Ministry of agriculture of the Republic of Kazakhstan
Kazakh agro technical university named after S.Seyfullin

Considered at the meeting of
the Academic Council of
the university
Protocol №15 from 30.05.2019.

APPROVED
The chairman of the Board of
"Kazakh Agro Technical University
named after S.Seyfullin"
_____ A.K.Kurishbayev
«_____»_____2019.

EDUCATIONAL PROGRAM
«Mechanical engineering»

Code and classification of the field of education:
7M07 Engineering, manufacturing and construction industries
Code and classification of training areas:
7M071 Engineering and engineering work
Code in the International Standard Classification of Education:
0710
Qualification: **master of technical sciences in the educational program "Mechanical engineering "**

Duration of study: **2 years**

Nur-Sultan 2019

Team of authors:
1. Userbaev Muratbek Turarbekovich – c.t.s., head of the department «Technological machines and equipment» AO "KATU named after S.Seyfullin";

2. Khan Valeriy Anatolyevich – c.t.s., senior lecturer of the department «Technological machines and equipment» AO "KATU named after S.Seyfullin";

3. Mendalieva Saule Ilinichna – c.t.s., senior lecturer of the department «Technological machines and equipment» AO "KATU named after S.Seyfullin";

4. Zhumagaliev Erlan Ulanovich – c.t.s., senior lecturer of the department «Technological machines and equipment» AO "KATU named after S.Seyfullin";

5. Kakimov Ulan Kagyrkhanuly c.t.s., senior lecturer of the department «Technological machines and equipment» AO "KATU named after S.Seyfullin";

6. Kosatbekova Dinara Shadiyarbekovna –MSci, post doctoral graduate of the department «Technological machines and equipment» AO "KATU named after S.Seyfullin";

7. Myrzakhmet Balgali – master of the department «Technological machines and equipment» AO "KATU named after S.Seyfullin".

The team of authors approved by the order of JSC "KATU named after S.Seifullin" № 932-H from 12.12.2018

Educational program «Mechanical engineering»
reviewed at the meeting of the department Technological machines and equipment
protocol №09/2 from «09» 04. 2019,
approved by the Faculty Council
protocol №09 from «13» 05. 2019.

Content

1 Passport of the educational program

1.1 The aim of the educational program

The aim of the educational program "Mechanical Engineering" in the direction of 7M071 magistracy is to develop students' general cultural (general scientific, social and personal, instrumental) and professional competencies in the field of design, production and technical operation of technological machines and equipment with the training of qualified specialists able to explore these technical objects, develop their promising designs with the choice of the optimal solution, possessing high technological and reliability.

The objectives of the educational program are:

-to provide an individual educational trajectory of study in accordance with the specialty chosen by undergraduates;

-to provide a full-fledged and high-quality scientific and pedagogical education, to form professional competence, to deepen theoretical and practical, as well as individual training of undergraduates in the field of technical regulation.

-to ensure the development of disciplines, guaranteeing the professional mobility of fundamental courses at the intersection of sciences;

- contribute to the acquisition of skills of participation in scientific events at various levels, the continuation of scientific training in doctoral studies;

-to provide the necessary amount of knowledge in the field of university pedagogy and psychology and the acquisition of teaching experience in the university.

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

The relevance of the educational program. Updating the integrated information technology platform for the resource potential of the agro-industrial complex should become more **innovative**, taking **full advantage** of the new **technological order 4.0**. At the same time, the development and testing of **new tools** aimed at **modernizing** and **digitizing** enterprises in order to increase their efficiency need to stimulate **technology transfer** from developed countries in the industrialization of the world. The need to revise the role of **agricultural universities**, based on **updating the curriculum** in order to transform them into **centers of dissemination of the most advanced knowledge and best practices** in the AIC, is particularly relevant. One of the positive examples of the implementation of a **pilot project on digitization** is the introduction of digital technologies in the field of precision farming on the basis of KazATU named after S. Seifullin.

The material and technical base of the agroindustrial complex is characterized by the presence and its constant replenishment by a wide range of modern technological machines and equipment used in the industry, foreign and domestic production and special requirements for operation. Issues of researching the effective operation of technology, improving the design of mechanisms and components, the development of new production technologies and repair, ensuring the achievement of higher indicators of technological reliability, are particularly relevant. Their successful solution is based on the promotion of a set of measures for the implementation of the Industrialization 4.0 program related to scientific achievements and the availability of qualified personnel.

The educational program "Mechanical Engineering" was developed in conjunction with professors of the University of California, Davis (USA) in accordance with the National Qualifications Framework and professional standards, consistent with the Dublin descriptors and the European Qualifications Framework, based on the State Compulsory Higher Education Standard approved on October 31, 2018 (№604).

The total number of credits for this educational program is 120 credits, of which: the total number of credits for theoretical studies is 73 credits, for practical training (pedagogical, research) - 11 credits, the student's research work, including the master's thesis - 24 credits, final certification - 12 credits, including a comprehensive examination in the specialty - 4 credits and the develope and submit of a master's thesis 8 credits.

The peculiarity of the educational program is the consolidation of theoretical knowledge by conducting laboratory and practical classes on the basis of its own training workshops and laboratories within the university. In order to exchange scientific and pedagogical experience in cooperation with foreign universities, EP provides scientific internships and research practice, within the framework of academic mobility, both in universities, research institutes and industrial enterprises of Kazakhstan, and the possibility of its passing undergraduates at the University of California in Davis.

Competitive advantages of the educational program. A professional infrastructure (educational resources) was created on the basis of KATU (as recommended by Davis scientists):

- Production and experimental workshop of metalworking and welding;
- Kazakhstan-Belarus training and production center;
- Pavilion Kazakh-Chinese center for agricultural mechanization;
- Laboratory "Robotics, Mechatronics and 3D Printing";
- Laboratory of Materials Science and TCM;
- Laboratory "Installation and operation of technological machines";
- Training workshops.

The presence of a modern laboratory and technical base of training classes and constantly updated research laboratories, highly qualified faculty members is the basis for the development of strong advanced knowledge by undergraduates, the ability to conduct research in promising high-tech areas in accordance with

Industry 4.0 and 5.0 programs. The result of these works is to obtain meaningful results and scientific achievements that have an applied character. Scientific cooperation with leading universities in the United States and European countries will allow for the **transfer of new "smart" technologies and their adaptation** to domestic conditions.

The introduction of educational programs in the educational process, including a set of disciplines that constitute the theoretical basis for the technological development of the agroindustrial complex, will provide a scientific and innovative focus for the training of undergraduates and the training of qualified personnel to work in the industry.

Within the framework of this EP, for the purpose of further scientific growth, masters who have completed their studies and defended a thesis are given the opportunity to enter the doctoral program under the educational program 8D071 - "Mechanical Engineering" at the department on the basis of KATU and other higher educational institutions of the near and far abroad.

The uniqueness of the EP is determined by the competencies that the master will have when he completed this program:

- implementation on the basis of mutually beneficial strategic partnership with employers and all interested parties of an agreed spectrum of levels and forms of continuing professional education, providing for each student the possibility of forming an individual educational trajectory taking into account further professional, career and personal growth.

- improving the efficiency and effectiveness of research, fuller use of the scientific potential of the university to improve the quality of training, implementation of the principle of training through research at all stages of training;

- training of specialists and researchers with the necessary competencies and innovative thinking.

- introduction of new educational technologies and principles of organization of the educational process, ensuring the effective implementation of innovative models of continuous education and problem-oriented learning, including the use of modern information and communication technologies.

- monitoring of targeted training and employment of graduates.

The main stakeholders of the OP are:

1. Teaching staff, leading experts of industrial enterprises and associations of the agro-industrial complex;

2. Department of Technical and Innovative Development of the Ministry of Industrial-Innovative Development of the Republic of Kazakhstan;

3. Ministry of Agriculture of the Republic of Kazakhstan;

4. Machine-building enterprises of any profile;

5. Design organizations of machine building;

6. Research institutes and research and production centers.

3 Competency model (portrait) of the graduate

3.1 Professional activities

- production and psychological-pedagogical activity in organizations of secondary, higher and additional professional education of technical and agricultural areas, research, design organizations and in production;
- research activities in the field of education and in the workplace in the field of advanced training of workers in accordance with the specialization;
- educational, management and production activities in accordance with the qualification of the Master of Technical Sciences.
- material production in design and design institutions; production and repair enterprises; dealerships firms; transport organizations, etc.

3.2 Types of professional activity

Types of professional activity:
production and technology;
organizational and managerial;
research and teaching;
design engineering.
Tasks of professional activity:

- development of technical specifications for the design and manufacture of devices, machines, drives, systems, non-standard equipment;
- research and analysis of the causes of marriage and the assessment of the economic efficiency of technological equipment;
- technical control in the design, manufacture, testing and operation of process equipment;
- planning and carrying out theoretical and applied research projects;
- development of models of physical processes and new methods of experimental research, analysis of research results and their generalization;
- preparation of scientific and technical reports, reviews and publications on the results of completed studies;
- development of promising designs, machines and devices;
- creation of calculation software;
- carrying out an examination of design and technological developments;
- conducting patent research of new design solutions and determination of technical level indicators;
- carrying out technical calculations for projects and the development of methodological and technical documentation, proposals for its implementation.
- improving the design of technological machines and equipment;
- analysis of the achievements of scientific and technical progress in the field of agricultural engineering;
- introduction of modern technologies in the production of technological machines and equipment;

- study of foreign experience in the production of technology and its implementation in the agro-industrial sector;

- complex mechanization and automation of technological machines and equipment and technological processes;

- establishment and maintenance of optimal operating modes of technological machines and equipment.

3.3 General educational competencies (*see GOSO*)

The master should be able to: improve and develop their intellectual level; to generalization, analysis, critical thinking, systematization, forecasting when setting goals in the field of professional activity with a choice of ways to achieve them; critically evaluate the mastered theories and concepts, rethink the accumulated experience, change, if necessary, the profile of their professional activities; collect data, process it using modern information technologies and interpret the results to form judgments on scientific issues; independently apply the methods and tools of knowledge, training and self-control to acquire new knowledge and skills; to freely use literature and business writing and oral speech in the state language of the Republic of Kazakhstan, to create and edit professional texts, to speak a foreign language as a means of business communication.

3.4 Base competencies (*see GOSO*)

Abilities and skills: to choose analytical and numerical methods in the development of mathematical models of machines, drives, equipment of chemical plants; possess the skills of independent work in the field of research; receive and process information using modern information technologies, apply applied software when solving practical issues using personal computers using general and special-purpose software, including in the remote access mode; evaluate the technical and economic efficiency of the design, research, manufacture of machinery, drives and production equipment; select optimal solutions when creating products with the requirements of quality, reliability, safety and environmental cleanliness of production; provide protection and valuation of intellectual property; organize work to improve the scientific and technical knowledge of workers.

