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

Considered at the meeting
of the Academic Council
of the University
Protocol № 15 from «30» 05 2019 y.

CONFIRM
Chairman of the JSC "S.Seifullin
Kazakh Agrotechnical University"
A.Kurishbayev
«30» 05 2019 y.

EDUCATIONAL PROGRAM
«Agroengineering»

Code and classification of the field of education:
7M08 Agriculture and bioresources
Code and classification of training areas:
7M085- «Land management»
Code in the International Standard Classification of Education:
7M08
Qualification: Master of Agricultural Sciences in the educational program

Duration of study: 2 years

Nur-Sultan, 2019

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The team of authors was approved by the order of JSC «KATU named after S.Seifullin»
№932-N dated 12.12.2018; №962-N dated 12.12.2018 and №964-N dated 12.12.2018.
The educational program «Agroengineering»
considered at the meeting of the Department «Agricultural machinery and Technology» protocol №7 from «27» 01 2019 y.,

approved by the Council of the Technical Faculty
protocol № 9 «28» 02 2019 y.

Dean of the Technical Faculty Nukeshev S.O.

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Content

1 Passport of the educational program

1.1 Purpose of the educational program:

The purpose of the educational program (EP) «Agroengineering» is to prepare masters of science with relevant professional skills and competencies that contribute to solving theoretical and practical aspects of the impact of engineering systems (innovative and digital technology, technologies of the agro-industrial complex) to obtain potential agricultural productivity, and systemic problems facing agriculture.

To achieve the above-mentioned goal of the EP the tasks are formulated:

1. To develop independence and the ability to think scientifically and conduct scientific research in the field of agroengineering, to collect, process, analyze and systematize scientific and technical information on the subject of research, to choose methods and means of solving problems using innovative methods;

2. The association of the competent scientific and pedagogical staff of KATU, foreign scientists and managers of the largest agricultural enterprises for the preparation of masters of sciences, taking into account the needs of the labor market and the practice orientation of graduates;

3. Focusing on various groups of Masters of Sciences and their professional needs on the basis of providing them with flexible educational trajectories and forming the motivation of trainees for professional improvement, self-realization and practice-oriented research activities;

4. Formation of relevant professional skills and competencies among undergraduates that contribute to solving the most promising trends in agriculture and related sectors: mechanization, automation of agriculture, for solving engineering problems by using appropriate methods of analysis, synthesis and engineering design;

5. Formation of readiness of masters to organize and conduct practice-oriented innovation and research activities.

2 General characteristics of the educational program (relevance, features, competitive advantages, uniqueness, stakeholders, etc.)

The relevance of the educational program «Agroengineering» is due to the increasing demand in the labor market today for specialists, professionals in the field of modern methods of design, engineering design, planning experiments, scientific research in the field of agriculture, focused on finding solutions to many of the most important global problems of our time, mechanization of technological processes in agricultural production, which is in the world in practice, it is very necessary for the introduction of innovations and digitalization of agriculture.

The educational program was developed jointly with university professors and leading specialists, successful production managers, and also coordinated with the Dublin Descriptors and the European Qualifications Framework, based on the State Mandatory Standard of Higher Education approved by the Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2018 (№ 604) and the standard curriculum of the specialty in the field of training 7M085 – «Land management».

The total number of credits for this educational program is 120 credits, of which: the total number of credits for theoretical training is 84 credits (including all types of practices – 11 credits), the research work of a graduate student, including internships and the completion of a master's thesis – 24 credits, final certification – 12 credits.

A feature of the educational program is the consolidation of theoretical knowledge, while a high-quality professional infrastructure (educational resources) has been created on the basis of KATU, which is necessary for the implementation of EP:

- Scientific and experimental campus of the University (with an area of 12,000 hectares)
- Kazakh-Belarusian Personnel Training and Retraining Center;
- Kazakh-Chinese Agricultural Mechanization Center;
- Kazakh-German Precision Farming Center «Glass»;
- Kazakh-American Precision Farming Center «John Deer»;
- laboratory of 3-D visualization and modeling;
- Pavilions of agricultural machinery;
- animal husbandry mechanization laboratories;
- laboratories for testing internal combustion engines and fuel injection pumps;
- laboratories of service maintenance of transport equipment;
- GIS Technology Center;
- Design Bureau;
- workshop with metal cutting and welding equipment;
- robotics laboratory;
- laboratory of fuel and lubricants;
- reading and computer rooms.

In addition, the TS together with the masters, takes an active part in the implementation of the National Program for the Digitalization of the agro-industrial complex of the country. At the moment, the industries in agro-energy, agro- and bio-processing, agrotechnology, food industry, aquaculture, agriculture, crop production, animal husbandry and timber processing need specialists with good training and digital literacy.

The uniqueness of the EP lies in the absence of such programs in Kazakh universities that combine all theoretical and practical aspects of biological systems management with the most promising trends in the agro-industrial complex and related sectors - mechanization, agricultural automation, digital technologies, including blockchain technology, KPI technology, etc.

As part of this educational program, undergraduates have the opportunity to travel to leading universities in Europe, the USA, China and the EAEU, to study and undergo scientific internships at leading universities in the world, such as the University of Angers (Université d'Angers, France), the University of California at Davis (UC Davis, USA), Xinjiang Agricultural University and the North-Western University of Agriculture and Forestry (China), Weienstephan-Triesdorf University of Applied Sciences (Germany), Belarusian State Agrarian Technical University (Belarus), etc, Graduates of the specialty study in the master's and doctoral programs of the People's Republic of China and the USA.

The advantage of the educational program is that it is optimized on the basis of long-term practice, taking into account the solution of all accumulated problems, and is maximally adapted to the world modern realities of the development of agriculture. Competent and professional teaching staff, scientific consultants of dissertations have a high citation index, as well as a huge body of knowledge, confirmed by the implementation of the results in production.

The competitive advantages of this educational program are the following:

- highly qualified and relatively young teaching staff (about 70% settled down);
- high material and technical equipment of the educational program (there are 3 operating centers at the department);
- training is conducted in three languages (state, Russian and English);
- introduced distance learning using Internet technologies for continuous training of specialists from production;
- dual training technology has been introduced (part of the classes are held at the production and research institute);
- Programs have been widely implemented: international credit mobility, external and internal mobility of the Ministry of Education and Science of the Republic of Kazakhstan.
- close communication with employers and graduates of the educational program has been established;
- 100% provision of a hostel for living during training;

The main stakeholders of the EP are:

1. TS, doctoral students, undergraduates, parents, persons equated to them and relatives of doctoral students;
2. Ministry of Agriculture of the Republic of Kazakhstan – State Inspection Committee in the agro-industrial complex;

3. Management of organic products and technical regulation;
4. Research institutes and research and production centers;
5. Consulting companies for education and training;
6. Agro-industrial complex, farms and peasant farms;
7. Plants, factories and plants;
8. Patent, design bureau.

3 Competence model (portrait) graduate

3.1 Areas of professional activity

The scope of professional activity of the Master of Science in the direction of «Agroengineering» includes:

- technical and technological modernization of agricultural production;
- efficient use and maintenance of agricultural machinery, machinery and equipment, means of electrification and automation of technological processes in the production, storage and processing of crop and livestock products;
- scientific research, scientific production, design organizations, nature protection bodies, practical enterprises and design organizations and machine testing stations;
- management activities in agricultural organizations of various forms of ownership, local and republican governing bodies of education, agriculture.

3.2 Types of professional activity

A graduate of the educational program «Agroengineering» in the field of training 7M085 – «Land management» can hold the positions of engineers, mechanics, managers, designers, leading specialists:

- in higher educational institutions, research institutes;
- in various types of agricultural formations (firms, enterprises, farms and peasant farms);
- in machine technological stations (MTS);
- in social and entrepreneurial complexes (SEC);
- at processing and energy supply enterprises, plants, factories, plants;
- in design and engineering organizations;
- in local and republican agricultural management bodies.

