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

Reviewed by at the meeting of the University Academic Council Protocol number 19 dated 31 08 2022

#### **EDUCATIONAL PROGRAM**

8D07105 Mechanical engineering

Code and classification of the field of education: 8D07- Engineering, Machining and Construction branches Code and classification of training areas: 8D071- Engineering and Engineering affair Code in International Standard Classification of Education: 0710 Qualification: PhD / Educational Program 8D07105- Engineering and Engineering affair Duration of study: 3 years (scientific and pedagogical direction)

# Авторский коллектив:

Usserbayev Muratbek Turarbekovich – NJSC S.Seifullin KATU, c.t.s., chairman of the department; Sherov Karibek Tagaevich, NJSC S.Seifullin KATU, d.t.s., professor Mendaliev Saule Ilinishna, NJSC S.Seifullin KATU, c.t.s., senior lecturer Kossatbekova Dinara Shadiyarbekovna, NJSC S.Seifullin KATU, master degree, professor Tusupbekova Gulim Magauiyanovna, NJSC S.Seifullin KATU, PhD student of the group 30-103-22

Jacek Cieslik, AGH-UST University of Science and Technology, (Krakow, Poland), professor;

Akchurin Aysultan Anvarovich, Independent director of the board of directors of "Petropavl Heavy Machinery Plant" JSC, c.t.s;

Eldar Muratovich Azbanbayev, director of the scientific research and development department of Kazakhstan Paramount Engineering LLP, PhD;

The team of authors approved by the order of JSC "S.Seifullin KATU"NJSC No. 932-H of December 12, 2018 (amended by order No. 515-H dated 04.10.2022)

Educational program **8D07105** "Mechanical Engineering" reviewed at the meeting of the department Technological machines and equipment protocol number 20 from 27 June 2022,

approved by the Faculty's Academic Council for Quality protocol  $Noldsymbol{0}$  10 (E) "29" June 2022 .

# Content

№	Component name	page
1.	Educational program passport	4
2.	General description of the educational program	5
3.	Graduate competency model (portrait)	6
4.	Base of professional practice	8
5.	Structure of the educational program	9
6.	1-Appendix. Academic calendar	10
7.	Appendix 2. Work study plan	12
8.	Appendix 3. The matrix of achievement of the educational result formed by the educational program with the help of educational subjects	16

#### 1 Educational program passport

#### **EP** purpose:

The main objective of the educatiRSal program "Mechanical Engineering" (OP) is to prepare competitive PhD doctors of scientific and pedagogical directiRS, possessing modern competencies and skills, techniques and technologies that cRStribute to the solutiRS of issues arising in industrial enterprises, specialized research and educatiRSal organizatiRSs by providing deep theoretical knowledge and practical experience in the field of technological machines and equipments.

To achieve the above objectives of the OP formulated the following tasks:

- 1. Fulfillment of the social order of a society for the development and formation of demanded personnel in the labor market;
- 2. Focusing attention on various groups of PhD doctors and their professional needs on the basis of providing them with flexible individual educational trajectories and forming students' motivation for professional improvement and self-realization;
  - 3. Formation of readiness of doctors PhD for the organization and implementation of practice-oriented innovation and research activities;
- 4. Formation of current professional skills and competencies at PhDs, which contribute to solving theoretical and practical aspects of promising trends in industry and related sectors: technology for manufacturing parts, mechanisms and machines; technology of machining parts using advanced processing methods; technology assembly components and machines; technologies for repair and restoration of parts, as well as technology for hardening parts, mechanisms and machines; automation and robotization of industrial production;
- 5. Formation of the image of KATU, as a key educational and expert organization in the field of production of parts, mechanisms, machines and industrial products among scientific and educational institutions of the republic and Central Asia.