3.5 Professional competencies

Abilities and skills:

- develop: technical specifications for the design and manufacture of machines, drives, systems and non-standard equipment; plans and programs of innovation activity at the enterprise, physical and mathematical models of the machines, drives, devices, processes, phenomena and objects belonging to the professional sphere; techniques and organize experiments with the analysis of their results;

- to prepare: applications for inventions and industrial designs, scientific and technical reports, reviews, publications on the results of the research performed;

terms of reference for the development of design solutions, to make descriptions of the principles of operation and device design of products and objects with the rationale for the adopted technical solutions;

- to organize work on the implementation of field supervision in the manufacture, installation, commissioning, testing and commissioning of manufactured technical objects.

4 Base of professional practice

Teaching practice is conducted in the classrooms and laboratories of the department. The bases for passing undergraduate research practices are organizations, enterprises of the agro-industrial complex, the industrial and social sphere, divisions of the management system of state enterprises, joint-stock companies and private firms. It also extends to research and production associations, scientific, design and design organizations, repair, engineering plants, agricultural repair enterprises, etc. KazNIIIMESH LLP, Akkol, Akmola region; Kazakhstan Agro-Innovation Corporation, Kokshetau; Special Equipment LLP, Aktobe; LLP Production Innovation Company ASTANA Yutaria Ltd, Astana; LLP "KazTechInnovations", Almaty; Semaz LLP, Semey; LLP "Kazmedpribor holding" Shymkent; LLP KazInTeh-IRC Astana; LLP "AktauOilMash" Aktau; Altyn Dimenmen LLP, Almaty.

5 The structure of the educational program of the magistracy in the scientific and pedagogical direction

№	The name of the cycles of disciplines and activities	Total complexity	
		in academic hours	in academic credits
1	2	3	4
1.	Theoretical study	1920	64
1. 1	The cycle of basic disciplines (BD)	1050	35
1)	University component (UK):	600	20
	including:		
	History and philosophy of science	150	5
	Foreign language (professional)	150	5
	High school pedagogy	90	3
	Psychology of management	150	5
	Teaching practice	60	2
2)	Component of choice (CC)	450	15
	Technological equipment for the processes of processing industries	150	5
	Scientific Research Methodology /	90	3
	Automated diagnostics of technological machines	150	5
	English for academic purposes	60	2
1. 2	The cycle of the main disciplines (MD)	1470	49
1)	University component (UC)	630	21
	Modern equipment for processing food products	150	5
	Scientific basis of applied programs and modeling of technological machines and equipment	150	5
	Robotic complexes and automation of food processing	90	3
	Designing technological machines and equipment	120	4
	Fundamentals of technical repair and maintenance of technological machines and equipment	120	4
2)	Component of choice (CC)	570	19
	Methods and instruments for measuring and controlling parameters of technological machines	150	5

	Modern equipment for water supply and ventilation of food production	120	4
	Processing technology of food and agricultural products	150	5
	Materials science in food production	150	5
3)	Research practice	270	9
2	Research work	720	24
1)	Master's research work, including internships and the implementation of a master's thesis (R & D)	720	24
3	Additional types of training (ATT)	-	-
4	Final certification (FC)	360	12
1)	Registration and submission of the master's thesis (R&SMT)	360	12
	Total	3600	120

Appendix 1. Academic calendar

Kazakh Agrotechnical University named after S.Seifullin

Considered on the University Council

Protocol №___ от "___" _____ 2019.

APPROVED:
Director of the Department of Academic Affairs
JSC «KATU n.a. S.Seyfullin»
_____ N.A. Serekpayev
"_____" _____ 2019.

Academic calendar for the 2019-2020 academic year PROGRAM in the field of education 7M071 - ENGINEERING AND ENGINEERING

Курс	September				October					November				December				January					February				March				April					May				June				July					August			
	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*	*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*
	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	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
	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	6	13	20	27	3	10	17	24	1	8	15	22	30	5	12	19	26	3	10	17	24	31	7	14	21	28
		1	*2*	*3*	4	*5*	*6*	*7*	*8*	*9*	*10*								*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*				*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*											

direction of training "Mechanical Engineering"

I	ПН	•	•	•	•	·/РК	•	•	•	•	·/РК	С	С	ЗД	ЗД/ЗС	К	К	К	•	•	•	•	·/РК	•	•	•	•	·/РК	С	С	К	•	•	•	•	·/РК	·/Пп	·/Пп	·/Пп	·/Пп	·/РК	С	С	Л/К	Л/К	Л/К	Л/К	Л/К	К	К	К	К
II	К	•	•	•	•	·/РК	•	•	•	•	·/РК	С	С	ЗД	ЗД/ЗС	К	К	К	·/Ип	·/Ип	·/Ип	·/Ип	·/Ип/РК	·/Ип	·/Ип	·/Ип	·/Ип	·/Ип/РК	С	К	Ип	Ип	Ип	Ип	КЭ	КЭ	//	//	//	//	//	//	//									

ПН - presentation week
• - theoretical study
РК - mid-term control
С - examination session
Л - summer semester

Пп - pedagodical practice
Ип -research practice
Нм - Master's research work, including the implementation of a master's project

К - holidays
КЭ - complex exam
// - Preparation and submission of a master's thesis

Holidays:

August 30 - Constitution Day
August 21 - Kurban Ait
December 1 - Day of the First President
December 16, 17 - Independence Day
January 1, 2 - New Year
January 7 - Christmas
March 8 - International Women's Day
March 21, 22, 23 - Nauryz
May 1 - The holiday of unity of the people of Kazakhstan
May 7 - Defender of the Fatherland Day
May 9 - Victory Day
July 6 - Capital Day

Total weeks:

theoretical study - 30 weeks
examination session - 4 weeks
winter holidays - 3-4 weeks
summer weeks - 6-9 weeks
semmer semester - 6 weeks

Dean of the Technical Department _____ S.O.Nukeshev

Head of the planning and organization of the educational process _____ G.Zh.Soltan

"____" _____ 2019.

Appendix 2 Work curriculum *(sample 2 years)*

Considered
on the University Council
meeting
Protocol № ____
“___” _____ 20___

APPROVED
by the first Deputy of
the chairman of the board
JSC “KATU”
_____ Abdyrov A.M.
“___” _____ 20___ .

WORKING CURRICULUM
for 2018-2020
for educational program “Mechanical engineering”
in areas of preparation of 7M071 – Engineering and Engineering work
Degree: Master of Technical Sciences in the areas (Scientific and Pedagogical)
Form of study: Full-time (Master 2 years)
Year of applience: 2019-09-01

Module cipher	Discipline cycle	Discipline components	Discipline code	Name of the discipline	Credits of ECTS	Control by semesters			Amount in hours						Distribution of study hours by semesters / trimesters / quarters					
										incuding					1	2	3	4	5	6
						Exam	Differential test (practice)	Preparation to MC 1, MC-2 and exam	Total	Lectures	Practical	LPS	IWWL	IWM	Number of weeks in the semester / trimester / quarter					
1	БД	ВК	Ped 5203	High School Pedagogy	3	1			90	20	10		12	48	**3**					
2	БД	ВК	Psi 5204	Psychology of management	5	1			150	30	20		20	80	**5**					
3	БД	ВК	IYa 5202	Foreign language (professional)	5	1			150		50		20	80	**5**					
4	БД	ВК	IFN 5201	History and philosophy of science (kaz)	5	1			150	30	20		20	80	**5**					
5	БД	КВ	ADTM 5207	**Automated diagnostics of technological machines /** Analysis and design of composite structures/ Machine numerical control systems	5	2			150	20	30		20	80		**5**				
6	БД	ВК	MNI 5208	**Scientific Research Methodology /** Engineering experiments and uncertainty analysis	3	2			90	10	20		12	48		**3**				
7	БД	КВ	TOMSP 5205	**Technological equipment for the processes of processing industries** / Theoretical foundations for the mechanization of agricultural production / Advanced modeling and modeling of mechatronic systems	5	2			150	20	30		20	80		**5**				
8	БД	ВК	AYaDAC 5206	English for academic purposes	2	3			60		20		8	32			**2**			
9	ПД	КВ	SKMZPM	**Materials science in food production** / Modern construction materials and protective coatings in mechanical engineering / Mechanical characteristics of materials	5	3			150	**20**	**30**		20	80			**5**			
10	ПД	КВ	NAMRTMEO 5302	**Fundamentals of technical repair and maintenance of technological machines and equipment**	4	5			120	20	20		16	64					**4**	
11	ПД	КВ	SChPUChSA 5305	**Modern equipment for processing food products** / Problems of creating technological machines and equipment / Advanced methods in mechanical design	5	3			150	**20**	**30**		20	80			**5**			

12	ПД	КВ	NTOTM 6306	**Processing technology of food and agricultural products** / High technologies processing technology machines / Modern metalworking	5	4			150	**20**	**30**		20	80				**5**		
13	ПД	ВК	NOPPMTMO 5304	**Scientific bases of applied programs and modeling of technological machines and equipment**	5	4			150	**20**	**30**		20	80				**5**		
14	ПД	КВ	NOSGTMO 6305	**Modern equipment for water supply and ventilation of food production** / Scientific basis for the structures of hydraulic drives of technological machines and equipment / Introduction to scientific calculations in the field of solid and fluid dynamics	4	4			120	20		20	16	64				**4**		
16	ПД	КВ		**Robotic complexes and automation of food processing** / Automation of technological processes in mechanical engineering / Automated design and production	3	2			90	10	10	10	12	48		**3**				
17	ПД	ВК	PTMO 5301	**Designing technological machines and equipment**	4	5			120	20	20		16	64					**4**	
18	ПД	КВ	MTPSTZ 5307	**Methods and instruments for measuring and controlling parameters of technological machines** / Mechanization of technological processes in a precision farming system / Analysis and design of digital control systems	5	5			150	20	30		20	80					**5**	
				Pedagogical practice	2	1	2		60						**2**					
				Research practice	9		5,6		270								5	4		
				Master's research work, including the	24		1,2,3,		720							4	3	2	7	8
				Complex exam	4				120											4
19				Preparation and submission of Master's thesis	8				240											8
	Total of theoretical study				**120**			**0**	**3600**	**300**	**400**	**30**	**292**	**1168**	**20**	**20**	**20**	**20**	**20**	**20**
PP	Pedagogical practice				2	1			60											
RP	Research practice				9	4, 5			270											
MRW	Master's research work, including the implementation of a master's project				24	1, 2, 3, 4, 5, 6			720											
OA	Overall attestation				12				360											
	Complex exam				4	4		3	120											
	Preparation and submission of Master's thesis				8	4		3	240											
	Total				120				3600											