3.3 General education competencies

Masters of Agricultural Engineering have the following general educational competencies:

- ability to abstract thinking, analysis, synthesis;

- readiness for self-development, self-realization, to use creative potential and act in non-standard situations, to bear social and aesthetic responsibility for the decisions made;

- demonstration of developing knowledge and orientation in the field under study, based on advanced knowledge of this field, in the development and (or) application of ideas in the context of research.

- professional application of their knowledge, understanding and ability to solve problems in a new environment, in a broader interdisciplinary context;

- the ability to use the basics of natural science knowledge and methodology to identify production problems and solve professional tasks;

- confident use of modern information technologies for work, leisure and communication;

- knowledge of the traditions and culture of the peoples of Kazakhstan; awareness of the attitude of tolerant behavior of the individual and prevention of domestic racism, xenophobia, extremism; possession of high spiritual qualities;

- ability to apply modern experimental methods of working with objects in field and laboratory conditions, skills of working with modern equipment.

3.4 Basic competencies

Agroengineering basically considers not just science, but the practical application of scientific knowledge to solve urgent problems with the effective use of costs. The graduate of the educational program «Agroengineering» must possess the following basic competencies:

- possess basic knowledge in the field of engineering science, have the ability to engage in self-study, be able to effectively manage time and information, strive for professional and personal growth;

- possess deep theoretical knowledge and practical experience, basic engineering knowledge in the field of technical and energy support of high-precision technologies for the production of agricultural products and agricultural production;

- the ability and willingness to organize high-performance use and reliable operation of agricultural machinery and technological equipment for the production, storage, transportation and primary processing of crop and livestock products at large agricultural enterprises;

3.5 Professional competencies

A Master of Science who has studied under the educational program «Agroengineering» must possess the following key competencies:

- to consider rationalization proposals for improving the technologies of storage and processing of agricultural products and to give conclusions on the expediency of their use.

- the ability to carry out engineering calculations for the design of systems and facilities and the willingness to apply engineering knowledge about modern research methods.

- ability to project activities based on a systematic approach,

the ability to build and use models to describe and predict various phenomena, to carry out their qualitative and quantitative analysis.

4 Base of professional practices (all types of practices)

The educational program of the scientific and pedagogical magistracy includes 2 types of practices - pedagogical, research:

Pedagogical practice is organized in order to develop undergraduates' skills in developing a training course, independently conducting seminars and practical training sessions, as well as gaining experience in organizational and educational work. Pedagogical practice of undergraduates is a mandatory part of the educational program of higher professional education and is conducted in accordance with the approved working curriculum and schedule of the educational process.

Research practice is a form of professional training of undergraduates for scientific, pedagogical and scientific activities, which is a type of practical activity of undergraduates related to conducting scientific research within the chosen topic of research work. The objects of the master's research internship are various organizations of the industrial, scientific and research sphere, divisions of enterprises, farms and peasant farms, as well as higher educational institutions. It also applies to scientific and production associations, scientific, design and design organizations, public administration bodies. The University has signed contracts with enterprises for the passage of undergraduates.

The largest employers for conducting research practices are: scientific and production center of grain farming named after A.I. Barayev; LLP "North Kazakhstan Agricultural Experimental Station"; JSC Atameken-Agro; LLP "Agrocenter Astana"; LLP Agrofirma "Rodina"; LLP "Eurasia Group"; Akkol branch of LLP "KazNIIMESH"; Akmola Phoenix LLP; Izhevsk PC; TNK LLP; Shakhterskoye LLP; STAGRO LLP; Agricultural Engineering Design Bureau; S.Seifullin Kazakh Agrotechnical University, etc.

5 Structure of the Master's degree program in the scientific and pedagogical direction

№ n/a	Name of cycles of disciplines and types of activities	Total labor intensity	
		in academic hours	in academic credits
1	2	3	4
1.	Theoretical training	1920	64
1.1	Cycle of basic disciplines (BD)	1050	35
	University Component (UC):	600	20
	including:		
	History and philosophy of science	150	5
1)	Foreign language (professional)	150	5
	Higher school pedagogy	90	3
	Management Psychology	150	5
	Pedagogical practice	60	2
	Component of choice (CC)	450	15
	including:		
	Modeling of systems	150	5
2)	Computer simulation		
	Basics of Similarity		
	Higher Engineering Mathematics	300	10
	Mathematical modeling of biology		
1.2	Cycle of profile disciplines (PD)	1470	49
	University Component (UC):	900	30
	including:		
1)	GIS and remote sensing technologies in agriculture	90	3
	Theoretical foundations of agricultural	300	10

	production mechanization		
	Fundamentals of scientific research	180	6
	Engineering design	180	6
	Experiment planning	150	5
2)	Component of choice (CC)	300	10
	including:		
	Technical support of technological processes in the precision farming system	300	10
	High-precision agricultural technologies		
3)	Research practice	270	9
2	Research work	720	24
1)	Research work of a master's student, including internship and completion of a master's thesis (RWMS)	720	24
3	Additional types of training (AToT)		
4	Final certification (FC)	360	12
1)	Registration and defense of a master's thesis (RaDoMT)	360	12
	Total	3600	120

Appendix 1. Academic Calendar***

КУРСЫ			Сентябрь				Октябрь					Ноябрь				Декабрь				Январь					Февраль			
I	2019	#	2	9	#	#	#	7	#	#	#	4	#	#	#	2	9	#	#	#	6	#	#	#	3	#	#	#
	2020	#	6	#	#	#	4	#	#	#	1	8	#	#	#	6	#	#	#	3	#	#	#	#	7	#	#	#
№ недели			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			пн	•	•	•	•	•	•	•	•/Н	../пп	./пп	С	С	зд	зд/з с	К	К	К	•/Н	•	•	•	•	•	•	•
II	2020		#	7	#	#	#	5	#	#	#	2	9	#	#	#	7	#	#	#	4	#	#	#	1	8	#	#
	2021		4	#	#	#	2	9	#	#	#	6	#	#	#	4	#	#	#	1	8	#	#	#	5	#	#	#
№ недели			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			•	•	•	•	•	./н	•/Пи	•/Пи	./Пи	./Пи	С	н	н	н	н	н	Н	Н	пи/н	пи/н	пи/н	пи/н	пи/н	Н	Н	Н

КУРСЫ		Март				Апрель					Май				Июнь				Июль					Август			
I	2019	2	9	#	#	#	6	#	#	#	4	#	#	#	1	8	#	#	#	6	#	#	#	3	#	#	#
	2020	6	#	#	#	3	#	#	#	1	8	#	#	#	5	#	#	#	3	#	#	#	#	7	#	#	#
№ недели		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		•	•	С	С	•/Н	•	•	•	•	•	•	•	•	•	С	С	к/л	к/л	к/л	к/л	к	к	к	к	к	к
II	2020	1	8	#	#	#	5	#	#	#	3	#	#	#	#	7	#	#	#	5	#	#	#	2	9	#	#
	2021	5	#	#	#	2	9	#	#	#	7	#	#	#	4	#	#	#	2	9	#	#	#	6	#	#	#
№ недели		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		Н	Н	Н	Н	Н	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х									

Презентация	Теор. обучение	Зап.на дисц.	Экзам. сессия	Каникулы	Исследоват практика	Педагог. практика	НИРМ	Компл экзамен	Итоговая аттестация	Сдача FX	Летний семестр
пн	.	ЗД	С	К	пи	пп	Н	/	Х	ЗС	л