#### 1.2 Educational outcome

- **EO 1.** Show professional communication, scientific, discursive and writing skills.
- **EO 2.** Reveal the ability to critically analyze and evaluate the received theoretical and experimental data, draw conclusions and synthesize new ideas for the creation of new technological machines and equipment in the field of agricultural engineering.
- **EO 3.** To summarize the scientific aspects of theoretical research and experimental results in the development of new models of mechatronic and robotic systems, their modules and subsystems.
- **EO 4.** To form the ability of scientific thinking, to design and implement the results of theoretical and experimental research on the creation of new technological machines and equipment in the field of agricultural engineering.
- **EO 5.** Gain knowledge in the field of theoretical methods of analysis and construction of a dynamic model of processes in mechanical systems when creating agrotechnological machines and processing equipment.
  - **EO 6.** Determine the methodology for posing the problem, justifying the choice of the goal and objectives of scientific research.
- **EO 7.** Substantiate and propose the stages of scientific research on the theoretical justification of the design and technological parameters of the working bodies of the developed agricultural machine, the methodology and equipment used for experimental research, as well as describe the test conditions.
  - EO 8. Synchronize the knowledge of theoretical and experimental research at the stages of preparation, planning, conducting and analyzing an

engineering experiment, interpret the results obtained and solve problems of optimizing the parameters of technological machines for agricultural and processing industries.

- **EO 9.** Own scientific methods for constructing a mathematical model of technological machines and its analysis when exposed to dynamic processes of various nature.
- **EO 10.** Develop skills to identify the physical essence of the phenomenon occurring in materials in the conditions of production and operation of products from them under the influence of external factors.
- **EO 11.** Describe the functions and tasks of automated control systems at the upper and lower levels. Understand and determine the modes of operation of automated process control systems, quantitative assessment of the effectiveness of control systems, describe the tasks and stages of designing control systems.

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

The study program was developed jointly with professors of the University of California, Davis (USA) and taking into account the recommendations of leading experts of advanced industrial enterprises, in accordance with the NFC and professional standards, agreed with the Dublin descriptors and the European Qualifications Framework, on the basis of the State Compulsory Higher Education Standard, doctoral studies approved by order of the Minister of Education and Science of the Republic Kazakhstan dated October 31, 2018 (No. 604), the classifier of specialties of higher and postgraduate education the formation of the Republic Kazakhstan, educational, program and methodological documentation, individual work plans for doctoral students and other documents approved in the prescribed manner.

A feature of the EP is to consolidate the theoretical knowledge of classrooms during the experimental research on the basis of its own workshops within the university. To implement the "Mechanical Engineering", the department "Technological Machines and Equipment" has a modern material and technical base and scientific and experimental platform in the field of mechanical processing of parts, automation and production robotization (further platform), created within the framework of the State program of industrial and innovative development Kazakhstan for 2015-2019, as well as a highly qualified faculty.

The **competitive advantages** of this OP are the following:

- highly qualified faculty;
- high material and technical equipment of the OP;
- training is conducted in three languages (state, Russian and English);
- a close relationship with employers and graduates of educational programs;
- 100% provision of a hostel for living during the course of study;
- availability of a medical center, social pharmacy and store for students.

The uniqueness of the EP lies in combining all the theoretical and practical aspects of the manufacture of competitive products through the application in the manufacture of innovative and advanced technologies for processing and manufacturing parts, mechanisms, assemblies, components and machines for agricultural purposes, in order to implement the program of import substitution and national security of the country in the field of

industrial independence i.e. the transition from the mining cluster to the processing and production, and increasing the share of the percentage of Kazakhstan goods, as well as increasing the export potential.

The main **stakeholders of the EP** are:

- PTC
- Leading experts of industrial enterprises and associations of the agroindustry complex;
- Department of Technical and Innovative Development of the Ministry of Industrial-Innovative Development of the Republic of Kazakhstan;
- Machine-building enterprises of any profile;
- Design organizations of machine building;
- Research institutes and research and production centers.

#### 3 Competency model (portrait) of the graduate

#### 3.1 Professional activities

The field of professional activity of the Doctor of Philosophy (Phd) of the educational program "Mechanical Engineering" includes:

- all types of organizations of education and science;
- research and design organizations;
- production and psychological-pedagogical activity in organizations of secondary, higher and additional professional education of technical and agricultural areas, research, design organizations and production;
  - research activities in the field of education and workplace in the field of advanced training of workers in accordance with the specialization;
  - educational, management and planning activities in accordance with the qualifications of the doctor PhD.
- The doctor of this profile is prepared for activities in the field of material production, which includes a set of tools, methods and methods of human activity aimed at solving complex problems associated with the design, operation and repair of process equipment.