Appendix 3 Description of the disciplines of compulsory and university components

History and philosophy of science

1. Basic information about the discipline: a total of 150 hours, including auditory hours-50; Lectures-30; Practical-20; Outside auditory hours -90; IWWL - 20; IWM - 80.	
Name of the discipline	History and philosophy of science
2. Amount of credits	5 (scientific and pedagogical)
3. Prerequisites:	Philosophy, religious science, sociology, political science.
4. Post requisites:	Knowledge gained in the discipline "History and Philosophy of Science" will achieve understan and comprehension of knowledge of the methodology of science and skills of research activities.
5. Competences:	Know and understand: the basic epistemological model, the nature of the transformations o concept of rationality; forms and methods of pre-scientific, scientific and non-scientific knowle modern methods of learning. To be able to: formulate and solve problems arising in the course of research and requires in-c professional knowledge; choose appropriate research methods, modify existing and develop methods, based on specific research tasks. To have skills to use and methodological knowledge in research and teaching. Have the skills of independent research and scientific-pedagogical activity, which requires a b education in the appropriate direction; writing scientific theses, articles; presentations at scier forums. Be able to analyze and comprehend the realities of the modern theory and practice based on the methodology of socio-humanitarian and scientific knowledge.
6. Course author	Department of Philosophy
7. Main literature	1. The Routledge Companion to the Philosophy of Science (Second edition). Edited by Martin Curd and Stathis Psillios. New York: Routledge, 2013. 2. Groundbreaking scientific experiments, inventions, and discoveries of the 18th century. Jonathan Shectman. Westport: Greenwood Press, 2003. 3. Hamblin, Jacob Darwin. Science in the early twentieth century: an encyclopedia. Santa Barbara: ABC-CLIO, 2005.
8. Content of the discipline	As a result of studying the discipline "History and Philosophy of Science" graduate student should possess the ability to apply the acquired knowledge about the structure and functions of scientific knowledge, the methods of science in their professional activities; distinguished ideological, political, religious build on scientific concepts. Knowledge of tools and methods of

	modern science is a prerequisite for independent creative scientific work and to distinguish genuine from pseudo-scientific work constructions.

Pedagogy of high school

1. Basic information about the discipline:	
Name of the discipline	Pedagogy of High school
2. Credits	3 (scientific-pedagogical)
3. Prerequisites:	Philosophy, Sociology, General pedagogy, General psychology
4. Post requisites:	Pedagogical practice. Implementation of the activities of the teacher of high school and pedagogical process management
5. Competences:	As a result of studying the discipline "Pedagogy of higher school" undergraduate - will learn: actual problems of pedagogical science; the essence of pedagogical activity of the University teacher; - will master the skills: selection from the surrounding reality of pedagogical facts, phenomena, events and their description in the language of pedagogical science, based on the laws of pedagogical theories, explanations, forecasting and development; construction of the educational process, based on new concepts of training and education. Also will be competent: in teaching and solving the problems of higher pedagogical education and the prospects for its further development; in the application of effective technologies in higher education; solutions to current psychological and pedagogical problems, evaluation of the results achieved;
6. Author	The Department of professional training (Sagalieva Zh.K, Zhussupova A. A., Shakhmetova, D. S.)
7. Literature	1. Zavada, G. V., O. V. Bushmina higher school Pedagogics: Textbook. benefit. – Kazan: Kazan state power engineering University, 2008. 2. Kuznetsov I. N. Handbook of the practicing teacher: Studies. benefit. – M.: Grossmedia: ROSBUH, 2008. 3. Necasova M. D., Shagalieva J. K. Pedagogical higher school: Studies. benefit. – Astana: publishing house of the Folio, 2018.
8. Content of the discipline	Fundamentals of pedagogy of high school. Subject and tasks of pedagogy of higher school. Methodology and methods of pedagogical research in higher education. Didactics of higher school. Pedagogical process in higher school. Laws and principles of training. Methods, forms and means

	of higher education. The current state of higher education in Kazakhstan. Professional development of lecturer. The process of education in high school. The purpose of education as a pedagogical problem. The staff as a form of functioning of the integral pedagogical process. Management of pedagogical process.

Psychology of management

1. Basic information about the discipline: a total of 150 hours, including auditory hours-50; Lectures - 30, Practical-20; Outside auditory hours -100; IWWL - 20; IWM - 80.	
Name of the discipline	PSYCHOLOGY OF MANAGEMENT
2. Amount of credits	5 (scientific-pedagogical), 2 (professional)
3. Prerequisites:	Philosophy, Sociology, General psychology, Psychology of higher education
4. Post requisites:	Pedagogical practice, research practice. Psychological support of management activities; methods of working with functional States in the activity manager's;
5. Competences:	As a result of the development of the discipline undergraduate should: 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 management problems and rules of their solution in the conditions of actual operating production structures, methods of work with functional States in the activity of the Manager, optimization of management processes; Know: 1. to apply the knowledge gained during the course; to operate freely with psychological concepts; to use psychological knowledge in explaining the phenomena in the field of management and group psychologists processes'. 2. to carry out the analysis of professional activity of the Manager from the point of view of ensuring its psychological efficiency; to apply the methods, the receptions directed on development of professionalism of administrative

	personnel, Manager's personality and management system efficiency improvement; Master: 1. professional skills of the psychological analysis of professional activity of the Manager, the phenomena in the sphere of work and joint activity the achievement of organizational goals; 2. practical skills of psychological support of administrative activity; methods of work with functional States in activity Manager; skills of using developing technologies aimed at improving the professionalism of management personnel and team management; Be competent in readiness to lead the team in the field of their professional activities, tolerant of social, ethnic, religious and cultural differences.
6. Author	Zhusupova A. A., Shagalieva J. K., Shakhmetova D. S.
7. Literature	1. Stolyarenko A. D. "Psychology of management" Rostov – on-don "Phoenix" 2007. 2. Stolyarenko A. D. "Psychology of business communication and management" Rostov – on – don "Phoenix" 2008. 3. Volkogonova O. D., Tooth, A. T. "Managerial psychology" Moscow publishing house "Forum": Infra – M, 2007. 4. Nemov R. S. Psychology Moscow ed.center "Vlados" 2010.
8. Content of the discipline	Basic psychology. Psychological aspects of small groups and collectives. "Social and psychological bases of the head activity"

Foreign language (Professional)

1. The main information about the discipline: a total of 150 hours, including: auditory hours-50; Practical-50; Outside auditory hours -100; IWWL - 20; IWM - 80.	
Name of the discipline	Foreign language (Professional)
2. Amount of credits	5 - scientific and pedagogical direction (2 - profile)
3. Prerequisites:	Foreign language (Bachelor degree) English for Specific Purposes Professionally-oriented foreign language
4. Postrequisites:	Disciplines on the specialty in English, English for Academic Purposes
5. Competences:	Foreign language proficiency (English) at B2- (IELTS 5.5-6.0), C1 (IELTS 7.0) with the knowledge of

	terminology and terminological sublanguage of the specialty.
6. Courseauthor	Department of Foreign Languages
7. Main 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 teaching volume - 150 hours (90 hours profile), 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 vocabulary - 1200-1400 words, passive vocabulary - 1800-2400
2	Reading	Formation of reading skills with an almost full comprehension (level B1) and with a full comprehension (level C1). Authentic thematic texts and texts on the specialty
3	Writing	Formation of the ability to write an article, official and unofficial letters. Be able to know and use different styles when creating a written text on topics in the specialty
4	Listening	Formation of the ability of listening comprehension of authentic messages containing professional information
5	Speaking	Formation of oral communication skills in the specialty in the form of a monologue / dialogue / polylogue

Modern equipment for processing food products

1. General information about the discipline: Modern equipment for processing food products: a total of 150 hours, including: auditory hours-50; lectures-20; practical classes-30; Outside auditory hours -100; IWWL - 20; IWM - 80.	
Name of the discipline	**Modern equipment for processing food products**
2. Amount of credits	5
3. Prerequisites:	Automated diagnostics of technological machines / Analysis and design of

	composite structures, Automation of technological processes in mechanical engineering / Robotic systems and automation of food processing, Advanced modeling and modeling of mechatronic systems / Technological equipment of processes of processing industries.
4. Postrequisites:	High technologies of processing technological machines / Technology of processing food and agricultural products, Scientific bases of applied programs and modeling technological machines and equipment, Designing technological machines and equipment, Scientific analysis of methods of repairing technological machines and operating equipment / Basics of technical repair and maintenance of technological machines and equipment.
5. Competences:	- **the ability** to navigate with the appointment and development of technologies, taking into account the technical and economic indicators of the processes of fusion welding and pressure, competently and reasonably offer welding materials for the implementation of welding technology, to obtain equal strength welded joint, - **to know** the procedures for ensuring technological discipline at the machine-building and construction and installation enterprise, be able to identify the advantages and disadvantages of new technological processes of the machine-building and construction and installation production, - **be able** to master the new technological equipment of machine-building and construction and installation enterprises, - **to have the skills** to perform design work and execute design and technical documentation in accordance with standards, specifications and other regulatory documents using computer-aided design tools
6. Author of the course	
7. Literature	Literature 1. Технология и оборудование сварки плавлением и термической резки: Учебник для вузов. - 2-е изд. испр. и доп. /А.И. Акулов, В.П. Алехин, С.И. Ермаков и др. / Под ред. А.И. Акулова. - М.: Машиностроение, 2003. - 560 с.