Праздничные дни

День столицы	6 июля	Международный женский день	8 марта
День Конституции РК	30 августа	Праздник "Наурыз"	21-23 марта
День Первого Президента РК	1 декабря	День единства народов Казахстана	1 мая
День независимости РК	16-17 декабря	День защитника отечества	7 м:
Новый год	1-2 января	День победы	9 м

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

Appendix 2. Working curriculum

Шифр модуля	Наименование модуля	Цикл дисциплины	Компонент дисциплины	Код дисциплины	Наименование дисциплины	Кредиты РК	Контроль по семестрам		Объем в часах							Распределение объема учебных часов по семестрам/триместрам/кварталам					
											в т.ч.										
							Экзамены	Дифференцированный зачет(практика)	Всего	Аудиторные	Лекции	Практические	РК1, РК2, экз.	СРМП	СРМ	1	2	3	4	5	6
																Количество недель в семестре/триместре/квартале					
Общие модули																					
1	Общественные науки	Б Д	В К	IFN 5201	История и философия науки	5	1		150	50	30	20		20	80	5					
2		Б Д	В К	Ped 5203	Педагогика высшей школы	3	1		90	30	20	10		12	48	3					
		Б Д	В К	Psi 5204	Психология управления	5	1		150	50	30	20		20	80	5					
4		Б Д	В К	IYaP 5202	Иностранный язык (профессиональный)	5	1		150	50		50		20	80	5					
5		Б Д	В К	ПП	Педагогическая практика	2		1	60							2					
Модули специальности																					
6	Научно исследовательский	Б Д	К В	MS 5205	Моделирование и анализ биологических и физических систем	5	2		150	50	30	20		20	80		5				
					Компьютерное моделирование																

					Основы подобия															
7		БД	КВ	VIM 5206	Высшая инженерная математика	10	2, 3		300	100	60	40		40	160		5	5			
					Математическое моделирование биологии															
10	Проектирование и планирование	ПД	КВ	TGiDvSH 6207	Технологии ГИС и ДЗЗ в сельском хозяйстве	3	3		90	30	20	10		12	48			3			
12	Теория механизации	ПД	ВК	TOMSP 5302	Теоретические основы механизации сельскохозяйственного производства	10	2, 3		300	100	60	40		40	160		5	5			
13		ПД	ВК	ONI 5301	Основы научных исследований	6	2		180	60	30	30		24	96		6				
14	Процессы агроинженерных производств	ПД	ВК	IP 5304	Инженерное проектирование	6	4		180	60	30	30		24	96				6		
15		ПД	КВ	MTPSTZ 6307	Техническое обеспечение технологических процессов в системе точного земледелия	10	3, 4		300	100	60	40		40	160			5	5		
					Высокоточные технологии сельского хозяйства																
16		ПД	ВК	PE 6308	Планирование эксперимента	5	4		150	50	30	20		20	80				5		

17		ПД	ВК	ПИ	Исследовательская практика	9		5	270									4	5	
Итого теоретического обучения						**84**	**15**	**2**	**2520**	**730**	**380**	**350**		**292**	**1168**					
НИРМ	Научно-исследовательская работа магистранта, включая прохождение стажировки и выполнение магистерской диссертации					24		1-6	720							1	1	1	1	12	8
ДВО	Дополнительные виды обучения																			
ИА	**Итоговая аттестация**					12			360											
	Оформление и защита магистерской диссертации					12	6		360											12
	Итого					**120**			**3600**	**730**	**380**	**350**		**292**	**1168**	21	22	19	21	17	20

Appendix 3. Description of the disciplines of the university component

1. Basic information about the discipline:	
Name of the discipline	**History and philosophy of science**
2. Number of credits	5
3. Prerequisites:	Философия (курс бакалавриата), религиоведение (курс бакалавриата), социология (курс бакалавриата)
4. Post-requirements:	Pedagogical practice, dissertation
5. Competencies:	They should have a presentation about the subject of professional activity and about the methods of self-determination and introspection, about the basics of theories of speech communication. Know the correct presentation of their thoughts orally and in writing; formulation of conclusions. Be able to: design the educational process; form speech and communicative competence. Have skills in means and technologies of unsupervised learning; evaluation of achieved results; organization and management of students' activities; use of argumentation theory, logic. Be competent in the field of scientific and scientific-pedagogical activity in higher educational institutions; in matters of modern educational technologies; in ways to ensure constant updating of knowledge, expansion of professional skills and abilities.
6. Author of the course	Abdina A.K.
7. Basic literature	1 Abdina A.K. "Philosophy", 2008; 2 Ibraeva K.J. "Organization and planning of scientific research in professional pedagogy", 2008; 3 Trofimova N.M., Pushkina T.F., Kozina N.V. "Age psychology", 2009.
8. The content of the discipline. Analysis of philosophical and ideological, epistemological, logical and methodological issues. Skills and abilities of research activity. Structure and functions of scientific knowledge. Methods of science. Philosophical views on science. Worldview. History of science. Methods of scientific cognition. Systematic understanding in the field of study and mastering the skills and methods of research in a particular field. Actual methodological and philosophical problems of science.	

1. Basic information about the discipline:	
Name of the discipline	**Higher school pedagogy**
2. Number of credits	3 (scientific-pedagogical)
3. Prerequisites:	Philosophy, Sociology, General Pedagogy, General Psychology
4. Post-requirements:	Pedagogical practice. Implementation of the activities of a teacher of higher professional education and management of the pedagogical process.
5. Competencies:	As a result of studying the discipline **«Pedagogy of higher education»**, a master's student - will learn: actual problems of pedagogical science ; the essence of pedagogical activity of a university teacher; -master the ability to: isolate pedagogical facts, phenomena, events from the surrounding reality and describe them in the language of pedagogical science, based on the laws of pedagogical theories, explanations, forecasting and development; constructing the educational process based on new concepts of teaching and upbringing. Will be competent: in teaching and in solving problems of higher pedagogical education and prospects for its further development; in the application of effective teaching technologies in higher education; solutions to topical psychological and pedagogical problems, evaluation of the results achieved;
6. Author of the course	Department of Vocational Training (Sagalieva Zh.K., Zhusupova A.A., Shakhmatova D.S., Seilkhan G.I.)
7. Basic literature	1. Zavada G. V., Bushmina O. V. Pedagogy of higher school: Textbook. – Kazan: KSEU, 2008. 2. Kuznetsov I. N. The handbook of a practicing teacher: Textbook. – M.: Gross Media: ROSBUKH, 2008. 3. Esekeshova M. D., Sagalieva Zh.K. Pedagogy of higher school: Textbook. manual. – Astana: Foliant Publishing House, 2018.
8. Content of the discipline	Fundamentals of higher school pedagogy. The subject and tasks of higher school pedagogy. Methodology and methods of pedagogical research in higher education. Didactics of higher education. The pedagogical process in higher education. Laws, patterns and principles of learning. Methods, forms and means of teaching in higher education. The current state of higher education in the Republic of Kazakhstan. Professional formation of a high school teacher. The process of education in high school. The purpose of education as a pedagogical problem. Educational staff as a form of functioning of an integral pedagogical process. Management of the pedagogical process.