# 3.2 Types of professional activity

# The objects of professional activity are:

- secondary and higher vocational schools;
- enterprises and organizations that train and retrain specialists;
- research, design organizations of the educational sector and research institutes;
- engineering plants producing technological equipment; enterprises and organizations that operate technological equipment: design, design and technological organizations; machine repair enterprises of technological equipment; branded and dealer centers of machine-building and repair plants of technological equipment; marketing services; logistics systems, technological equipment management services, various technological equipment testing centers.

#### 3.3 General educational competencies

- possess the methodology of a systematic approach to the organization, modern approaches to management and analytical management methods, methods of diagnostics, analysis and problem solving, as well as methods of decision making and their implementation in practice;

- competently solve practical management problems and implement these solutions, be prepared to perform management functions and be able to solve professional problems in the interests of the organization as a whole;
- possess the knowledge, skills and abilities necessary for taking up a relevant managerial position and based on a deep understanding of the characteristics of a market economy and its capabilities, functions and economic role of the state, understanding environmental problems, awareness of the social responsibility of business and adherence to civilized ethical norms of its conduct:
- to be able assess modern problems and prospects for the socio-economic development of Kazakhstan, to understand modern trends in the development of the world economy and globalization, to navigate in matters of international competition.

# 3.4 Basic competencies

- demonstrate a systematic understanding of the field of study, mastering the skills and research methods used in this field;
- demonstrate the ability to think, design, implement and adapt the essential research process with a scientific approach;
- to contribute by own original research to the expansion of the boundaries of the scientific field, which deserves publication at the national or international level;
  - critically analyze, evaluate and synthesize new and complex ideas;
  - communicate their knowledge and achievements to colleagues, the scientific community and the general public;
- to promote the advancement of the technological, social or cultural development of a society based on knowledge in the academic and professional context.

#### 3.5 Professional competencies

Organizational and technological activities:

- development of design, technological, design-estimate documentation for the creation and repair of technological machines and equipment;
- organization of the team work of performers, consideration of different opinions and management decisions;
- trade-off decisions taking into account various requirements (cost, quality, deadlines and safety) for different types of planning and determining the optimal solutions;
  - accounting for various types of costs in order to ensure the production of quality products.

Production and management activities:

- optimization of manufacturing technology of technological machines and equipment;
- quality control of technological processes, materials and finished products;
- the choice and effective use of materials, equipment and other means for the implementation of production processes;
- Metrological verification of measuring the indicators of product quality;
- carrying out measures for the standardization and certification of technological machines and equipment, the technology of their manufacture and repair;
  - organization and management of services, enterprises related to the operation and maintenance of technological machines and equipment. *Project activities:*
- defining the goals and objectives of the project, taking into account various factors when building the structure of their interrelations and identifying priority areas for solving problems;

- development and analysis of solutions to the problems of forecasting the consequences, planning and implementation of projects;
- development of projects of technological machines and equipment taking into account technological, design, aesthetic, economic and other parameters;
  - use of information technology in the selection of materials, technological machines and equipment.

# Typical tasks of professional activity are aimed at solving:

- tasks related to the improvement and improvement of their qualification level;
- technical and detailed design of units and parts of technological machines and equipment;
- testing of technological machines and equipment and its elements for reliability according to standard procedures;
- development of standard technological processes for the manufacture of blanks, parts, assembly units of technological machines and equipment;
  - production management at the level of production sites of enterprises of technological machines and equipment;
  - technological support of existing production;
  - technical design of automatic control means of technological machines and equipment based on standard solutions;
  - tests of automation equipment according to standard procedures;
  - development of vibration isolation systems for technological machines and equipment and noise protection;
  - analysis of the reliability and durability of technological machines and equipment.

# **4 Base professional practice** (all types of practices)

The practice is carried out in order to develop practical skills of scientific, scientific, pedagogical and professional activities.