	2. Сварка. Резка. Контроль: Справочник. В 2-х т. / Под общ. ред. Н. П. Алешина, Г. Г. Чернышева. - М.: Машиностроение, 2004. Т. 2 / Н. П. Алешин, Г. Г. Чернышев, А. А. Акулов и др. - М.: Машиностроение, 2004. -4 8 0 с. 3. Технология сварки плавлением и термической резки металлов: Учебное пособие / В.А. Фролов, В.Р. Петренко, А.В Пешков, А.Б. Коломенский, В.А. Казаков / Под ред. В.А. Фролова. - М.: Альфа-М: ИНФРА-М, 2011. 448 с. 4. Технологические основы сварки и пайки в авиастроении: Учебник для вузов / В.А. Фролов, В.В. Пешков, А.Б. Коломенский, В.А. казаков / Под ред. В.А. Фролова. - М.: Интернет Инжиниринг, 2002. - 456 с. 5. Справочник по сварке цветных металлов / С.М. Гуревич; Отв. ред. В.Н. Замков, 2-е изд., перераб. и доп. Киев: Наукова думка, 1990. - 512 с. 6. Гладкий П.В., Переплетчиков Е.Ф., Рябцев И.А. Плазменная наплавка. - Киев: «Экотехнология», 2007. - 292 с. 7. Сварка. Резка. Контроль. Т.1: Справочник / Под общ. ред. Н.П.Алешина, Г.Г.Чернышова. - М.: Машиностроение. 2004. - 624 с.
8. Content of the discipline Classification of machines and equipment for processing industries, Structural elements of machines. Connection details and the main types of mechanisms. Hardware and technological schemes of processing industries (flour, grains into cereals, pasta, pasteurized milk, vegetable oils, cottage cheese, cheeses, sausage baked goods, etc.). Technological equipment for the preparation of agricultural products and semi-finished products for the main production operations, equipment for crushing and grinding of raw materials and semi-finished products. Equipment for mechanical separation of processed products. Equipment for the processing of agricultural products and semi-finished compound. Pressing raw materials and semi-finished products. Heat exchange processes. Equipment for heating, pasteurization and sterilization. Devices for hydrothermal and heat processing of grain. Equipment for cooking and evaporation. Dryers. Equipment for baking, extraction, distillation and rectification, cooling and freezing of food products. Equipment for dosing, bottling, packing and packaging of finished products. Features of the equipment of low-tonnage processing industries. Line mechanized and automated lines of processing industries.	

Scientific bases of applied programs and modeling of technological machines and equipment

1. General information about the discipline: Scientific bases of applied programs and modeling of technological machines and equipment: total 150 hours, including: auditory hours-50; Lectures-20; Practical-30; Outside auditory hours - 100; IWWL - 20; IWM - 80.	
Name of the discipline	**Scientific bases of applied programs and modeling of technological machines and equipment**
2. Amount of credits	5
3. Prerequisites:	Automation of technological processes in mechanical engineering / ENG 171 Analysis, simulation and design, Automated diagnostics of technological machines / Systems of numerical program control of machines, Problems of creating technological machines and equipment / ENG151 Statistical methods in designing and manufacturing technological machines
4. Postrequisites:	Scientific analysis of methods of repairing technological machines and equipment operation / Fundamentals of technical repair and maintenance of technological machines and equipment, Design of technological machines and equipment, Analysis and design of digital control systems / Mechanization of technological processes in the system of precision farming..
5. Competences:	- **To have knowledge** of the scientific foundations of applied programs for modeling technological machines and equipment; methods and tools for modeling technological machines and equipment; basic techniques for working with the studied software; features and areas of application of software products, the structure and capabilities of modern applications of modeling. machines and equipment, rules for constructing 3D models, basic user interfaces of mathematical packages, basic data types of a programming language for technical calculations; principles of organization of the graphic system of mathematical packages. - **Ability to use** modern computer applications for modeling agricultural machinery and equipment; set and solve problems of experimental research; use organizational and psychological aspects in research work; perform an assessment of the economic efficiency of scientific research; basics of professional creativity; analyze the technical situation and find new technical solutions; use 3D modeling

	systems; use methods of computer simulation and design of industrial engineering products, including using application packages. - **the ability to use** modern elements of modern application software modeling c.x. machines and equipment (MSCNastran, Patran, Mark, Dytran, Sofy, MSCSinda, FlightLoads) in solving technological and design problems; calculations and visualization of their results in the packages Mathemetica, Maple, MathCad, Matlab in the design and modeling of technical systems. - **experience** in working with databases, knowledge subsystems and application packages that form modern application programs of the University MDFEA Bundle for modeling agricultural materials. machines and equipment.
6. Author of the course	
7. Literature	1. Аверченков В.И., Федоров В.П., Хейфец М.Л. Основы математического моделирования технических систем. – Брянск: Изд. БГТУ, 2004. 2. Майстренко, А.В. Численные методы расчёта, моделирования и проектирования технологических процессов и оборудования: учебное пособие / А.В. Майстренко, Н.В. Майстренко. – Тамбов: Изд-во ФГБОУ ВПО «ТГТУ», 2011. – 144 с. 3. Поршнев С.В., Беленкова И.В. Численные методы на базе MathCAD. – С.-Пт.: Изд. «БХВ-Петербург», 2005. 4. Черный А.А. Математическое моделирование: Учеб. пособие – Пенза: Пенз.гос.ун-т, 2011. – 256 с. 5. Самарский А.А., Михайлов А.П. Математическое моделирование: Идеи. Методы. Примеры. – М.: Наука, «Физматлит», 1997. 6. Черный А.А. Компьютерные программы математического моделирования и расчетов по математическим моделям: учебн. Пособие. – Пенза: Изд-во Пенз.гос.ун-та, 2006.-197с. 7. Черный А.А. Компьютерные дополненные программы математического моделирования и расчетов по математическим моделям:

	учебное пособие/А.А. Черный.-Пенза: Информационно-издательский центр ПензГУ, 2008-356с. 8. Сафонов А.И., Новицкий С.Н. Математическое моделирование технических систем. (Лабораторный практикум). – Мн.: БНТУ, 2004. 9. Сафонов А.И. Математическое моделирование технических устройств, механизмов и систем. - Мн.: БНТУ, 2005. 10. Бахвалов Н.С., Лапин А.В. Численные методы в задачах и упражнениях. – М.: Высшая школа, 2000. 11. Бахвалов Н.С., Жидков Н.П. Численные методы. – М.: Лаборатория базовых знаний, 2001. 12. Ашихмин В.Н., Гитман Н.Б. Введение в математическое моделирование. – М.: ЛОГОС. 2005. – 440 с.
8. Content of the discipline Modeling of technological machines and equipment. Classification, structure and functionality of CAD / CAM systems. General CAD / CAM / CAE classification. Terms and definitions of computer-aided design. Principles of selection of CAD / CAM systems for the enterprise. Principles of operation of modern CAD. Examples of CAD / CAM / CAE packages and their purpose. CAD / CAM system. Systems of automated analysis (calculation) CAE. The composition and capabilities of modern high-level systems on the example of Pro / ENGINEER. Development of UE in CAD / CAM systems. Principles of development of UE in computer-aided design. The advantages and disadvantages of the introduction of CNC machines. Processing strategies Machine codes (G - codes) and ART standard. Decision sequence in the development of UE in the CAM systems. Postprocessing. Transfer UE to the CNC machine. Spline - interpolation. An example of a run-through parametric project in Pro / E. Creating a mathematical model and drawing details. Modeling and optimization of cutting processes. Objects of modeling in engineering production. Types of mathematical models. Requirements for mathematical models. Mathematical models of power and thermal processes when cutting materials. Methods of optimization of cutting processes. The finite element method as a tool for modeling cutting processes. Preparation of the initial data. Setting the design and operating parameters of the cutting process during turning. Creating the geometry of the cutting tool. Creating the geometry of the workpiece and the element chips. Modeling loads acting on the cutting tool. Modeling in SolidWorks. Modeling in the environment of T-FLEX CAD 10. Simulation of loads acting on the workpiece and chip element. Modeling in SolidWorks. Modeling in the environment of T-FLEX CAD 10.	

Robotic complexes and automation of food processing

1. General information about the discipline: Robotic complexes and automation of food processing: total 90 hours, including: auditory hours-30; lectures-10; Practical-10; Laboratory - 10; Outside auditory hours -60; IWWL - 12; ILM - 48.	
Name of the discipline	**Robotic complexes and automation of food processing**
2. Amount of credits	3
3. Prerequisites:	Design and technological support of production, engineering technology basics, agricultural engineering technology, repair of technological machines (undergraduate courses)
4. Postrequisites:	Modern equipment and technologies for welding / ENG108 Test and measurement systems, Scientific bases of structures of hydraulic drives of technological machines and equipment / MAE 219 Introduction to scientific calculations in the field of solid body and fluid dynamics, High-tech technologies of processing technological machines / Modern metalworking
5. Competences:	Abilities: - apply the knowledge necessary for building models of the principles of operation and the mathematical description of the component parts of mechatronic and robotic systems (information, electromechanical, electrohydraulic, electronic elements and computer equipment); - implement models of computer technology; - conduct patent research in the field of professional activity; - lead the development of algorithms and software for the implementation of corrective devices; - develop working software documentation for components of a prototype mechatronic or robotic system. to master: - knowledge of the design and operation of industrial robots, the organization of robotic complexes and flexible automated production; - skills in coordinating the interaction of complexes of the type “machine-robot”, drawing up cyclograms of work;

	- the ability to carry out technological and mechanical calculations of individual modules and units that are part of the robotic complex and security measures in the application of industrial robots and RTK.
6. Author of the course	
7. Literature	**1.** Автоматизация технологических процессов и производств в теплоэнергетике: учеб. для вузов / Г. П. Плетнев.- 4-е изд., стер. - М. : Изд-во МЭИ, 2007. - 352 с. : ил. - Библиогр.: с. 349. - Предм. указ.: с. 350-351. - Прил.: с. 336-348. - ISBN 978-5-903072-85-9. 2. Основы автоматизации технологических процессов и производств [Текст] : учеб. пособие для вузов / О. М. Соснин . - М. : Академия, 2007. - 240 с. - (Высшее профессиональное образование. Автоматизация и управление). - Прил.: с. 203-236. - Библиогр.: с. 237. - ISBN 978-5-7695-3623-6. 3. Проектирование систем автоматизации технологических процессов [Текст] : справ. пособие / А. С. Клюев [и др.]; под ред. А. С. Клюева.- 3-е изд., стер., перепеч. с изд. 1990 г.. - М. : Альянс, 2008. - 464 с. : ил. - Прил.: с. 457. - ISBN 978-5-903034-44- 4. Автоматизация производственных процессов в машиностроении: учеб. для вузов / Ю. З. Житников [и др.] ; под общ. ред. Ю. З. Житникова. - Старый Оскол : ТНТ, 2009. - 656 с. : ил.. - Библиогр.: с. 647-655. - ISBN 978-5-94178-217-8. 5. Кузьмин,А.В. Теория систем автоматического управления [Текст] : учеб. для вузов / А. В. Кузьмин, А. Г. Схиртладзе. - Старый Оскол : ТНТ, 2009. - 224 с.: ил. - Библиогр.: с. 223. - ISBN 978-5-94178-189-8.
8. Content of the discipline: Basics of automation and robotization of technological processes. Automation objects in machine-building production, machine-tool construction and their parameters subject to automatic control. Automatic adjustment and adaptation of regulators. Robotic technological complex, its composition, control device, equipment equipment. Automated system of machines - processing module, technological cell, automatic line or automated section.	