1. Basic information about the discipline:	
Name of the discipline	Management Psychology
2. Number of credits	5 (scientific-pedagogical)
3. Prerequisites:	Philosophy, Sociology, General Psychology, Psychology of higher education
4. Post-requirements:	Pedagogical practice, research practice. Psychological support of management activities; methods of working with functional states in the manager's activities;
5. Competencies:	As a result of mastering the discipline , a master 's student must: To know: 1. socio-psychological content and structure of management activities; and management functions; psychological characteristics of the personality of the head; psychological patterns of joint activities to achieve organizational goals; 2. basic approaches to solving managerial tasks and rules for solving them in the conditions of actual production structures, methods of working with functional states in the manager's activities, optimization of management processes; Be able to: 1. apply the knowledge gained during the course; freely operate with psychological concepts; use psychological knowledge in explaining phenomena in the field of management psychology and group processes. 2. to analyze the professional activity of the manager from the point of view of ensuring his psychological effectiveness; to apply methods and techniques aimed at developing the professionalism of management personnel, the personality of the manager and improving the effectiveness of the management system; Own: 1. professional skills of psychological analysis of the professional activity of the manager, phenomena in the field of work and joint activities to achieve organizational goals; 2. practical skills of psychological support of management activities; methods of working with functional states in the manager's activities; skills of using developing technologies aimed at improving the professionalism of management personnel and team management; **Be competent** in readiness to lead a team in the field of their professional activities, tolerantly perceiving social, ethical, confessional and cultural differences.
6. Author of the course	Zhusupova A.A., Sagalieva Zh.K., Shakhmatova D.S., Seilkhan G.I.
7. Basic literature	Rostov– on–Don Rostov-on-Don Phoenix 2007. 2. Stolyarenko A.D. "Psychology of business communication and management" Rostov –on–Don Phoenix 2008. 3. Volkogonova O.D., Zub A.T. "Management psychology" Moscow Publishing House "Forum" - Infra – M 2007. 4. Nemov R.S. "Psychology" Moscow publishing center "Vlados" 2010.
8. Content of the discipline	Fundamentals of psychology.

	Psychological aspects of small groups and collectives. "Socio-psychological foundations of the leader's activity".

1. Basic information about the discipline:	
Name of the discipline	**Foreign language (professional)**
2. Number of credits	5 - Scientific and pedagogical direction (2 - subject oriented)
3. Prerequisites:	Foreign language (Bachelor's degree) (B1-B2) English for special purposes (B1-B2) Professionally oriented foreign language (B1-B2)
4. Post-requirements:	Disciplines in the specialty in English, English for academic purposes
5. Competencies:	Proficiency in a foreign language (English) at the level B2-(IELTS 5.5-6.0), C1 (IELTS 7.0) with knowledge of terminology and terminology sublanguage of the specialty.
6. Author of the course	Department of Foreign Language
7. Basic literature	1. Laurence Anthony (May 18, 2018) *Introducing English for Specific Purposes (Routledge Introductions to English for Specific Purposes) 1st Edition.* Routledge 2. John Flowerdew, Tracey Costley (07 Oct 2016). *Discipline-Specific Writing: Theory into practice.* Taylor & Francis Ltd. 3. by Jackie Stavros, Cheri Torres, David L. Cooperrider (22 May 2018). *Conversations Worth Having: Using Appreciative Inquiry to Fuel Productive and Meaningful Engagement.* Berrett-Koehler Publishers 4. Nadežda Stojković (July 2018) *Positioning English for Specific Purposes in an English Language Teaching Context.* Vernon Series in Education.

8. The content of the discipline. The course program is designed for the amount of teaching – 150 hours (90 hours specialized), of which: 45 hours (18) – for classroom work and 90 (36) hours – for independent work. The course ends with a comprehensive exam. The course is designed for 1 semester

1	Vocabulary 3000-4000 words	Active dictionary-1200-1400 words, passive dictionary 1800-2400
2	Reading	The formation of the ability to read with almost complete understanding (level B1) and with full understanding (level C1). Authentic thematic texts and texts on the specialty
3	Letter	The formation of the ability to independently write an article, official and unofficial letters. Can know and use different styles when creating a written text on topics in the specialty
4	Listening	The formation of the ability to perceive authentic messages containing professional information by ear
5	Speaking	Formation of oral communication skills in the specialty in the form of a monologue\ dialogue \ polylogue

1. Basic information about the discipline:	
Name of the discipline	**GIS technologies and RSE**
2. Number of credits	5
3. Prerequisites:	geography, mathematics, physics.
4. Post-requirements:	Master's thesis
5. Competencies:	Have knowledge in the field of computer science and modern geoinformation technologies, have the skills to use software and work in computer networks, be able to create databases and use Internet resources, possess GIS technologies, be able to work with information from various sources to solve professional problems, have an idea of the current state of the remote sensing data market, their features and characteristics, to know the theoretical foundations and methodology of digital image processing for the purposes of mapping and monitoring of agriculture, be able to work in specialized software packages for processing and analyzing remote sensing data, be able to classify remote sensing data and extract information about the state of crops and their diseases.
6. Author of the course	Ermakov F.K.
7. Basic literature	1. Thenkabail, P.S., Knox, J.W., Ozdogan, M., Gumma, M.K., Congalton, R.G., Wu, Z., Milesi, C., Finkral, A., Marshall, M., Mariotto, I., You, S. Giri, C. and Nagler, P. 2012. Assessing future risks to agricultural productivity, water resources and food security: how can remote sensing help?. Photogrammetric Engineering and Remote Sensing, August 2012 Special Issue on Global Croplands: Highlight Article. 78(8):773–782. IP-035587. 2. Russell G. Congalton, Kass Green. 2019. Assessing the Accuracy of Remotely Sensed Data: Principles and Practices, Third Edition. Reference - 328 Pages - 19 Color & 37 B/W Illustrations . ISBN 9781498776660 - CAT# K29742. 3. Prasad S. Thenkabail, John G. Lyon, Alfredo Huete. Fundamentals, Sensor Systems, Spectral Libraries, and Data Mining for Vegetation. 2018. Reference - 449 Pages - 118 Color & 57 B/W Illustrations ISBN 9781138058545 - CAT# K33293 4. Prasad S. Thenkabail, John G. Lyon, Alfredo Huete. Hyperspectral Indices and Image Classifications for Agriculture and Vegetation. 2018. Reference - 296 Pages - 85 Color & 21 B/W Illustrations ISBN 9781138066038 - CAT# K33412 5. Prasad S. Thenkabail, John G. Lyon, Alfredo Huete. Hyperspectral Remote Sensing of Vegetation, Second Edition, Four Volume Set. Reference - 1478 Pages - 414 Color & 204 B/W Illustrations ISBN 9781138066250 - CAT# K33423 6. Jensen, John R. Remote sensing of the environment: an earth resource perspective. 2nd ed. 2007. 550.28 – dc22. ISBN 0-13-188950-8

8. The content of the discipline. Fundamentals of GIS and remote sensing: Coordinate systems. Positioning systems. Cartographic projections. Electronic maps, layers. Digital image. Multispectral image. Hyperspectral image. Remote sensing of the earth. Satellites.**GIS and remote sensing:** Spatial data collection. Creating a spatial database. Features of the organization of data storage. Digitization of data. Photogrammetry. Correction of remote sensing data. Remote sensing data processing. **Data analysis:** Spatial analysis. Classification approaches. Types of classified data. Identification of types of crops according to remote sensing data. Identification of diseases of crops according to remote sensing data. Identification of the main properties of soils according to remote sensing data.