The educational program of scientific and pedagogical doctoral studies includes: pedagogical and research practice.

In the period of teaching practice, doctoral students, if necessary, are invited to conduct classes in undergraduate and graduate programs.

The research practice of the doctoral candidate is carried out with the purpose of studying the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as consolidating practical skills, applying modern methods of scientific research, processing and interpreting experimental data in the dissertation research.

The content of research practice is determined by the theme of the doctoral dissertation.

# Structure of the educational program

No	Noming avales of dissiplines and types of activity	General	workload
Νō	Naming cycles of disciplines and types of activity	in academic times	in academic credits
1	2	3	4
1.	Theoretical training	1350	45
1.1	Cycle of basic disciplines (BD)	870	29
	University component	600	20
1)	Academic writing	150	5
2)	Methods of scientific researches	150	5
3)	Pedagogical practice	300	10
	Option component	270	9
1)	Engineering Experimentation & Uncertainty Analysis	90	3
2)	Methods of empirical and theoretical research	90	3
3)	Mechanical Performance of Materials	90	3
4)	Mechanical characteristics of new structural materials	90	3
5)	Theory and Design of Control Systems	90	3
6)	Theoretical foundations for the design of control systems	<i>7</i> 0	3
1.2	Cycle of professional subjects	480	16
	University component	480	16
1)	Mechatronics and robotics	90	3
2)	Dynamics of processes in mechanical systems	90	3
3)	Research practice	300	10
2	Scientific research work	3690	123
1)	Scientific research work of a doctoral student, including the completion of an internship and the	3690	123
	completion of a doctoral dissertation		120
3	Additional types of training		
4	Final attestation	360	12
1)	Writing and defense of a doctoral dissertation	360	12
	Total	5400	180

Approved
Deputy Chairman of the Board for Avademic Affairs - Rector

1. Abdyrov
2022

# ACADEMIC CALENDAR

for 2022-2023 academic year in areas of Doctoral training

_	Beginning of 1st trimester	1 September
1	Presentation week	from 1 September to September 2 (from August 29 to September 2 for 1 course)
2	Constitution day	30 August
3	The day of knowledge	1 September
4	Examination session	from 14 to 25 November
5	The day of the First President	of 1 December
6	FX delivery	from 14 November to 9 December
7	Independence day	16 December
8	Holidays	from 28 November to 31 December
9	The New year's holiday	January 1,2,3
	Beginning of 2nd trimester	1 January
10	Christmas	7 January
11	International Women's Day	on 8 March
12	Nauryz holiday	21,22,23 March
13	Examination session	from March 13 to 24 March
14	FX delivery	from March 13 to 31 March
15	Holidays	from March 27 to March 31
Beg	inning of 3rd trimester	1 April
16	Holiday of Unity of Nations of Kazakhstan	1 May
17	Defender is day	7 may
18	Victory Day	9 may
19	Examination session	from 12 June to 23 June
20	Holidays	from 26 June to 31 August
21	FX delivery	from 12 June to 30 June
22	Enrollment for a trimester	from 26 June to 30 June
23	Final examination	until June 30
24	Summer trimester	from 3 June to 11 August
25	Capital Day	6 July

Note: If it concurs with a weekend or a holiday, study begins on the next working day.

Deputy Director of the Department of Academic Affairs \_\_\_\_\_\_ A.Sh.Imasheva

#### График учебного процесса на 2022-2023 учебный год для образовательных программ и специальностей докторантуры технического факультета