Automated machine. Automatic manipulator. Programming of working cycles of the machine, modes of the technological process and auxiliary functions (automatic lubrication, transportation of waste, etc.). Automatic software control movements of the working bodies of CNC systems. Discreteness of the task of the control program. The task of calculating and selecting the optimal structures, the composition of equipment, CNC devices, computing facilities (computers) and communication channels of group control systems. Schemes of automation of mechanical and hydro-mechanical processes. Automation of transportation and storage, grinding, pressing, counting piece products, dosing, mixing, filtering. Schemes of automation of thermal processes. Automation of heat exchangers and condensers, refrigeration compressor stations, air compressor stations, pasteurization and sterilization, boiler plants. Schemes of automation of mass transfer processes. Automation of absorption and adsorption, extraction, rectification, crystallization, drying, evaporation plants. Schemes of automation of chemical processes of food production. Automation of hydrogenation, depaturation, sulfitation, conversion, refining. Automation of typical technological processes in the meat and dairy industry. Slaughter, cutting of carcasses, production of meat and bone feed mixture, defrosting and ambassador of meat, cooking minced meat and heat treatment of meat products. Storage, normalization and heat treatment of milk. Dairy production.

Designing technological machines and equipment

1. General information about the discipline: Designing technological machines and equipment: a total of 120 hours, including: auditory hours-40; Lectures-20; Practical-20; Outside auditory hours -80; IWWL - 16; IWM - 64.	
Name of the discipline	**Designing technological machines and equipment**
2. Amount of credits	4
3. Prerequisites:	Robotic complexes and automation of food processing, Modern equipment for water supply and ventilation of food production, Technology of processing food and agricultural products, Scientific bases of applied programs and modeling of technological machines and equipment, Modern equipment for processing food products, Process equipment of processing industries, Automated diagnostics technological machines.
4. Postrequisites:	Doing research and writing a dissertation
5. Competences:	*To know* the problems of engineering technology, -new construction materials and computer technologies -modern methods of research;

	To be able to apply new approaches and methods based on the use of computer technologies to solve the problems of designing modern technological machines, to apply new structural materials and types of their processing when developing technological processes in engineering production; To possess - modern methods of production organization, skills in the development of elements of new technological processes in engineering production
6. Author of the course	
7. Literature	1. Норенков И.П. Основы автоматизированного проектирования. Учебник для ВУЗов – М.: Изд. МГТУ им. Баумана, 2000. 2. AutoCAD 2000. Библия пользователя. Пер. с англ. – М.: Издательский дом «Вильямс», 2003. – 1040 с. 3. Кондрашов В.Е., Королев С.Б. Matlab как система программирования научно-технических расчетов. М. Мир, 2002. – 350 с. 4. SolidWorks 2008 : самоучитель / Н. Ю. Дударева, С. А. Загайко. — СПб.: БХВПетербург, 2008. — 382 с.: ил. + CD-ROM. 5. Инженерные расчеты в SolidWorks Simulation / А. А. Алямовский. — Москва: ДМК Пресс, 2010. — 464 с.: ил. + DVD. — Проектирование. — ISBN 978-5-94074- 586-0 6. Каталог САПР: программы и производители / П. Н. Латышев. — Москва: СОЛОН-Пресс, 2006. — 608 с. — Системы проектирования. — ISBN 5-98003-276-2. 7. Автоматизированное проектирование в системе КОМПАС-3D V12 : / Ганин Н.Б. — Москва: ДМК Пресс, 2010
8. Content of the discipline Introduction. General concepts about the design and construction of technological machines and equipment. Stage of the creation of machinery and equipment. Justification of the need to create a machine or product complex. Scientific and technical research. Patent search. Manufacturing, testing and finishing prototypes. Stages of development of design documentation. Analysis of domestic and foreign designs of machines or components. The principle of minimum size and material. Manufacturability of the design, durability, reliability and durability. Economic principles. Socio-	

environmental principles. Fundamentals of computer-aided design of machinery and equipment. Mathematical and software, parameters and characteristics of computer-aided design tools. Composition, functions and principles of modern CAD. CAD subsystems and their elements. Design methods. Automation of technological design of machinery and equipment models. General principles of modeling. Modeling techniques. Specifications. ADEM (Automated Design Engineering Manufacturing) - a program with tools for designers and designers (CAD), technologists (CAPP) and CNC programmers (CAM). CAD / CAM / CAPP / PDM - a system designed to automate design and technological preparation of production (ECC). Subject-oriented CAD systems under a single control logic and on a single information base: volumetric and flat modeling and design; registration of design and technological documentation; technological process design; manufacturability analysis and project rationing; CNC equipment programming (milling, turning, EDM, laser, etc.); preparation of up-to-date data for MES and ERP systems.

Fundamentals of technical repair and maintenance of technological machines and equipment

1. General information about the discipline: Fundamentals of technical repair and maintenance of technological machines and equipment: a total of 120 hours, including: auditory hours-40; Lectures-20; Practical-20; outside auditory hours -80; IWWL - 16; IWM - 64.	
Name of the discipline	**Fundamentals of technical repair and maintenance of technological machines and equipment**
2. Amount of credits	4
3. Prerequisites:	Automated diagnostics of technological machines, Technological equipment for processes of processing industries, Materials science in food production, Modern equipment for food processing, Technology for processing food and agricultural products.
4. Postrequisites:	Conducting research practice, writing a master's thesis
5. Competences:	**To have an idea:** about the main scientific and technical problems and prospects for the creation of new design solutions and the improvement of machines, their operation, diagnostics and repair. **To know:** the specifics of the operation of machinery and equipment; reasons for failures; types of maintenance and repair; methods of technical diagnostics and technical condition prediction; technological methods to maintain the reliability of

	technical objects during operation; the structure of the production processes of repairing machines; ways to restore parts. **To be able to**: carry out calculations of indicators of reliability and residual resource; diagnose the technical condition of machinery and equipment; organize the acceptance, installation, commissioning, maintenance, storage and repair of machinery and equipment and test them after repair. **To have experience** in the development of design and technological documentation for the repair and maintenance of machines.
6. Author of the course	
7. Literature	В.И. Черноиванов, В.В. Бледных, А.Э. Северный. Техническое обслуживание и ремонт машин в сельском хозяйстве. – изд. 2-ое перераб. и доп. М.: Челябинск: ГОСНИТИ, ЧГАУ, 2003 г. – 992 с. В.И. Черноиванов, И.Г. Голубев Восстановление деталей машин (Состояние и перспективы). М.: ФГНУ «Росинформагротех», 2010. - 376 с. В.И. Черноиванов Техническое обслуживание, ремонтиобновлениесельскохозяйственнойтехникивсовременныхусловиях. М.: ФГНУ«Росинформагротех», 2008. - 148 с. М.И. Юдин, И.Г. Савин, В.Г. Кравченко и др. Ремонт машин в агропромышленном комплексе. Под редакцией М.И. Юдина. – изд. 2-ое, перераб. и доп. – Краснодар: КГАУ, 2000. – 688 с. В.В. Варнаков, В.В. Стрельцов, В.Н. Попов, В.Ф. Карпенков. Технический сервис машин сельскохозяйственного назначения. М.: Колос, 2000. – 256 с. Е.А. Пучин, О.Н. Дидманидзе, В.С. Новиков и др. Технология ремонта машин: Учебник для вузов. М.: УМЦ «ТРИАДА». – Т.II, 2006. – 284 с. Е.А. Пучин, О.Н. Дидманидзе, В.С. Новиков и др. Технология ремонта машин: Учебник для вузов. М.: УМЦ «ТРИАДА». – Т.I, 2006. – 348 с. Е. А. Пучин, В. С. Новиков Н. А. Очковский и др. Технология ремонта машин М.: КолосС, 2007 Е.А. Пучин. Практикум по ремонту машин. М.: Колос, 2009.

	Пучин Е. А., Дидманидзе О. Н., ЛезинП.И, ЛисуновЕ.А., Кравченко И. Н. Надежность технических систем.М.: УМЦ «Триада», 2005. — 353 с. 14ПузряковА. Ф.Теоретические основы технологии плазменного напыления.М Черноиванов В.И., Лялякин В.П. Организация и технология восстановления деталей машин. 2-е изд., доп. и перераб. М.: ГОСНИТИ,2003. – 488 с. Кравченко И. Н., Зорин В. А., Пучин Е. А. Основы надежности машин. — Ч. II. М.: Изд-во ВТУ при Федеральном агентстве специального строительства, 2006. — 260 с. Кравченко И. Н., Зорин В.А., Пучин Е. А. Основы надежности машин. — Ч. I. М.: Изд-во ВТУ при Федеральном агентстве специального строительства, 2006. — 224 с. Ф. И. Пантелеенко, В. П. Лялякин, В. П. Иванов. Восстановление деталей машин: Справочник М.: Машиностроение, 2003. — 672 с. Варнаков В. В., Стрельцов В. В., Попов В. Н., Карпенков В. Ф. Технический сервис машин сельскохозяйственного назначения. М.: Колос, 2000. — 256 с. Иванов В.П.Технология и оборудование восстановления деталей машин: Учебник. – Мн.: ЗАО “Техноперспектива”, 2006. – 453 с.
8. Content of the discipline The theoretical basis of the repair of technological machines. Introduction to tribology. Wear parts. Thermal spray coating. Oxygen Wire Spray Process (OFW). Electric arc wire spraying process (EAW). Oxygen Powder Spray Process (OFP). The process of spraying powder with plasma (PA). The process of spraying high-speed oxygen-hydrogen fuel (HVOF) powder. Electroplated coatings. PVD and CVD coatings. Ion Beam Deposition Chemical vapor deposition. Spray deposition process system. Additive production. Methods and forms of technological equipment repair. Technology recovery worn parts. Classification types of repair. Engineering support repair. Systems of preventive maintenance of machinery and equipment, the development of standards for the aggregate method of repair.	