1. Basic information about the discipline:	
Name of the discipline	**Theoretical foundations of agricultural production mechanization**
2. Number of credits	10
3. Prerequisites:	Agricultural machines (bachelor's degree course), agrotechnological machines of animal husbandry (bachelor's degree course), mechanization of animal husbandry (bachelor's degree course).
4. Post-requirements:	Master's thesis
5. Competencies:	**A.** Knowledge and understanding of machines and tools for performing basic technological processes and operations of the agricultural process; devices, workflow and adjustments of modern agricultural production machines. **B.** Knowledge of methods of theoretical justification of the processes of mechanization of agricultural production, setting machines to a given operating mode; energy saving of technological processes of post-harvest processing and storage of agricultural products. **C.** The ability to correctly calculate the parameters of machines and tools, evaluate the quality of work and the effectiveness of the use of modern agrotechnological machines; compare, formulate conclusions, build their own argumentation, express their position on the main issues of the technological process, formulate conclusions about the use of specific equipment, build their own argumentation; compile and prepare machines and tools for work and select for them necessary energy resources. **D**. The ability to master modern designs and technological processes of agrotechnological machines. **E**. The ability to analyze key issues on the justification of the basic parameters and modes of operation of working bodies, mechanisms of agrotechnological machines and their design.
6. Author of the course	Aduov M.A., Zaichko G.A.
7. Basic literature	1 Klenin N.I. Agricultural machines: textbook for students. universities, training. for example, "Agroengineering" / N.I. Klenin, S.N. Kiselyov, A.G. Levshin; [ed. Yu.A. Chichov].-Moscow : KolosS, 2008. - 816 p. : ill. 2 Aduov M.A. Mechanization of sowing seeds of grain crops and application of mineral fertilizers. Monograph, S. Seifullin KATU, Astana, 2008. - 209 p. 3 Aduov M.A., Kapov S.N., Nukusheva S.A. Seeders with combined coulters for direct sowing of grain crops. Monograph, KATU named after S.Seifullin.-Astana: 2017. -142 c. 4 Shilo I.N., Romanyuk N.N., Kitun A.V., Kolonchuk V.M.,

	Kolonchuk M.V., Abdyrov A.M., Nukeshev S.O., Zaichko G.A. Manual for solving engineering problems and production situations on technical support and service of animal husbandry. Astana, S. Seifullin KATU, Astana, 2017. - 223 p. 5 Kolga D.F., Kazarovets N.V., Simanovich V.S., etc. Technical support of processes in animal husbandry: a textbook. - Minsk: IVC of the Ministry of Finance, 2012. - 576 p. 6 Novikov A.V., Shilo I.N., Ketsko V.N. Diagnostics and maintenance of machines for agriculture: study guide. - 2nd ed. - Minsk: BGATU, 2010. - 404 p. 7 Torekhanov A.A. Scientific achievements in the field of animal husbandry: inform. sb. about scientific achievements in the region of animal husbandry / M-vo rural household of the Republic of Kazakhstan. - Almaty: Kazniizhik, 2011. - 184 p.
8. The content of the discipline. Theory and calculation of modern machines and implements for tillage. Theoretical foundations of mechanical tillage. Tillage machines and tools for tillage. Energy assessment of plows, huskers, harrows and milling cutters. Technological process of machines and calculation of the main parameters of machines for applying organic and mineral fertilizers.. The energy intensity of the fertilizer application process. Modern sowing and planting machines. Machines for protecting plants from pests, diseases and weeds. Technological process and justification of the mode of operation of machines. Calculation of the main working bodies and operating modes of forage harvesting, harvesting, grain cleaning and sorting machines. The purpose of the device, workflow and adjustments of modern livestock farming machines. Fundamentals of the theory of the processes of grinding, dosing, mixing, pressing, moisture-thermal and chemical processing of feed, milking and primary processing of milk, cleaning and removal of manure. Theories of animal husbandry mechanization processes, setting up machines for a given operating mode. The quality of work and the efficiency of the use of modern agrotechnological machines. Modern designs and technological processes of agrotechnological machines. Key questions on the justification of the main parameters and modes of operation of working bodies, mechanisms of agrotechnological machines and their design.	

1. Basic information about the discipline:	
Name of the discipline	**Fundamentals of scientific research**
2. Number of credits	5
3. Prerequisites:	History and philosophy of science
4. Post-requirements:	Technical support of technological processes in the precision farming system, Master's thesis
5. Competencies:	**A.** Knowledge and understanding of the main provisions of creative thinking; scientific tasks; creative work on the search, analysis, development and introduction into production of significant developments; goals, objectives and stages of research, experimental methods. **B.** Possession of practical skills in conducting scientific research; methods of substantiation of the main design and technological parameters of the work of working bodies, machines, aggregates; methods of conducting experimental studies and processing experimental data. **C**. The ability to compare, formulate conclusions, build their own argumentation, express their position on the main issues of scientific research and experimental planning.

	D. The ability to compare, formulate conclusions, build their own argumentation, express their position on the main issues of scientific research; evaluate theoretical and experimental research. **E.** The ability to analyze the state of scientific research; questions of planning experiments to substantiate the main parameters and modes of operation of working bodies, mechanisms of agrotechnological machines
6. Author of the course	Kostyuchenkov N.V.
7. Basic literature	1. Kovrikov I.T. Fundamentals of scientific research and UNIRS. Textbook./ I.T. Kovrikov. – Orenburg: LLC "Agency "Press", 2011. – 212 p. 2. Fundamentals of scientific research: Textbook / B.C. Kravchenko, E.I. Trubilin, B.C. Kurasov, V.V. Kutseev, E.V. Truflyak-KubGAU. - Krasnodar, 2005. - 136 p.: ill. 3. Fundamentals of scientific research: Methodological guidelines. Collection of tasks / B.C. Kravchenko, E.I. Trubilin, B.C. Kurasov, V.V. Kutseev, E.V. Truflyak. KubGAU. - Krasnodar, 2005. - 105 p.: ill. 4. Fundamentals of scientific research and modeling: educational and methodological complex / A.N. Leonov, M.M. Dechko, V.B. Lovkis. – Minsk: BGATU, - 2010. - 276 p. 5. Fundamentals of scientific research in examples and tasks: an educational and methodological manual / A.N. Leonov, M.M. Dechko, V.B. Lovkis; edited by A.N. Leonov – Minsk: BGATU, 2013. - 136 p.
8. The content of the discipline. The main provisions. Methodological foundations of scientific knowledge. Theoretical and empirical research. Research methods. Choosing the direction of scientific research. Basic requirements for scientific research. Stages of research work. Search and accumulation of scientific information. Processing of scientific information. Theoretical research. Research methods. Stages of theoretical research. Experimental studies. Classification, types and tasks of the experiment. Preparation and conduct of the experiment. Methodology of the experiment. Metrology. Processing of experimental research results. Analysis of theoretical and experimental studies. Introduction of scientific research. Processing of experimental research results. The effectiveness of scientific research.	

1. Basic information about the discipline:	
Name of the discipline	**Engineering design**
2. Number of credits	5
3. Prerequisites:	History and philosophy of science, fundamentals of scientific research.
4. Post-requirements:	Master's thesis
5. Competencies:	**A.** To have an idea about the basic methods of designing and creating general engineering and agricultural systems, designing new equipment and technological processes in accordance with modern requirements of their operation of technical systems, fundamentals of economic theory; about forecasting and making competent engineering and design decisions; about the concept of goals, objectives and stages of scientific research, general research methodology; **B.** To know the practical skills of designing and constructing engineering systems; practical skills and methods of substantiating the basic design and technological parameters of the work of working bodies, machines, aggregates; methods of conducting experimental

	research and processing experimental data; **C**. Be able to compare, formulate conclusions, build their own arguments, express their position on the main issues of engineering systems design; use patent, technical and reference literature; evaluate theoretical and experimental research; compare, formulate conclusions; **D.** Have the skills to form a sense of tolerance, responsibility, respect and compliance with legislation regulating labor activity and norms of service and interpersonal ethics; use of modern methods of planning experiments of technological processes; **E**. To be competent in analyzing the state of engineering systems of agricultural production; in determining and solving problems in the field of designing agricultural machines, the economic efficiency of newly created tools; when working with educational and methodological literature, visual and technical training tools, analyzing the issues of planning experiments to substantiate the main parameters and modes of operation of working bodies, machine mechanisms.
6. Author of the course	Iskakov R.M.
7. Basic literature	1 Kruchinin V.V. Computer technologies in science, education and production of electronic equipment, 2012 http://e.lanbook.com/books/element.php?pl1id=4945 2 Klepikov V.V., Soldatov V.F. "Designing of technological equipment", 2008. 3 Benyukh O.A. Engineering design [Electronic resource]. Kostanay: KSU, 2012. http://www.rmeb.kz/default.asp?sign=1&dbid=RMEB
8. The content of the discipline. The result of studying the discipline undergraduates is knowledge of the basics of designing and constructing machines, methods of substantiation and calculation of the main parameters and modes of operation of agricultural machines, aggregates; knowledge of patent, technical and reference literature, the main directions and trends in the development of scientific and technical processes in the field of agricultural machinery. The ability to determine the areas of economically feasible application of all types and types of agricultural machinery and equipment; the ability to design and construct machines, mechanisms, components and equipment for various purposes used in agriculture, with simple and complex types of loads; the ability to evaluate the design and construction of machines, mechanisms, components and equipment by economic, technological and energy factors; the ability to justify, perform calculations and design individual more advanced workers organs and assemblies of agricultural machines; the ability to sketch out the design and construction of machines, mechanisms, assemblies and equipment; the ability to develop technological documentation for the production of agricultural machinery and equipment; the ability to use modern computer technology when solving design and operational work; the ability to determine ways to reduce the metal consumption of designed and constructed machines, mechanisms, components and equipment.	