		(	Сент	тябі	nь			Ок	гябр	ь			1	Ноя	бnь				Лек	абрі				Я	вар	ь			Фе	врал	ь			М	арт			A	прел	Ь			Ma	й				Июн	ть			Июл	ь	Т	ABI	густ	
١	1	2	! :	3	4	5	6	7	8	9	1	10	11	12	13	3 1	14	15	16	17	18	19	2	20	21	22	23	24	25			7 2	28	29	30	31	32	33	3 34	35	36	37	38		40	41	42		43	44	45	46 4	17 48	3 49	50	51	52
Ē	29	5	5 1	12	19	26	3	10	17	24	4 3	31	7	14	21	1 2	28	5	12	19	26	5 2		9	16	23	30	6	13	20	) 2	:7	6	13	20	27	3	1	0 17	7 24	1	8	15	22	29	5	12	2 1	19	26	3	10 1	7 24	4 31	7	14	21
-	2	9	) 1	16	23	30	7	14	21	. 28	8	4	11	18	25	5	2	9	16	23	30	6	1	13	20	27	3	10	17	24	1 3	3	10	17	24	31	7	1	4 21	1 28	5	12	19	26	2	9	16	5 2	23	30	7	14 2	21 28	3 4	11	18	25
		1	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											
																												8D07	105 N	<b>1exa</b>	ниче	ская	яина	женер	ия																						
I	пн	[ -/]	н -,	/H	·/H	·/H	·/H	·/H	·/E	·/I	H ·/	/H	·/H	C/ 3C	C 30		BC/ K	3С/ К	ΙК	К	К	·/I	ı -,	/Η	·/H	·/H	·/H	·/H	·/I	·/I	·/	н	·/H	C/3C	C/3C	3C/I	к Ип Н		п/ Ит Н Н			/ Ип Н			/ Ип. Н		C/3	C C	2/3C	ЗС/ ЗЛ/К	к	К	к	: К	к	к	К
п	К	F	H	Н	Н	Н	Н	Н	Н	Н	[ ]	Н	Н	C/ 3C	C 30		BC/ K	3С/ К	к	К	К	Ип Н		In/ 1 H	Ип/ Н	Ип/ Н	Ип/ Н	Ип Н	/ Ип Н			- 1	Ип/ Н	C/3C	C/3C	3C/I	к	F	Н	Н	Н	Н	Н	Н	Н	Н	C/3	C C	730	3С/ 3Л/К	к	К	к	к	к	К	К
Ш	К	Пı Н	п/ П Н	In/ l H	Пп/ Н	Пп/ Н	Пп/ Н	Пп Н	/ Пп Н	/ Пи Н	π/ Π [ ]	Iπ/ H	Пп/ Н	C/ 3C	C 30		BC/ K	3С/ К	к	К	К	Н	1	н	Н	Н	н	Н	Н	Н	ı	н	н	Н	Н	Н	Н	F	н н	н	Н	Н	H/ ДД	H/ ДД	H/ ДД	дл	ДŲ	цД	щ	ИА							

ПН - презентационная неделя

· - теоретическое обучение

ЗД запись на дисциплины

3С- сдача FX

С - сессия экзаменационная

Праздничные дни: 30, 31 августа - День Конституции

1 сентября - День знаний

1 декабря - День Первого Президента 16, 17 декабря - День независимости 1, 2, 3, 4 января - Новогодние праздники

7 января - Рождество

Л - летний семестр

Н - научно-исследовательская работа докторанта и выполнение докторской диссертации

Ип - исследовательская практика

Пп - педагогическая практика

К - каникулы

ДД - написание докторской диссертации

ИА - итоговая аттестация

8 марта - Международный женский день

21, 22, 23 марта - Наурыз мейрамы

1, 2 мая - Праздник единства народа Казахстана

7 мая - День защитника Отечества

9 мая - День Победы 6 июля - День Столицы Всего недель:

теоретическое обучение - 20-30 недель экзаменационная сессия - 3-4 недели

каникулы зимние - 3 недели каникулы весенние -1 неделя летний семестр - 6 недель Annex 2. Working curriculum.

