection chemicals; - optimal selection of pesticides and biological means of plant protection in the development of integrated systems of plant protection from harmful organisms.
6. The author of the course	Turganbaev T. A., Ph. D.
7. Basicliterature	1.TheBazdyrev, G. I., Tretyakov N. N., Beloshapkina O. O. Integrated plant protection against harmful organisms.— M.: INFRA-M, 2014. — 302 p. 2.Reference book of pesticides (pesticides) permitted for use in the Republic of Kazakhstan. Astana 2013-2022. 3.Chulkina V. A., Toropova E. Yu., Starov G. Ya.. Integrated plant protection: phytosanitary systems and technologies. M.: Kolos, 2009. 4.Ageev, V. V. Agrochemistry Vol. 2: Fertilizers. Fertilizer system. Ecology / V. V. Ageev, A. I. Podkolzin; ed. by V. V. Ageev. – Stavropol: SSAU, 2006. – 480 p.: Il. – (Gr. THE MINISTRY OF AGRICULTURE OF THE RUSSIAN FEDERATION). – ISBN 5-5-98413-068-8: 5.A laboratory course in agricultural chemistry for agronomy: proc. manual / A. N. 6.Naulko, V. V. Ageev, Y. I., Podkolzin A. I.. Grechishkina, Y. O. Lobanova, L. S. Gorbatko, V. I. Radchenko, M. S. Sigida, S. A. Korostylev E. V. Golosnoy. N. In. Nikolenko; SSAU. - Stavropol: AGRUS, 2010. - 276 p. 7.Popova, L. I., Chemical means of plant protection.-

	Spbgturp.-2019., 96c.
8. The content of the discipline As a result of studying the discipline is necessary to acquire the knowledge and skills necessary for the successful use of modern means of plant protection of chemical and biological nature, the regulation of their use at the present stage of development of agriculture, as well as the skills of research activities. Master's student should be able to apply the knowledge about the benefits for the growth of sustainable land use of rational and safe use of modern means of plant protection, to disseminate and apply in practice new knowledge on the proper use of plant protection tools that provide environmentally and economically acceptable harvest.	

Nameofdiscipline	Optimizationofcropnutrition
2. Numberofcredits	Five
3. Prerequisites:	Biology, Agrochemistry, soil science, fertilizer application system, crop production, agriculture
4. Post-requisites:	Agricultural system and crop production
5. Competences:	*know:* - optimal levels of mineral nutrition of the most important agricultural crops; *know:* -optimal parameters of fertility of various types of soils and methods of their regulation, methods of plant and soil diagnostics, chemical composition of plants and methods of regulation of quality indicators of crop yields. *know:* -use the data of various methods of soil and plant diagnostics to optimize the conditions of mineral nutrition of plants with the whole to obtain maximum yields of agricultural crops with high quality indicators of production and profitability of their production. *have the skills:* -development of methods to optimize mineral nutrition; *be competent:* -in matters of mineral nutrition of crops and its optimization through the use of a set of agricultural techniques, taking into account soil and climatic conditions.
6. The author of the course	Nurmanov E. T., associate Professor
7. Basicliterature	1.Agricultural chemistry (ed. Mineeva V. G., Moscow: MGU, spike. Two thousand seven 2.Pryanishnikov, D. N. Selected works// D. N. Pryanishnikov.. Vol. 1, M. Kolos, 1965 3.Artushin A. M. Deryugin, I. P., A. Kulyukina An N.. Yagodin, B. A. Fertilizers in intensive

	technologies of cultivation of crops. M. Agropromizdat, 1991 4.Gurbetci Z. I. physiological and Agrochemical basis of fertilizer application. -M. Publishing house of USSR Academy of Sciences, 1963 5.Mineev V. G. Chemization of agriculture and natural environment. - M. Agropromizdat, 1990 6 Mineev V. G. Environmental problems of Agrochemistry. – M., 1988; 7 Chernenok V. G. nitrogen regime of soils of Northern Kazakhstan and application of nitrogen fertilizers- rhenium. – Akmola. One thousand nine hundred ninety seven 8 Chernenok V. G. Features of the phosphorus regime of soils of Northern Kazakhstan. – Bulletin science, AAU. – Akmola. – 1997 - №9 9 Chernenok V. G. Theoretical bases of optimization of conditions of phosphorus feed grain- high cultures. – Bulletin of science, AAU. – Astana. – 1998 – Vol. 2. - №2
8. The content of the discipline Optimization of nutrition of crops – the most important condition for increasing the productivity of agriculture. Chemical and biological processes in the soil and their role in the transformation of nutrients and improve the fertility of the soil. Optimal parameters of soil fertility in the conditions of intensification of agriculture. Creation of optimal conditions for plant nutrition and its regulation by applying fertilizers. Biological features of major crops and fertilizers system of preoptimization their food. Optimizationofmineralnutritionandcropquality	