1. Basic information about the discipline:	
Name of the discipline	**Experiment planning**
2. Number of credits	5
3. Prerequisites:	History and philosophy of science, fundamentals of scientific research.
4. Post-requirements:	Master's thesis
5. Competencies:	**A.** Knowledge and understanding of the purpose, objectives and

	stages of scientific research, experimental methods. **B.** Possession of practical skills in conducting scientific research; methods of conducting experimental research and processing experimental data. **C.** Ability to compare, formulate conclusions, build their own arguments, express their position on the main issues of scientific research and experimental planning. **D.** Ability to compare, formulate conclusions, build their own argumentation, express their position; evaluate theoretical and experimental research. **E.** The ability to analyze the issues of planning experiments to substantiate the main parameters and modes of operation of working bodies, mechanisms of agrotechnological machines.
6. Author of the course	Zaichko G.A.
7. Basic literature	1 Rykov V.V., Itkin V.Yu. "Mathematical statistics and experimental planning", 2008. http://mirknig.com/knigi/nauka_ucheba/1181574598-matematicheskaya-statistika-i-planirovanie-eksperimenta.html. 2 Grishentsev A.Yu. "Theory and practice of technical and technological experiment", 2010. http://mirknig.com/knigi/estesstv_nauki/1181421600-teoriya-i-praktika-tehnicheskogo-i-tehnologicheskogo-eksperimenta.html.. 3 Kruchinin V.V. Computer technologies in science, education and production of electronic equipment, 2012.
8. The content of the discipline. Modern methods of planning experiments of technological processes of agrotechnological machines. Key issues of planning experiments to substantiate the main parameters and modes of operation of working bodies, mechanisms of agrotechnological machines. Tasks, organization and stages of experimental research. Setting tasks. Planning an experiment to obtain a mathematical model of the process. Plans of the first order. Second-order plans. Optimization of research objects. Methodological support of the experiment. The result of teaching this discipline is knowledge of the tasks and stages of scientific research, general methods of experimental research, plans of the first and second order, tasks of processing experimental data. The ability to plan an experiment to obtain a mathematical model of the process; the ability to carry out a canonical transformation of mathematical models; the ability to study the response surface using two-dimensional sections; the ability to plan an experiment using modeling.	

Appendix 4 Description of elective component disciplines

1. Basic information about the discipline:	
Name of the discipline	**Modeling of systems**
2. Number of credits	5
3. Prerequisites:	«Mathematics: Mathematical analysis», «Mathematics: Differential Equations»
4. Post-requirements:	The knowledge and skills acquired during the course «Modeling and analysis of biological and physical systems» can be used when writing a final qualifying work.
5. Competencies:	To know: - mathematical foundations of modeling; - principles of conducting a computational experiment; - basic research applied software tools. be able to: - make a mathematical model of a problem situation, choose a solution method, interpret the resulting solution; - to form your own vision of the applied aspect of the problem in mathematical results, to use the means of applied software packages to solve problems arising in the course of research activities. own: - methods of constructing mathematical models in scientific research; - methods of analysis of the object domain based on the selection of a suitable mathematical apparatus, including a computational experiment based on computer modeling; - ability to develop mathematical models of solved scientific problems and tasks; - skills of working with application software.
6. Author of the course	Murzabekova G.E., Shaushenova A.G.
7. Basic literature	1. Golubeva N.V. Mathematical modeling of systems and processes: textbook. stipend. St. Petersburg: Lan, 2013. - 192 p. 2. Demchenko M.S. Fundamentals of simulation modeling technology [Electronic resource] / - M. : Laboratory books, 2012. - 171s. : Table. - URL: http://biblioclub.ru/index.php. 3. Salmina N.Yu. Simulation modeling [Electronic resource] : textbook; Ministry of Education and Science of the Russian Federation, Tomsk State University of Control Systems and Radioelectronics. - Tomsk: El Content, 2012. - 90 p.: http://biblioclub.ru/index.php?page=book id=208690. 4. Meshechkin V.V. Simulation modeling [Electronic resource]: textbook. - Kemerovo: Kemerovo State University, 2012. - 116 p. http://biblioclub.ru/index.php?page=book id=232371.
8. The content of the discipline. The concept of optimization of processes, parameters of structures and devices in engineering production. Decision-making. Optimization criteria, their types. Basic principles of model construction and analysis. The concepts of the object and subject of research. Physical and mathematical models. Methods of constructing mathematical models. Basic methods for solving equations of mathematical models in agroengineering. The method of numerical solution of ordinary differential equations of the first order. Euler's method. The Gauss method. The Adams method. The Runge-Kutta method. The method of sequential approximation. The structure of	

optimization problems. Optimization methods. Optimization of tasks in linear programming. Optimization of tasks in nonlinear programming. Formulation of the nonlinear programming problem. Optimality criteria in problems with constraints. Approximation of data from computational and field experiments by regression dependencies. Optimization problems of multifactorial dependencies represented by regression dependencies. Elements of mathematical 6 theory of experiment planning. Linear regression dependencies. Nonlinear regression dependencies.

1. Basic information about the discipline:	
Name of the discipline	**Computer simulation**
2. Number of credits	5
3. Prerequisites:	Mathematics, computer science
4. Post-requirements:	The knowledge and skills gained while studying the course «Computer Modeling» can be used when writing a final qualifying work.
5. Competencies:	To know: basic concepts of modeling theory, classification of models and areas of their use, modeling tasks; methods of modeling and analysis of systems; principles of model construction. Be able to: reasonably choose a modeling method; build an adequate model of a system or process using modern computer tools; interpret and analyze the results of modeling. Skills and knowledge of: methods and techniques of work in CASE-tools; methods and techniques of work in the simulation modeling system; the main criteria for evaluating the simulation results.
6. Author of the course	Murzabekova G.E., Shaushenova A.G.
7. Basic literature	1 Cheremnykh S.V. Structural analysis of systems: IDEF-technologies / S.V. Cheremnykh, I.O. Semenov, V.S. Ruchkin. – M. : Finance and Statistics, 2001. – 207 p. 2 Maklakov, S. V. Modeling of business processes with BPwin 4.0 / S. V. Maklakov. – M. : Dialog-MEPhI, 2002. – 224 p. 3 Oslin B.G. Simulation modeling of queuing systems: textbook / B.G. Oslin ; Tomsk Polytechnic University. – Tomsk : TPU Publishing House, 2003. – 106 p. 4 Bogolyubova M.N. System analysis and mathematical modeling: textbook / Tomsk Polytechnic University. – Tomsk: TPU Publishing House, 2002. – 104 p. 5 Tarasik V. P. Mathematical modeling of technical systems : textbook. – Minsk: Design PRO, 1997. – 640 p.