Appendix 4 Description of elective disciplines

Technological equipment for the processes of processing industries

1. General information about the discipline: Technological equipment for the processes of processing industries: a total of 150 hours, including: auditory hours-50; Lectures-20; Practical-30; Outside auditory hours -100; IWWL - 20; IWM - 80.	
Name of the discipline	**Technological equipment for the processes of processing industries**
2. Amount of credits	**5**
3. Prerequisites:	Fundamentals of design and machine parts, Reliability of technological machines, Fundamentals of technology for processing agricultural products, Equipment processing and food production (undergraduate courses).
4. Postrequisites:	Materials science in food production, Fundamentals of technical repair and maintenance of technological machines and equipment, Modern equipment for processing food products, Technology of processing food and agricultural products, Designing technological machines and equipment.
5. Competences:	- **to have an idea**: about technology and food technology; technical requirements for raw materials, materials and finished products; processes of crop and livestock production; - **to know**: basics of technology, the general structure and principle of operation of equipment for processing agricultural products; technologies and methods for the processing of raw materials and semi-finished agricultural production; methods of preparing machines and equipment of processing industries for work and their adjustment; operating rules to ensure the most efficient use of technical means; quality control methods of operations performed; bases and principles of automation of technological processes of processing; trends and main directions of development in the field of design improvement, the value of the technological parameters of raw materials processing in ensuring the quality of processed products. - **be able to**: carry out technological operations of preparing raw materials for processing, improve and optimize existing technological processes based on a systematic approach to the analysis of the quality of raw materials, technological

	process and requirements for final products; to carry out the analysis of technological processes at the enterprises of processing industries; select and use effective methods of production and primary processing of crop production, use control and regulation devices for the operation of machines and production processes, identify and eliminate defects in their work; - **to own methods**: methods and means of theoretical and experimental research of technological processes and the products obtained; development and implementation of measures to improve the technological performance of machines and equipment processing complexes; selection and use of various methods for assessing and controlling the quantity and quality of raw materials, materials, semi-finished products, finished agricultural products. - **to have practical skills** to apply in their professional activities the means of mechanization, electrification and automation of agricultural production.
6. Author of the course	
7. Literature	1. Артамонов В.В., Артамонов В.П. Оптимизация контроля и технической диагностики теплоэнергетического оборудования. – СПб.: Наука,2009.- 191 с. 2. Шишкин А.В. Материаловедение. Технология конструкционных материалов. Т.1. – Новосибирск: Учебники НГТУ, 2004. – 447 с. 3. Шишкин А.В. Материаловедение. Технология конструкционных материалов. Т.2. – Новосибирск: Учебники НГТУ, 2004. – 506 с. Дополнительная 4. Варенков А.Н. Химическая экология и инженерная безопасность металлургического производства. – М. : Интернет Инжиниринг, 2000. – 382 с. 5. Энциклопедический словарь по металлургии: в 2 т. / гл. ред. Н.П. Лякишев. – М. :Интермет Инжиниринг. Т.1: А-О. – 2000.
8. Content of the discipline: Machines and devices are integral parts of technological complexes. Organization of food technology technologies. Technological lines for processing products by disassembling agricultural raw materials into	

components (milling processes, the production of granulated sugar from sugar beet, the production of potato starch, wine materials and tomato juice, vegetable oil from sunflower seeds, the production of malt, ethyl rectification food alcohol, yeast, enzyme preparations , pasteurized milk, primary processing of animals and poultry). Technological lines for processing products by assembling agricultural raw materials from components. Technological lines for processing products by the combined processing of agricultural raw materials (corn and oatmeal, dried potatoes and vegetables, chocolate, butter, cottage cheese, canned fish). Machines and devices - converters of food environments. Equipment for conducting mechanical and hydro-mechanical processes (washing, cleaning and separation of bulk materials, inspection, calibration and screening, cleaning of plant and animal materials from the outer cover, grinding food media, screening and enrichment of liquid products grinding food environments, separation and mixing of liquid-like inhomogeneous food media, molding food environments). Equipment for conducting heat and mass transfer processes. Devices for tempering and increasing the concentration of food environments. Scientific support of tempering processes and increasing the concentration of food environments. Devices for drying food environments. Scientific support of the drying process. Apparatus for baking and roasting food environments. Scientific support of the processes of baking and roasting food environments. Scientific support of baking and roasting food environments. Devices for cooling and freezing food environments. Scientific support of the processes of cooling and freezing of food environments. Apparatus for carrying out the processes of diffusion and extraction of food environments. Scientific support of the processes of diffusion and extraction of food environments. Equipment for the alcohol rectification process. Scientific support of the alcohol rectification process. Equipment for conducting biotechnological processes. Equipment for malting and obtaining enzyme preparations. Scientific support of malting processes and the production of enzyme preparations. Apparatus for the maturation of dairy products. Scientific support of the process of dairy products maturation. Equipment for smoking meat and fish. Scientific support of the process of smoking. Equipment for dispensing food and products. Scientific support of the dosing process of food products. Machines for packaging liquid and pasty products. Scientific support of the process of packaging liquid and pasty products.

Automated diagnostics of technological machines

1. General information about the discipline: Automated diagnostics of technological machines: a total of 150 hours, including: auditory hours-50; Lectures-20; Practical-30; Outside auditory hours -100; IWWL - 20; IWM - 80.	
Name of the discipline	**Automated diagnostics of technological machines**
2. Amount of credits	**5**
3. Prerequisites:	Materials science and technology of construction materials, Repair of

	technological machines, Reliability of technological machines, Machine use (undergraduate course).
4. Postrequisites:	Modern equipment for processing food products, Scientific bases of applied programs and modeling of technological machines and equipment, Designing technological machines and equipment, Methods and devices for measuring and controlling parameters of technological machines.
5. Competences:	- **to have an idea**: about system analysis, about technologies and equipment for diagnostics of technological machines, analysis of problems in the studied objects, optimal use of computer equipment; applied in the field of diagnostics of the main types of technological machines and equipment; - **to know**: computer technology in the diagnosis of machinery and equipment; vibration, mass spectrometry, halogen, acoustic, electrical, thermal and ultrasonic diagnostic methods; processes and tools used in computer technology. - **should be able to**: carry out diagnostic control of technical objects, correctly identify faults and the reasons for their occurrence, use computer diagnostic devices in accordance with the instructions given in the database of standards used in the analysis.
6. Author of the course	
7. Literature	**Основная литература**: 1. Носов В.В.Диагностика машин и оборудования2012. - Издательство: Лань. - 373 с. 2. Черепашков А.А., Носов Н.В. Компьютерные технологии, моделирование и автоматизированные системы в машиностроенииВолгоград: Ин-Фолио, 2009. - 640 с. 3. Сафарбаков А.М., Лукьянов А.В., Пахомов С.В. Основы технической диагностики деталей и оборудования. Иркутск: ИрГУПС, 2007. -128с. 4. Яцков А.Д., Романов А.А. Диагностика, монтаж и ремонт технологического оборудования. - Тамбов: Издательство ТГТУ, 2006. - 120 с.

	Дополнительная литература: 1.Сапожников, В. В. Основы технической диагностики. М. : Маршрут, 2004. - 318 с. 2. Генкин М.Д. Виброакустическая диагностика машин и механизмовМ. : Машиностроение, 1987. - 282 с. 3. Основы технологии машиностроения: Учебник для вузов /В. М. Бурцев, Васильев А. С., Дальский А. М. и др.; Под ред. А. М. Дальского. - 2-е изд., стереотип. - М.: Изд-во МГТУ им. Н. Э. Баумана,2001. - 564 с.
8. Content of the discipline The choice of technical means of measuring and controlling the parameters of technological machines, depending on their design and operating conditions. Assessment of the accuracy and reliability of measuring instruments. Rules of installation and operation of technical measuring instruments. Types of testing technological machines: control, research, parametric, commissioning, diagnostic, resource, etc. Test benches and equipment. Evaluation of the technical condition of technological machines according to test results. Scientific principles are the improvement of the diagnostics of technological machines, the diagnostics of technological machines and the method of control without disassembly. Machine faults and their types. Issues of research disassembly parameters and assembly, machine diagnostics. Simulation of control objects. The choice of diagnostic methods. Forecasting the resource of technological machines, processing and analysis of diagnostic information. Mathematical and software, parameters and characteristics of automated diagnostic tools. Organization of laboratory and practical classes on the discipline with the use of measurement, control and testing. Requirements of safety regulations when testing machines in the laboratory.	

Methodology of scientific research

1. General information about the discipline: Methodology of scientific research: total 90 hours, including: auditory hours-30; Lectures-10; Practical-20; Outside auditory hours -60; IWWL - 12; IWM – 48.	
Name of the discipline	**Methodology of scientific research**
2. Amount of credits	**3**
3. Prerequisites:	Higher Mathematics, Computer Science, Physics, Chemistry, Engineering Systems Modeling (Bachelor), History and Philosophy of Science.
4. Postrequisites:	Modern equipment for food processing, technology for processing food and

	agricultural products, Scientific bases of applied programs and modeling of technological machines and equipment.
5. Competences:	As a result of studying the discipline, the following competencies should be formed in the undergraduate: – **Ability** to abstract thinking, analysis, synthesis; – **Readiness** for communication in oral and written forms in Russian and foreign languages for solving tasks of professional activity. - the ability to understand the development of science and technology; - knowledge: methodology as the basis of scientific research; theoretical and experimental research methods; methods of collecting and analyzing scientific information; research and processing tools; rules for registration of scientific works. - **skills**: to plan and conduct scientific and project research; use methods for evaluating research results and project activities; carry out scientific research and independently make effective creative decisions in the field of technological machines and equipment; draw up and present the results of the research. - **readiness** to use methods of setting goals and objectives of scientific and design research; developing a research plan; choosing the necessary research methods; modifying existing and developing new methods based on the objectives of a specific study. - **to formulate** and solve problems arising in the course of research and practical activities; present and protect the results of integrated engineering activities, develop scientific and technical, project and service documentation, issue scientific and technical reports, reviews, publications based on the results of completed studies; use the methodology of scientific research in professional activities.
6. Author of the course	
7. Literature	1. Ревко-Линардато П.С. Методы научных исследований: Учебное пособие. – Таганрог: Изд-во ТТИ ЮФУ, 2012. – 55 с.