					Год поступления: 25-05-2022																					
					H H H		акаде		роль по ским пер				Объе	ем в ча	ıcax			Pa	спред	целен		дитов риода		адемі	ически	M
	RUĄt		ЛИНЫ		диспины	диты		ный	ный					в т.ч.					1 кур	C	:	2 курс	;	3	В курс	
ж	16 MO	ИНЫ	испип	ZH PI		иекр		рован ка)	рован ая)	_						СРД		1	2	3	4	5	6	7	8	9
модул	товани	испипл	нент ди	сципл	новани	ическ	I I	ренци ракти	ренци урсов	ка/НИ		рные	_	ческие		П	СРД		He,	дель в	з акад	емиче	еском і	перис	де	
Шифр модуля	Наименование модуля	Цикл дисциплины	Компонент дисциплины	Код дисциплины	Наименование	Академические кредиты	Экзамены	Дифференцированный зачет(практика)	Дифференцированный зачет(курсовая)	Практика/НИР	Всего	Аудиторные	Лекции	Практические	ЕПП			10	10	10	10	10	10	10	10	10
	-										ш	_		_					ļ							-
1		ПД	ВК	MR 7301	Мехатроника и робототехника	3	1		1		90	30	10	20		12	48	3								
2	Профилиру	ПД	ВК	DPMS 7302	Динамика процессов в механических системах	3	2				90	30	10	20		12	48		3							
3	ющий	ПД	ВК	IP 7303	Исследовательская практика	5					150									5			ш			
4		ПД	ВК	IP 8304	Исследовательская практика	5					150											5	$\sqcup$			
5		БД	ВК	MNI 7206	Методы научных исследований	5	1		ļ		150	50	20	30		20	80	5					$\vdash \vdash$			_
6		БД	ВК	AP 7205	Академическое письмо	5	2				150	50	20	30		20	80		5				$\vdash$			
7		БД	BK	PP 9201	Педагогическая практика	10	-	-	-		300				-	-	-		<u> </u>	<u> </u>			$\vdash$	10	$-\!\!+$	$\dashv$
8 9		БД	KB	IEAN 7202 METI 7207	Инженерные эксперименты и анализ неопределенности	3	1				90	30	10	20		12	48	3					$\vdash$			-
10	Базовый	<u>БД</u> БД	KB KB	ME 11 7207 MHM 7203	Методы эмпирического и теоретического исследования Механические характеристики материалов																		$\vdash$	-	-+	
11		БД	КВ	MHNKM 7208	Механические характеристики новых конструкционных материалов	3	2				90	30	10	20		12	48		3						$\top$	
12	†	БД	КВ	TPSU 7204	Теория и проектирование систем управления								40			40										
13	İ	БД	КВ	TOPSU 7209	Теоретические основы проектирование систем управления	3	2				90	30	10	20		12	48		3							
	'				Научно-иссле	довате	ельская	работ	та (НИР)	•			•					•	•	,						
14		НИР	ОК	NIRDVVDD 7501	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	9					270							9								
15		НИР	ОК	NIRDVVDD 7502	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	6					180								6							
16		НИР	ОК	NIRDVVDD 7503	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	15					450									15						
17	Исследова	НИР	ОК	NIRDVVDD 8504	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	20					600										20		Ш			
18	тельская	НИР	ОК	NIRDVVDD 8505	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	15					450											15	1			
19	практика	НИР	ОК	NIRDVVDD 8506	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	20					600												20		$\top$	$\exists$
20		НИР	ОК	NIRDVVDD 9507	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	10					300													10		
21		НИР	ОК	NIRDVVDD 9508	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	20					600														20	
22		НИР	ОК	NIRDVVDD 9509	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	8					240												Ш		$\perp$	8
	теоретичесь					25	10	0	0	0	750	250		60	0	100	400						igsquare			
	Дополнител			обучения		143	-	l	ļ					4290									igwdot		<b>_</b>	
	Педагогичес					10	-	7	-	7				300					<u> </u>				${igspace}$		<b></b>	
ПИ НИРД	Исследовате	ельская	практи	ıка		123		3, 5		5 1, 2, 3, 4, 5, 6,				300 3690											+	$\dashv$
	Научно-иссле	едовате	ельская	і работа докторанта,	, включая выполнение докторской диссертации					7, 8, 9																
ИА	Итоговая ат					12								360									ш	$\Box$	$\Box$	
		е и защи	та докт	горской диссертации		12				9				360									ш			
	Итого					180					5400	250	90	60	0	100	400						$ldsymbol{ldsymbol{ldsymbol{ldsymbol{\square}}}$			