8. The content of the discipline. Introduction to computer modeling. The history of the appearance of modeling. The concept of the model, modeling, adequacy of the model. Goals and objectives of modeling. The modeling process. Classification of models. Types of model classification. Material (physical) and ideal models. Cognitive, meaningful, conceptual, formal models. Computer models. Business modeling. Business modeling tools. Models used in business. Business process analysis methodologies. Description of the ARIS business modeling tool. Methodology for constructing models using the ARIS system. Mathematical modeling. Mathematical model. Classification of models. The main stages of mathematical modeling. Random number generation. Simulation modeling. Basic concepts of simulation modeling. Tasks of simulation modeling. Areas of application of models. Stages of building models. Advantages and disadvantages of simulation modeling.

Queuing systems. Queuing theory. The composition of queuing systems. Types of queuing systems. Simulation model of queuing systems. Complex systems. Dynamic systems. Object-oriented modeling. Approaches to visual modeling of complex dynamic systems.

1. Basic information about the discipline:	
Name of the discipline	**Basics of Similarity**
2. Number of credits	5
3. Prerequisites:	Mathematics, computer science
4. Post-requirements:	The knowledge and skills gained while studying the course «Fundamentals of Similarity» can be used when writing a final qualifying work.
5. Competencies:	Know: – basic concepts of modeling, purpose and functions of models; - basic similarity theories; - the structure of the mathematical modeling process and methods of mathematical description; - technical means and practical modeling techniques. Be able to: - to make mathematical models of specific technological processes; - to investigate technological processes based on a mathematical model. Skills: - the use of mathematical modeling in scientific research.
6. Author of the course	Murzabekova G.E., Shaushenova A.G.
7. Basic literature	1 Kisilenko L.E. Machines and technology of foundry production. KNIR: educational and methodical manual – Moscow : MGIU, 2008 – 60 p. 2 Voskoboynikov V.G. General metallurgy [Text]: Textbook for universities. 6th ed., reprint. and additional / V.G. Voskoboynikov, V.A. Kudrin, A.M. Yakushev. – Moscow : IKTS "Akademkniga", 2005. – 768 p. 3 Mukanov D. Metallurgy of Kazakhstan: state, innovative potential, development trend. – Almaty, 2005. – 290 p. 4 Shishkin Yu.I. Theory and technology of converter processes: textbook. manual / Yu.I. Shishkin, A.K. Merchant, O.A. Grigorova. – Almaty: Gylym, 2006. -191 p. 5 Tsymbal V.P. Mathematical modeling of metallurgical processes. - M.: Metallurgy, 2006. – 310 p.
8. The content of the discipline. The theory of dimensions. Units of measurement. The formula of dimensions. Systems of units of measurement. Transformation of systems and their application. An algebraic method for constructing dimensionless complexes. The theory of similarity. Similarity in mathematics. Similarity parameters. Similarity in physics. Similar points. Similarity criteria. Types of criteria and physical meaning. Similarity theorems. The boundaries of their application. Obtaining criteria by the method of reduction. Criteria equations and their derivation. Similarity criteria in thermal conductivity. Non-stationary thermal conductivity. The Fourier number. Heat transfer and the Nusselt number. Forced convection. Reynolds number. Heat transfer during forced convection. The Peclet and Stanton numbers. Thermal and dynamic boundary layer. Prandtl number. Free convection. Galileo's number. Archimedes number. Heat transfer with free convection. Grashof number. Rayleigh number. Similarity in hydraulics. The Euler number.	

1. Basic information about the discipline:	
Name of the discipline	**Higher Engineering Mathematics**
2. Number of credits	10
3. Prerequisites:	Mathematics (calculus, vector analysis, linear algebra, differential equations), physics, biology, computer science
4. Post-requirements:	Comprehensive analysis
5. Competencies:	**A.** To use concepts and methods of mathematical modeling in the practice of scientific research, the study of general and particular methods of mathematical description of natural phenomena; **B.** Acquisition of practical skills in applying the basics of mathematical apparatus to solve theoretical and applied problems, the ability to translate the solution of practical problems into the language of logic. **C.** The ability to compare, formulate a statement of problems, build their own method of solution, prove and justify the correctness of your reasoning; **D**. In the field of communication – the formation of personality, the development of intelligence and abilities for logical and algorithmic thinking; **E.** In the field of education – the ability to apply mathematical modeling methods in various branches of natural science and technology, obtaining systematic fundamental education.
6. Author of the course	Department of Mathematics
7. Basic literature	1. Vladimirov V.S. Equations of mathematical physics. Textbook. – M.: Fizmatlit, 2003. – 400 p. 2. Rusak V.N. Mathematical physics. M.: KomKniga, 2006. 3. Bitsadze A.V., Kalinichenko D.F. Collection of problems on equations of mathematical physics. M., 2001 4. Smirnov M.M. Problems on equations of mathematical physics. –M., 1985. 5. Walter A.Strauss. Partial differential equations. John Wiley&Sons, Inc., 1992, USA (from the UC Davis website) 6. Elsholz. Differential equations and calculus of Variations. Moscow: Editorial URSS, 2002. 7. Otto, Sarah P.; Day, TroyA biologist's guide to mathematical modeling in ecology and evolution. Princeton, N.J.: Princeton University Press, cop. 2007 8. Neuhauser's "Calculus for Biology and Medicine" 3rd Edition. Kindle Edition. 2018 9. Mathematical Models in Biology by Leah Edelstein-Keshet; SIAM 2005

8. The content of the discipline. Partial differential equations. Boundary value problems. Solving linear and nonlinear ordinary and partial differential equations arising in the study of natural phenomena. Methods of Fourier transform, Laplace transform, mathematical models of processes and phenomena.

1. Basic information about the discipline:	
Name of the discipline	**Mathematical modeling**
2. Number of credits	10
3. Prerequisites:	Computer science, mathematics
4. Post-requirements:	Dissertation
5. Competencies:	**A.** To use mathematical modeling methods in the practice of scientific research; **B.** Acquisition of practical skills in applying the basics of mathematical apparatus to solve theoretical problems, the ability to translate the solution of practical problems into the language of logic. **C.** The ability to compare, formulate a statement of problems, build their own method of solution. **D.** In the field of communication – personality formation, development of intelligence and abilities to logical and algorithmic thinking. **E.** In the field of education – the ability to apply mathematical modeling methods in various branches of natural science and technology, obtaining systematic fundamental education.
6. Author of the course	Department of Mathematics
7. Basic literature	1. Vladimirov V.S. Equations of mathematical physics. Textbook. – M.: Fizmatlit, 2003. – 400 p. 2. Rusak V.N. Mathematical physics. M.: KomKniga, 2006. 3. Bitsadze A.V., Kalinichenko D.F. Collection of problems on equations of mathematical physics. M., 2001 4. Smirnov M.M. Problems on equations of mathematical physics. – M., 1985. 5. Walter A.Strauss. Partial differential equations. John Wiley&Sons, Inc., 1992, USA (с сайта UC Davis) 6. Эльсгольц. Дифференциальные уравнения и вариационное исчисление. М.: Эдиториал УРСС, 2002. 7. Otto, Sarah P.; Day, TroyA biologist's guide to mathematical modeling in ecology and evolution. Princeton, N.J.: Princeton University Press, cop. 2007 8. Neuhauser's "Calculus for Biology and Medicine" 3rd Edition. Kindle Edition. 2018 9. Mathematical Models in Biology by Leah Edelstein-Keshet; SIAM 2005
8. The content of the discipline. Partial differential equations. Boundary value problems. Mathematical analysis of biology and model. Standard models in ecology and evolution. Stability analysis of linear and nonlinear models, eigenvalues and eigenvectors, probability theory and mathematical statistics. Mathematical modeling methods for analytical and numerical solutions of linear and nonlinear ordinary and partial differential equations.	