	2. Организация, формы и методы научных исследований: учебник для магистрантов/ А.Я. Черныш, Н.П. Багмет и др. М.: Изд-во РТА, 2011. - 270 с. 3. Новиков А.М., Новиков Д.А. Методология научного исследования. – М.: Либроком. – 2009. - 280 с. 4. Основы научных исследований: курс лекций для аспирантов. В 2-х частях. Часть 1 / А.Я. Черныш, Т.Д. Михайленко и др. М.: РИО РТА, 2008. - 84 с. 5. Методология научных исследований: учебное пособие / А.Г. Крампит, Н.Ю. Крампит. – Томск: Изд-во Томского политехнического университета, 2008. – 164 с. 6. Новиков А.М. Методология / А. М. Новиков, Д. А. Новиков. – М.: СИНТЕГ, 2007. – 663с. 7. Лудченко А.А., Лудченко Я.А., Примак Т.А. Основы научных исследований: Учебное пособие/Под ред. А.А. Лудченко. – К.: Знание, КОО, 2000. – 114с. 8. Славутский Л.А. Основы регистрации данных и планирования эксперимента. Учебное пособие: Изд-во ЧГУ, Чебоксары, 2006. – 200 с.
8. Content of the discipline Methods of scientific research. Mathematization of science and automation of scientific research. The accumulation and processing of scientific and technical information. Bibliography. Patent information. Search for information. Classification and organization of research works. The concept of the problem, scientific direction and the topic of scientific research. Mathematical planning of an experiment in scientific research. On the methods of expert assessments in planning. Classification and main stages of research work. Organization of experimental research. Development of a hypothesis. Selection and description of the experimental technique, mastering the methods of measuring and determining indicators. Drawing up a work plan for research and preparation of the material base for the experiment. Drawing up schemes of laboratory and bench installation. Record indicators obtained during the experiment. Graphic design of the research results. Calculations Check Computing. Preparation of manuscripts for publication in print. Parameters and factors of optimization of the technological process. Response surface and regression equation. Full factorial experiment. Mathematical processing of research results. Experimental errors. Experimental estimates of the measured value and its standard deviation. Confidence interval of the measured value.	

English for Academic Purposes

1. The main information about the discipline: English for Academic Purposes	
Name of the discipline	**English for Academic Purposes:** a total of 60 hours, including auditory hours-20; Practical-20; Outside auditory hours -40; IWWL - 8; IWM – 32.
2. Amount of credits	2
3. Prerequisites:	Foreign language (Bachelor degree) English for Specific Purposes Professionally-oriented foreign language
4. Postrequisites:	Disciplines on the specialty in English
5. Competences:	Foreign language proficiency (English) at the level of B2- (IELTS5.5-6.0), C1 (IELTS 7.0) 1. development of academic language skills necessary to perform the functions associated with the use of a foreign language for performance of professional, scientific activities
6. Course author	Department of Foreign Languages
7. Main literature	1. Paul Dummet & John Hird (2016) *Oxford EAP. A Course in English for Academic Purposes.* Pre-Intermediate B1 Oxford University Press. 2. Ken Hyland and Philip Shaw (2016) *The Routledge Handbook of English for Academic Purposes.* Routledge, 711 Third Avenue, New York 3. Alex Ding & Ian Bruce (2017) *The English for Academic Purposes Practitioner.* Palgrave Macmillan 4. Yoneko Kanaoka (December 2017). A2 - B1. *Academic Encounters Level 1. Student's Book Listening and Speaking with Integrated Digital Learning. The Natural World. CAMBRIDGE UNIVERSITY PRESS* 5. Stephen Bailey (16 Jul 2018). *Academic Writing: A Handbook for International Students.* Taylor & Francis Ltd

8. The content of the discipline.

The course program "English for Academic Purposes" is designed for a teaching volume - 90 hours, of which: 27 hours for class work and 54 hours for independent work. The course ends with a comprehensive exam. The course is designed for 1 semester.

1	Vocabulary	at least 2500 learning Lexical Units of General and terminological nature

		Formation of perception skills of academic vocabulary of Latin and Greek origin
2	Academic reading	Formation of academic skills and abilities to work with similar texts in their professional activities
3	Academic writing	Formation of skills of organizing academic text, structuring academic text at macro- and micro levels from 1,000 to 5,000 words
4	Academic listening	Formation of the ability to listen and make notes of lectures in English
5	Academic speaking	Formation of basic skills of public speech in the format of academic presentation

Methods and instruments for measuring and controlling parameters of technological machines

1. General information about the discipline: Methods and instruments for measuring and controlling parameters of technological machines: total 150 hours, including: auditory hours-50; Lectures-20; Practical-30; Outside auditory hours - 100; IWWL - 20; IWM - 80.	
Name of the discipline	**Methods and instruments for measuring and controlling parameters of technological machines**
2. Amount of credits	**5**
3. Prerequisites:	Automated diagnostics of technological machines, Technological equipment of processes of processing industries, Modern equipment for food processing, Scientific bases of applied programs and modeling of technological machines and equipment, Robotic complexes and automation of food processing.
4. Postrequisites:	Conducting of research practice and master thesis
5. Competences:	*To have an idea*: about the possibilities of advanced scientific methods and technical means and use them at the level necessary for the prompt solution of production and technological problems, about the essence of precision farming. *To know*: devices and methods of measurement and control of electrical and non-electrical quantities, processing of measurement results. *To be able to*: - select and use methods and measuring systems of parameters and performance of technological machines and devices for monitoring and regulating the parameters of technological processes, - register, analyze analog-digital sensor signals in the measurement process;

	- to carry out the calibration and adjustment of measuring devices and primary transducers in volumes sufficient for research and operation in industrial conditions; - select methods for compensating for measurement errors caused by external factors (changes in ambient temperature, exposure to electric and magnetic fields, etc.). To be competent in technology and organization of production; the choice of rational modes of operation of technological machines and equipment in the field of technical means for the differential use of fertilizers; when using knowledge on the development and introduction of precision farming in agriculture of Kazakhstan.
6. Author of the course	
7. Literature	1. Нукешев С.О. Научные основы внутрипочвенного дифференцированного внесения минеральных удобрений в системе точного земледелия: моногр. /; М-во сельского хоз-ва РК. - Астана: КАТУ им. С. Сейфуллина, 2011. - 358 с. 2. Губашева А.М. Обзор конструкций высевающих устройств для дифференцированного внесения минеральных удобрений, 2011 3. Вахрамеев Ю.И. и др. Локальное внесение удобрений. – М.: Росагропромиздат, 1990. – 120 с. 3. Нукешев С.О. Научные основы внутрипочвенного дифференцированного внесения минеральных удобрений в системе точного земледелия (монография). - Астана, 2011. – 358 с. 4. Нукешев С.О. Механизация дифференцированного внесения минеральных удобрений. КАТУ, Астана, 2010. – 192 с. 5.Шпаар Д., Захаренко А.В., Якушев В.П. Точное сельское хозяйство (Precisionagriculture). – СПб-Пушкин, 2009. – 397 с. 6. Михайленко И.М. Управление системами точного земледелия. – СПб.: Изд-во С.-Петерб. ун-та, 2005. – 234 с. http://www.rmeb.kz/default.aspsign=1&dbid=RMEB

8. Content of the discipline: Introduction Measuring equipment and modern means of measurement. Development Prospects, New Applications, Digital measuring equipment. Basic concepts of measuring equipment. Measuring devices as information systems. Signals. Signal flowcharts. Static parameters and characteristics of measuring instruments. Limits of measurement. Sensitivity. Characteristic of errors. Error characteristics of measuring instruments. Reliability of funds measurements. Dynamic characteristics of measuring instruments. Dynamic errors and the possibility of reducing them. Measurement methods of electrical and non-electrical quantities. Measurements of geometric, mechanical and thermal quantities. Conversion of mechanical and thermal quantities into signals for their transmission and processing. Measurement of electrical quantities. Measurement of the composition and properties of substances. Methods and means of measuring temperature. Sensors. Primary and secondary measuring transducers. Means of visual display, output and recording of the results of mappings. Amplifiers and rectifiers. Means of telemetry. Collection and processing of measurement data. Industrial and Laboratory measuring instruments, control and testing. The main provisions of the differentiated use of mineral fertilizers in the system of precision farming. Principles operation of technical means for the differentiated use of fertilizers. Methods for solving planned technological and operational tasks for managing the production process of crops. Electronic cards distribution and introduction of batteries. The state of development of precision farming. Planned technological and operational tasks for managing the production process of crops. Agrotechnical and environmental aspects of the technological process of in-soil application of mineral fertilizers. Essence accurate farming Positioning systems. Remote sensing of the earth. Multispectral and hyperspectral sensors. Methods, devices and equipment for the study of spatial and temporal variability of parameters fertility fields. Breakdown of the field into areas according to soil type. Cartograms of distribution of batteries in the field. Electronic maps of mineral fertilizers. Evaluation of the effectiveness of various methods of differentiated fertilization. Machines for the differentiated application of mineral fertilizers. The sowing systems of machines for the differentiated application of mineral fertilizers. Prospects for the development and introduction to agriculture of precision farming.

Processing technology of food and agricultural products

1. General information about the discipline: Processing technology of food and agricultural products: total 150 hours, including: auditory hours-50; Lectures-20; Practical-30; Outside auditory hours -100; IWWL - 20; IWM - 80.	
Name of the discipline	**Processing technology of food and agricultural products**
2. Amount of credits	**5**
3. Prerequisites:	Automated diagnostics of technological machines, Technological equipment of processes of processing industries, Materials science in food production, Modern

	equipment for processing food products, Robotic complexes and automation of food processing.
4. Postrequisites:	Fundamentals of technical repair and maintenance of technological machines and equipment, Design of technological machines and equipment, Methods and instruments for measuring and controlling parameters of technological machines..
5. Competences:	**Know and understand**: - The main directions of processing of crop production; - the main range and requirements for the quality of processed products; - modern material and technical base for processing food and agricultural products, - the main technological processes occurring during storage and processing of crop production, modes of processing of raw materials; - optimal processing of raw materials with regard to its quality and range of products obtained. - The theoretical basis of the process equipment; **Be able to**: - evaluate the technological efficiency of the equipment and suggest ways and methods to improve its technical and economic indicators; - to develop new machines and devices or their separate units and parts; - compare and select the necessary equipment for a particular technological process; - use knowledge about the quality of products for the rational compilation of batches of raw materials of a given quality, sent for processing; - Evaluate and adjust the scheme of preparation of raw materials for processing. - apply advanced technological processes of raw materials processing; - to solve the problem of efficient operation of technological machines, through technical configuration and adjustments. **Own**: - special commodity, technical and technological terminology;

	- the main methods of evaluating the performance of the main process equipment; - modern methods for assessing the quality of processed products. - methods for conducting technical calculations and determining economic efficiency in the design of technological processes for the processing of crop products. **Acquire practical skills**: - select the optimal modes of processing of raw materials, taking into account its quality and range of products obtained; - assess the effectiveness of the main process equipment; - apply knowledge about the features of raw materials of various types to substantiate the choice of technological equipment, adjustments to the technological process scheme and modes of their processing; - to substantiate the change in the quality of the finished product depending on the modes and methods of processing raw materials; - apply knowledge of the purpose of individual processes and separate systems of the process to improve the yield and quality of the finished product; - solving engineering tasks for calculating the parameters and operating modes of processing machines.
6. Author of the course	
7. Literature	1. Байкин С.В., Курочкин А.А. Технологическое оборудование для переработки продукции растениеводства. М.: КолосС, 2007.- 445 с. 2. Бутковский В.А., Птушкина Г.Е. Технологическое оборудование мукомольного производства. - М.: ГП "Журнал хлебопродукты", 1999. 3. Вашкевич В.В., Горнец О.Б., Ильичев Г.Н. Технология итехнология производства муки. – Барнаул: 2000. 4. Технология переработки растениеводческой продукции/ Н. М. Личко, В. Н. Курдина, Е. М. Мельников и др.; Под ред. Н. М. Личко. — М.: КолосС, 2008. — 583 с: 5. В.И. Манжесов, И.А. Попов. Технология хранения, переработки и