					Год поступления: 25-05-2021																					
					<b>ч</b>			акаде	роль г мическ эиодам	им			Объе	м в час	ax			Pac	преде	елени		цитов риода		кадем	ичесн	им
	модуля		ПИНЫ		циплины	диты		ванный	HЫЙ					в т.ч.				1	курс	;	2	курс		3	3 курс	
<u> </u>		лины	Компонент дисциплины	и	ие дис	Академические кредиты		трован ка)	трован ая)	۵				ø		СРД		1	2	3	4	5	6	7	8	9
модуг	нование	испип	нент д	сципл	нован	мичесь	ЭНРІ	іфференциро чет(практика)	еренці курсов	Практика/НИ		орные	_	ически		п	СРД		Нед	ель в	акаде	миче	ском	пери	оде	
Шифр модуля	Наимен	Цикл дисциплины	Компо	Код дисциплины	Наиме	Акадег	Экзамены	Дифф. зачет(г	Дифференцированный зачет(курсовая)	Практи	Всего	Аудиторные	Лекции	Практические	лпз			10	10	10	10	10	10	10	10	10
	-				Модули специаль	ности/обр	азова	тельно		аммы	•															
1		ПД		MR 7301	Мехатроника и робототехника	3	1				90.0		0/10			0/12	3/48	3.0								
2	Профилиру	ПД		DPMS 7302	Динамика процессов в механических системах	3	2				90.0	30.0	0/10	1/20		0/12	3/48		3.0		Ţ					
3	ющий		ВК	IP 7303	Исследовательская практика	5	<u> </u>				150.0				-					5.0						
4			ВК	IP 8304	Исследовательская практика	5	<u></u>				150.0											5.0				
5		_	BK	MNI 7206	Методы научных исследований	5	1				150.0		1/20			1/20	5/80	5.0								
6 7			BK BK	AP 7205 PP 9201	Академическое письмо Педагогическая практика	5 10	2				150.0 300.0	50.0	1/20	2/30		1/20	5/80		5.0					10.0		
8	Базовый	БД	KB	IEAN 7202	Педагогическая практика Инженерные эксперименты и анализ неопределенности	3	1				90.0	30.0	0/10	1/20		0/12	3/48	3.0						10.0		
9		БД	KB	TPSU 7204	Теория и проектирование систем управления	3	2				90.0	30.0	0/10	1/20		0/12	3/48	3.0	3.0							
10		БД		MHM 7203	Механические характеристики материалов	3	2				90.0		0/10			0/12	3/48		3.0							
10	· ·	υд	IND.	1411 1141 7 200	Научно-иссл			тработ	а (НИР	)	00.0	00.0	0/10	1720		0/12	0/40		0.0	1	-	-				
11		НИР	ОК	NIRDVVDD 7501	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	9		ľ	,		270.0							9.0								
12		НИР	ОК	NIRDVVDD 7502	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	6					180.0								6.0							
13		НИР	ОК	NIRDVVDD 7503	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	15					450.0									15.0						
14	Исследоват	НИР	ОК	NIRDVVDD 8504	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	20					600.0										20.0					
15	ельская	НИР	ОК	NIRDVVDD 8505	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	15					450.0											15.0				
16	•	НИР	ОК	NIRDVVDD 8506	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	20					600.0												20.0			
17		НИР	ОК	NIRDVVDD 9507	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	10					300.0													10.0		
18		НИР	ОК	NIRDVVDD 9508	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	20					600.0														20.0	
19		НИР	ОК	NIRDVVDD 9509	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	8	7		0		240.0	250	00	100	0	100	400									8.0
	еоретическо Дополнител		-			25 143	7	0	0	0	5040	250	90	160 290.0	0	100	400									
дво ,	<b>дополнител</b> Педагогическ					143	1	7		7	-			290.0 300					-					-		
	Исследовате					10	<del>                                     </del>	3.5		5				300												_
нирд					рранта, включая выполнение докторской диссертации	123		0,0		1, 2, 3, 4, 5, 6, 7, 8, 9				3690												
	Итоговая ат			ал расста докто	Sparria, Biolio Iasi Balilotino na Austroposon Anocopiadan	12	1			7,0,9				360.0												
			•	окторской диссе	NAITH	12	t			9				360												
			<b>₹</b> ₩ ₩	S SPONOFI AFIOOD																						