Nameofdiscipline	Genetics of plants with the basics of breeding
2. Numberofcredits	5
3. Prerequisites:	Cytology, genetics, plant physiology, biochemistry, biotechnology
4. Post-requisites:	Theory and practice in breeding and seed production
5. Competences:	*know:* -modern methods of selection, ways of their development and improvement on the basis of the latest discoveries in genetics and molecular biology; -methods for creating source material for selection; - theoretical knowledge of the main achievements of plant genetics, breeding, patterns of inheritance of individual traits, modern ideas about the structure of the genome of plants; -methods of testing of breeding material, varieties, hybrids and offspring of elite plants in the relevant breeding nurseries; -requirements for zoning varieties and hybrids. *know:* - determine the types and varieties of field crops; - implement techniques of hybridization and crossing

	techniques; -conduct selections; -analyze the inheritance of traits and properties in a number of generations of hybrids of field crops; -grow elite seeds of field crops. *Have the skills:* -research of agricultural crops using modern techniques; - application of methods of selection and genetic analysis.
6. The author of the course	1 A. F. Petrov. Genetics with the basics of breeding. – M.: 1971.
7. Basicliterature	2 S. G. Inge – Vechtomov. Genetics with the basics of breeding. – M.:1989.
8. The content of the discipline Selection as a science. Cytological basis of heredity Mendelism. Principles and methods of genetic analysis. Chromosomal and non-chromosomal theory of heredity Molecular basis of heredity Structure and function of nuclei-new acids. Implementation of genetic information. Genetic code. Structure of the gene DNA markers for use in breeding. Gene injection. The variability of organisms, Intraspecific and distant hybridization. Inbreeding and heterosis Organization of breeding and seed production as a branch of agricultural production Seed production on an industrial basis. Technology of cultivation and standards for the quality of varietal seeds.	

Nameofdiscipline	Cellselection
2. Numberofcredits	5
3. Prerequisites:	biology, genetics, Cytology, organic chemistry, genetics, molecular biology
4. Post-requisites:	Theory and practice in breeding and seed production
5. Competences:	*know:* -modern methods of research of structure and function of cells; -structural and molecular organization of plant cells, -mechanisms of cellular functioning; -mechanisms of cell division and differentiation; -mechanisms of intracellular regulation; -basic principles of genome organization; -structure and function of the Pro – and eukaryotic gene; -chromosome structure and functions. *know:* -to use the knowledge gained in practice, to choose research methods that are adequate to the task. -to analyze modern scientific literature on cell biology and scientific problems considered in this discipline; -to identify the most important problem issues and predict their possible solutions. *have the skills:* -participation in scientific discussion, making independent

	judgments and independent decisions, free to navigate in the theoretical and methodological framework, to defend their point of view; the skills of using electronic resources at various levels.
6. The author of the course	Rysbekova A. B., ass.professor
7. Basicliterature	1 Alberts B., Bray D., Lewis D. Molecular cell biology: in 5 volumes. M.: Mir. 1994. 2 B. Alberts, A. Johnson, J. Levis et al. Molecular Biology of the Cell. Fifth Edition. Garland Science.2008.P -1268. 3 Chentsov Yu. S. Introduction to cell biology. Textbook. M., MSU, 2004. 494 p. 4 Afanas'ev Yu. I. and. Histology. M., 2000, 678s. 5 B. Glick, John.Parsnip. Molecular biotechnology. Principles and application. M.:Mir. 2002.-589 C. 6 Chentsov Yu. S. Introduction to cellular biology. Textbook. M., MSU, 2004. 494 p. 7 Bostock K., Sumner, E. the Chromosome of eukaryotic cells. M.: World, 1981.
8. The content of the discipline Introduction to cellular biology. The main stages of development of cell theory. Methods of cell biology. Organization and evolution of the nuclear genome. Molecular and spatial organization of chromosomes. Genetic apparatus of the cell. The structure of the chromosomes in Pro - and eukaryotes. Nucleic acid. DNA replication. Gene expression. Structure and functions of RNA. Proteinbiosynthesis. Prokaryoticgenes. Conceptsofeukaryoticgeneorganization.	