	стандартизация растениеводческой продукции. - СПб: Троицкий мост, 2010. 6. Технология пищевых производств / А. П. Нечаев, И. С. Шуб, О. М. Аношина и др.; под ред. А. П. Нечаева.- М.: Колос С, 2007. 7. Куцакова В.Е., Рогов И.А., Фролов С.В., Филипов В.И. Примеры и задачи по холодильной технологии пищевых продуктов Ч. 1. Теоретические основы консервирования / М.: Колос, 2001. – 136с.: ил. (Учебники и учеб. пособия для студентов вузов). 8 Хлебников В.И. Технология товаров (продовольственных). - М.: ИД «Дашков», 2002. 9. Рогов И.А. и др. Технология мяса и мясных продуктов. В 2-х книгах. Книга 1 Общая технология мяса. Книга 2 Технология мясных продуктов. - М.: 2009. 10. Крусь Г.Н. и др. Технология молока и молочных продуктов. -М: КолосС, 2008. 11. Ратушный А. С. и др. Технология продукции общественного питания. В 2-х томах. Т.1 Физико-химические процессы, Т.2 Технология блюд и закусок. - М.: МИР Колосс, 2004. 12. Валентас Кеннет Дж., Ротштейн Энрик, Сингх Р. Пол. Пищевая инженерия. Справочник с примерами расчетов.-СПб.:Профессия, 2004.

8. Content of the discipline The basic properties of food. Primary processing of raw materials. Preparation of raw materials for processing. Transportation. Acceptance. Sort. Wash. Reducing losses. Storage. The processes occurring in raw materials during storage. Technological instructions for the primary processing and storage of various raw materials. Technology of milk and dairy products. Assortment of dairy products: milk, cream, cottage cheese, sour cream, dairy products. Butter, cheese, ice cream. Technological processes. Storage and quality control. The production technology of cheese, cottage cheese, kefir (technological scheme of production, the main technological operations and their purpose, equipment, conditions and periods of storage of finished products, its output). Technology flour, cereals, food products from grain. The sequence of technological operations. Construction of the process of preparing the grain for grinding at a flour mill, equipped with complete equipment. Sieve separation. Isolation of mineral impurities. Hydrothermal processing of grain. Purification of grain from metal-magnetic impurities. Purification of grain from impurities that differ from it by aerodynamic properties. Grain processing into flour.

Grinding in machines shock-abrasive action. Sorting process. Sorting the products of grinding grain on the quality factor. Grinding process. Grinding process. Grain preparation for processing. The basic principles and schemes of cleaning and sorting in screening machines. Mixed feed production. Equipment for the production of animal feed. Technological calculation of equipment for the preparation of animal feed. General principles and technologies of processing fruits and vegetables. Technologies for the production of canned food, concentrates, pickles, juices, quick-frozen fruits and vegetables. Drying fruits and vegetables. Chemical preservation of fruits and vegetables and semi-finished products. Technology of production of vegetable oils. The hulling and grinding of seeds. Worm presses.

Modern equipment for water supply and ventilation of food production

1. General information about the discipline: Modern equipment for water supply and ventilation of food production: total 120 hours, including: auditory hours-40 Lectures-20 ; Laboratory -20; Outside auditory hours -80; IWWL - 16; IWM – 64.	
Name of the discipline	**Modern equipment for water supply and ventilation of food production**
2. Amount of credits	**4**
3. Prerequisites:	Automated diagnostics of technological machines, Technological equipment of processes of processing industries, Materials science in food production, Modern equipment for processing food products, Robotic complexes and automation of food processing.
4. Postrequisites:	Fundamentals of technical repair and maintenance of technological machines and equipment, Design of technological machines and equipment, Methods and devices for measuring and controlling parameters of technological machines
5. Competences:	- the ability to develop physical and mathematical models of hydraulic actuators, systems, processes and objects, methods of conducting experiments with the analysis of their results; terms of reference for the development of design solutions for structures of hydraulic actuators, design documentation of technical developments; to make calculations and design individual units and devices of the hydraulic system of technological machines and equipment; to prepare scientific and technical reports, reviews, publications based on the results of completed studies;

	- the ability to apply modern methods of developing technological processes for manufacturing machines and their equipment, to choose diagnostic tools to assess the technical condition of structures and systems of technological machines and equipment; - willingness to participate in the preparation of analytical reviews and scientific and technical reports on the results of the work performed, in the preparation of publications of the results of research and development in the form of presentations, articles and reports. - possession of the skills of studying the structures of technological machines and equipment according to the training profile, analyzing their functioning, identifying faults and providing measures for their maintenance and repair.
6. Author of the course	
7. Literature	1. Лозовецкий, В.В. Гидро- и пневмосистемы транспортно-технологических машин [Текст] : учеб. пособие / В. В. Лозовецкий. – СПб.: Издательство «Лань», 2012. – 560 с. 2. Александров, В.А. Механизация лесного хозяйства и садово-паркового строительства [Текст]: учеб. / В.А. Александров, С.Ф. Козьмин, Н.Р. Шоль, А.В. Александров. – СПб.: Издательство «Лань», 2012. – 528 с. 3. Бартенев, И.М. Машины и механизмы лесного и лесопаркового хозяйства [Текст]: учеб. пособие / И.М. Бартенев. – Воронеж, 2014. – 328 с. 4. Бартенев, И.М. Система машин для лесного хозяйства и защитного лесоразведения [Текст]: учеб. пособие / И.М. Бартенев, М.В. Драпалюк, М.Л. Шабанов. – Воронеж, 2010. – 215 с. **5.** Галдин Н.С. Основы гидравлики и гидропривода: Учебное пособие. – Омск: Изд-во СибАДИ, 2006. – 145 с. 6. Галдин Н.С. Элементы объемных гидроприводов мобильных машин: Справочные материалы: Учебное пособие. – Омск: Изд-во СибАДИ, 2005. – 127 с. 7. Гидравлика и гидропривод: Учебное пособие /Н.С.Гудилин,

	Е.М.Кривенко, В.С.Маховиков и др. – М.: Изд-во МГГУ, 2001. – 520 с. 8. Гидравлика, гидромашины и гидропневмопривод: Учебное пособие /Под ред. С.П.Стесина. – М.: ИЦ «Академия», 2005. – 384 с.
8. Content of the discipline General characteristics of the hydraulic systems of technological machines. Classification and principle of operation of the hydraulic drive. Requirements for working fluids. Volumetric hydraulic machines. Auxiliary equipment of volumetric hydraulic actuators. Regulating equipment. Preliminary and calibration calculation of hydraulic drive. Determination of hydraulic characteristics. Power and efficiency of hydraulic drive. Dynamic calculation of hydraulic drive. Hydraulic systems of technological machines and equipment (manipulators, machine tools and machine tools, robotic manipulators, equipment for processing and agricultural purposes). Testing, operation and maintenance of hydraulic actuators. Hydraulic equipment maintenance.	

Materials science in food production

1. General information about the discipline: Materials science in food production: a total of 150 hours, including: auditory hours-50; Lectures-20; Practical-30; Outside auditory hours -100; SRMP - 20; CPM - 80.	
Name of the discipline	**Materials science in food production**
2. Amount of credits	**5**
3. Prerequisites:	Materials science and technology of construction materials, Heat treatment of materials (undergraduate courses), Technological equipment of the processes of processing industries.
4. Postrequisites:	Processing technology of food and agricultural products, Scientific bases of application programs and modeling of technological machines and equipment, Modern equipment for water supply and ventilation of food production, Fundamentals of technical repair and maintenance of technological machines and equipment, Design of technological machines and equipment.
5. Competences:	- to have knowledge of the physical nature of phenomena occurring in materials under the conditions of production and use of products under the influence of external factors (heating, cooling, pressure, radiation, etc.), their influence on the structure, and structure on the properties of materials; the main criteria for the selection of structural materials, their characteristics.

	- the ability to assess and predict the behavior of the material as a result of analysis of operating and production conditions; reasonably and correctly to choose the material of the structures of machines, in accordance with the conditions of their operation; testing. - the ability to develop methodological and regulatory materials for the production, operation and testing of existing and designed materials, increased durability and corrosion resistance.
6. Author of the course	
7. Literature	**1.** Черный А.А. Компьютерные программы математического моделирования и расчетов по математическим моделям: учебн. Пособие. – Пенза: Изд-во Пенз.гос.ун-та, 2006.-197с. **2.** Сафонов А.И., Новицкий С.Н. Математическое моделирование технических систем. (Лабораторный практикум). – Мн.: БНТУ, 2004. **3.** Рогов, В.А. Современные машиностроительные материалы и заготовки: учеб. пособие для студентов высш. учеб. заведений / В.А. Рогов, Г.Г. Позняк. — М.: Издательский центр «Академия», 2008. — 336 с. 4. Материаловедение / Под ред. Б.Н. Арзамасова и др. – М.: Из-во МГТУ им. Баумана, 2009. 5. Технология конструкционных материалов: Учебник для студентов машиностроительных специальностей вузов / А.М. Дальский, Т.М. Барсукова, А.Ф. Вязов и др.; Под общей редакцией А.М. Дальского. - 6-е издание, переработанное и дополненное.- М.: Машиностроение, 2005. - 592с. **6**. Назаров, В.Г., Поверхностная модификация полимеров - М.: МГУП, 2008. 7. Дьякова, Е.В. Технология механической массы: учебное пособие для вузов / Е.В. Дьякова, В.И. Комаров. - Архангельск: АГТУ, 2006.
8. Content of the discipline. Structural strength of materials. Classification and properties of construction materials. The main stages of the process of obtaining blanks and machine parts. Surface finishing methods: grinding, superfinishing, honing, shevenging. Electrophysical and electrochemical methods of metal processing. Production of products by powder metallurgy. Anticorrosive and wear-resistant coatings of construction materials. Metal-ceramic materials and products from them. The	

structure of the materials and the requirements for them. Semiconducting materials. Superconductors. Ceramic materials, types. Ceramic composites. Fibrous, dispersed-filled and foamed composites. Composites with metal, polymer and carbon matrices. Fibrous reinforcing elements.