1. Basic information about the discipline:	
Name of the discipline	**Management and decision-making in precision agriculture**

2. Number of credits	3
3. Prerequisites:	Production Management (Bachelor's degree course).
4. Post-requirements:	Systems of agriculture and production of crop products, Phytosanitary technologies of cultivation of agricultural crops
5. Competencies:	As a result of studying this discipline, students should: To know: the basics of production management in the formation of the socio-economic system; production management in the enterprise management system; the content and structure of the production management system; market strategy in production management. - to be qualified: product strategy; content and objectives of the process of tactical production management; current plans of the production enterprise; organization of production processes; organization of auxiliary processes and provision of services. - be competent: organization of production management processes; motivation to achieve the goal; fundamentals of operational production management; production control and ways of regulating production. To know and understand: Knowledge of the principles of the organization of production activities, basic methods and tools for managing production activities and understanding the basic concepts and methods of organizing production activities. Be able (descriptor B): To use in practice the ability to plan the production activities of the organization, to develop corporate, competitive and functional strategies for the development of the organization. Possess: Possess the methodology of forecasting promising ways to solve problems; economic justification of effective projects. c. The ability to set goals and formulate tasks related to the implementation of professional functions. d. Be able to organize the work of performers for the implementation of specific projects, activities, works. E. Be able to analyze the relationship between the functional strategies of companies in order to prepare balanced management decisions. Systematize and obtain the necessary data to analyze the activities of the industry enterprise.
6. Author of the course	
7. Basic literature	1. Belyaev, A.M. Production management: Textbook for bachelors / I.N. Ivanov, A.M. Belyaev, V.V. Lobachev; Edited by I.N. Ivanov. - M.: Yurayt, 2013. - 574 p. 2. Sitnikov, S.G. Production management at telecommunication enterprises: A textbook for universities / S.G. Sitnikov. - M.: Gor. liniya-Telecom, 2013. - 276 p. 3. Shemyakina, T.Yu. Production management: quality management (in construction): Textbook / T.Yu. Shemyakina, M.Yu. Selivokhin. - M.: Alfa-M, SIC INFRA-M, 2013. - 272 p. 4. Alexandrova, A.V. Strategic management: Textbook / N.A. Kazakova, A.V. Alexandrova, S.A. Kurashova, N.N. Kondrashova. - M.: SIC INFRA-M, 2013. - 320 p. 5. Production management: textbook / E. M. Gainutdinov, L. I. Podderegina. – Minsk: Higher School, 2010. – 319, p . 6.Production management: textbook / E. M. Karpenko, S. Y. Komkov. – Gomel: GSTU, 2010. – 519 p.
8. Content of the discipline. Introduction to production management. Designing a new product.	

Management of innovative projects. Types of production processes. Production cycle. Production capacity. Placement of enterprises. The production structure of the enterprise. Organization of production by in-line methods. Organization of production maintenance. Product quality strategy. Production inventory management. Production planning and organization of product sales. Formation of production programs. Operational production management.

1. Basic information about the discipline:	
Name of the discipline	**Technical support of technological processes in the precision farming system**
2. Number of credits	10
3. Prerequisites:	Agro-soil science. Fundamentals of plant nutrition management.
4. Post-requirements:	Master's thesis
5. Competencies:	**A**. Knowledge and understanding of the basic provisions of the differentiated impact on the "soil-plant" system; knowledge of the principles of operation of technical means to ensure technological processes of cultivation of agricultural crops in the precision farming system. **B.** Knowledge of methods for solving planned technological and operational tasks for managing the production process of agricultural crops; the ability to develop electronic prescriptions for performing technological operations. **C.** The ability to compare, formulate conclusions, build their own arguments, express their position on the main issues of precision agriculture. **D.** The ability to bring to the producers of grain crops the prospects for the development and introduction of precision agriculture into agriculture in Kazakhstan. **E.** The ability to model and analyze the state of development of precision agriculture. Determine and solve planned technological and operational tasks for managing the production process of agricultural crops.
6. Author of the course	Nukeshev S.O.
7. Basic literature	1. Shpaar D., Zakharenko A.V., Yakushev V.P. Precision agriculture. – St. Petersburg-Pushkin, 2009. – 397 p. 2. Yakushev V.P. On the way to precision farming. – St. Petersburg: Publishing House of the Russian Academy of Sciences. 2001. – 458 p. 3. Mikhailenko I.M. Management of precision farming systems. – St. Petersburg: Publishing House of St. Petersburg University, 2005. – 234 p. 4. Nukeshev S.O. Scientific bases of intra-soil differentiated application of mineral fertilizers in the system of precision agriculture: monogr. M-in the rural household of the Republic of Kazakhstan. - Astana: S. Seifullin KATU, 2011. - 358 p. 5. Fertilizers and their Efficient Use Harold F. Reetz, Jr. First edition, IFA, Paris, France, May 2016. Copyright 2016 IFA., - 114 p.
8. The content of the discipline. Positioning systems. Local sampling in the coordinate system. Parallel driving system. Creating prescriptive maps. Differentiated tillage. Differentiated seeding. Differentiated application of fertilizers. Differentiated application of pesticides. Yield monitoring. Sensorics. Compilation of yield and electrical conductivity maps. Robotic systems in agriculture.	

1. Basic information about the discipline:	
Name of the discipline	**High-precision agricultural technologies**
2. Number of credits	10
3. Prerequisites:	Agro-soil science. Fundamentals of plant nutrition management. Agrometeorology. Agricultural machines
4. Post-requirements:	Master's thesis
5. Competencies:	**A**. Knowledge of the theoretical foundations of modern precision farming systems for cultivating crops; general principles of operation and device of global positioning systems; **B.** Knowledge of modern methods of mapping fields; skills in management strategies and the use of acquired knowledge for the introduction of precision farming; methods of creating electronic maps using GIS. **C.** The ability to compare, formulate conclusions, build their own arguments, express their position on the main issues of crop cultivation technologies monitoring. **D.** The ability to independently competently plan measures for the introduction of precision farming elements at a particular enterprise; to carry out accurate sowing and cultivation; to conduct an economic and energy assessment of precision farming technologies;
6. Author of the course	Nukeshev S.O.
7. Basic literature	1 Shpaar D., Zakharenko A.V., Yakushev V.P. Precision agriculture. – St. Petersburg-Pushkin, 2009. – 397 p. 2 Yakushev V.P. On the way to precision farming. – St. Petersburg: Publishing House of the Russian Academy of Sciences. 2001. – 458 p. 3 Mikhailenko I.M. Management of precision farming systems. – St. Petersburg: Publishing House of St. Petersburg University, 2005. – 234 p. 4 Nukeshev S.O. Scientific bases of intra-soil differentiated application of mineral fertilizers in the system of precision agriculture: monogr. M-in the rural household of the Republic of Kazakhstan. - Astana: S. Seifullin KATU, 2011. - 358 p. 5 Fertilizers and their Efficient Use Harold F. Reetz, Jr. First edition, IFA, Paris, France, May 2016. Copyright 2016 IFA., - 114 p.

8. The content of the discipline. Technological approaches to implementation precision farming in agricultural enterprises. The choice of technology elements, the choice of equipment and software, the stages of implementation. Positioning systems. Features of using GPS\GLONASS in agricultural production. Local sampling in the coordinate system. Parallel driving system. Creating prescriptive maps. Differentiated tillage. Differentiated seeding. Differentiated application of fertilizers. Differentiated application of pesticides. Yield monitoring. Sensorics. Mapping of fields in the precision farming system. Goals and objectives of mapping fields. Stages of mapping technology. Compilation of yield and electrical conductivity maps. Robotic systems in agriculture.