Nameofdiscipline	Physiological aspects of plant growth and development
2. Numberofcredits	5 creditstheory, 5 creditspractice
3. Prerequisites:	Disciplines under the bachelor's program
4. Post-requisites:	disciplinesofprofessionalactivity
5. Competences:	*Know:* - the main functions of the plant organism; - on the molecular mechanisms of physiological processes, the principles of perception, transmission and processing of information in the body; - on the main methods of plant physiology; at the level of the playback: - on the mechanisms of the main processes of life. - the manifestation of the basic laws of plant life at all levels of organization (molecular, cellular, organizational) - the role of plant physiology as the fundamental basis of all agronomic Sciences, biotechnology; - the dependence of the functions of plants from the environment. *Know:* -to use theoretical principles and methods of physiological

	analysis of plants; - conduct an experiment with plants; - solve problems on the main topics of the course on the calculation of the main indicators of water exchange, photosynthesis, respiration. - to use methods of research and analysis of living systems, mathematical methods of processing the results of physiological research *Have the skills:* - comply with safety requirements; - work with plant objects using physiological methods.
6. The author of the course	Seitkaziev A. I., Professor
7. Basicliterature	1.Koshkin E. I. Fiziologiya sustainability of crops / E. I. Koshkin. - M.: Bustard, 2010. - 636 p. - 18 EKZ 2.Sazanov, A. A. Genetics: proc. grown. / A. A. Sazanov. - SPb.: Lie to them.A. S. Pushkin, 2011. - 264 p. 3.Cellular engineering of plants: textbook / E. A Kalashnikov. M.: publishing house of Russian state agrarian University-MTAA, 2012. 318 p. 4.Ponomareva M. L., Zakiyev R. K. Field practice in genetics with the basics of breeding. Textbook. - Kazan; publishing House of Kazan University, 2007. - p. 144. 5.Maksimov G. V. , Collection of problems in genetics / [G. V. Maksimov, V. N. Vasilenko, O. I. klag U., Cummins M. Fundamentals of genetics. - Moscow: Technosphere, 2007. 6.Avdeev Yu. I. Genetic analysis of quantitative traits of plants / Yu. I. Guttman B., Griffiths E., 7.D. Suzuki, T. Cullis Genetics. M.: fair-PRESS, 2004.
8. The content of the discipline Subject, tasks, problems of plant physiology. Place in the system of biological Sciences. Levels of investigation of plant functions. Specific features of phototrophic organisms, their unity. Stages of development of science, the role of domestic scientists in the progress of plant physiology. The main structural components of eukaryotic cells. Interrelation, interdependence of structure and functional activity of cellular organoids. Structure and properties of biological membranes. The value of the membrane system of enzymes and metabolic funds of protoplast. Basic concepts of bioenergy. Electrochemical potential. Physico-chemical nature and significance of the process of photosynthesis in the General metobolism of the cell and the biosphere. Energy of photosynthesis. Photochemical stage. Participation of photochemical reactions in the process of photosynthesis. Fotomasterskie. Recovery cycle and related reactions, enzymes. Interaction of phototrophic organisms with oxygen. Physiology of water exchange of plants. Physiology of mineral nutrition. Transport of substances. Growth and development of plants. Movement of plants. Resistanceofplantstoadverseenvironmentalfactors.	

Nameofdiscipline	Bioinformatics

2. Numberofcredits	5
3. Prerequisites:	Disciplines under the bachelor's program
4. Post-requisites:	Disciplinesofprofessionalactivity
5. Competences:	*Know:* - History of bioinformatics development, principles and methods of genetic, protein and cell engineering; - methods of fundamental and applied research of biological Informatics; - Modern problems of molecular biology, solved using computer programming and modeling. *Know:* - To process the obtained experimental data; - Use the achievements of previous historical stages; - To demonstrate basic understanding of bioinformatics technologies, to apply them in practice; - Critically analyze the information received and present the results of research. *Have the skills:* - critical analysis and evaluation of modern scientific achievements, as well as methods of generating new ideas in solving practical problems, including in interdisciplinary areas. - creation of artificial genetic systems with specified properties.
6. The author of the course	Amralin A. U., associate Professor
7. Basicliterature	1.Lesk A. M. "Introduction to bioinformatics" Publisher: Binom. Knowledge laboratory, 2009, 350C 2.R Durbin, S Eddy, A Krogh, G Mitchison. "Analysis of biological sequences". Izhevsk: 2006. 480 PP. 3.Borodovsky M., With Ekishev. "Problems and solutions for the analysis of biological sequences". — Moscow-Izhevsk: SIC "Regular and chaotic dynamics", 2008. 420 PP. 4.Jean-Michel Clavery Bioinformatics for dummies. 2nd edition.2007.
8. The content of the discipline "Bioinformatics" studies genetic and mathematical methods of biology and considers the issues of computer analysis in comparative genomics (gene bioinformatics), mathematical methods, preparation of algorithms and (structural bioinformatics) and forecasting programs of spatial structures of proteins, strategies, research of necessary computational methodologies, centralized management of complex information of biological systems.	