					Год поступления: 25-05-2020																					
	뚼		1НЫ			IdTh			роль п мическ				Объе	ем в ча	сах			Pa	спред	делен		дитов риода		адеми	ически	м
	модуля	₫	цпи	-		кред		ван ика)	зан					в т.ч.					1 курс	;		2 курс	:	3	3 курс	
КПУ	ание и	дисциплины	гдисп	L H H	Бы	ские		практ	щиро овая)	Ā		ē		кие		СРД		1	2	3	4	5	6	7	8	9
Шифр модуля	аименование	дисц	Компонент дисциплины	Код дисциплины	Аименован	Академические кредиты	Экзамены	Дифференцирован ный зачет(практика)	<u>цифференциро</u> ₁ый зачет(к∨рсовая)	Практика/НИР	c	Аудиторные	Z	Практические		П	СРД		He	дель	в акад	емиче	ском г	терио,	де	
Виф	Наим	Цикл	Комп	Код	Наим	Акад	Экза	Дифо	Диф( ный заче	Прак	Всего	Ауди	Лекции	Прак	2ППЗ			10	10	10	10	10	10	10	10	10
		1			Модули специа.			зовате	пьной пр	ограммі																
1	4	ПД	ВК	MR 7301	Мехатроника и робототехника	3	1				90.0	30.0	0/10	1/20		0/12	3/48	3.0								
2	Профилир	ПД	ВК	DPMS 7302	Динамика процессов в механических системах	3	2	<u> </u>			90.0	30.0	0/10	1/20		0/12	3/48		3.0	F.C.	<u> </u>				$\longrightarrow$	
3	ующий	<u>ПД</u> ПД	BK BK	IP 7303 IP 8304	Исследовательская практика	5	1	1			150.0 150.0				<del>                                     </del>					5.0		5.0			$\rightarrow$	
<u>4</u> 5		БД	BK	MNI 7206	Исследовательская практика Методы научных исследований	<u>5</u>	1	1			150.0	50.0	1/20	2/30	<b> </b>	1/20	5/80	5.0				5.0			$\rightarrow$	
6	1	БД	BK	AP 7205	Академическое письмо	5	2				150.0		1/20		<del> </del>	1/20	5/80	5.0	5.0							
7	1	БД	ВК	PP 9201	Педагогическая практика	10					300.0	30.0	1/20	2/30		1/20	3/00		3.0					10.0	-+	
8	Базовый	БД	КВ	TPSU 7204	Теория и проектирование систем управления	3	2				90.0	30.0	0/10	1/20		0/12	3/48		3.0					10.0		
9	1	БД	KB	IEAN 7202	Инженерные эксперименты и анализ неопределенности	3	1				90.0		0/10	1/20		0/12	3/48	3.0	0.0							
10	1	БД	КВ	MHM 7203	Механические характеристики материалов	3	2				90.0		0/10	1/20		0/12	3/48	0.0	3.0							
					Научно-ис	сследов	атель	ская ра	абота (Н	ИР)																
11		НИР	ОК	NIRDVVDD 7501	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	9					270.0							9.0								
12		НИР	ОК	NIRDVVDD 7502	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	6					180.0								6.0							
13		НИР	ОК	NIRDVVDD 7503	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	15					450.0									15.0						
14	- Исследов	НИР	ОК	NIRDVVDD 8504	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	20					600.0										20.0					
15	ательская практика	НИР	ОК	NIRDVVDD 8505	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	15					450.0											15.0				
16	практика	НИР	ОК	NIRDVVDD 8506	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	20					600.0												20.0			
17		НИР	ОК	NIRDVVDD 9507	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	10					300.0													10.0		
18		НИР	ОК	NIRDVVDD 9508	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	20					600.0														20.0	
19		НИР		NIRDVVDD 9509	Научно-исследовательская работа докторанта, включая выполнение докторской диссертации	8					240.0						_									8.0
	теоретиче		_			25	7	0	0	0	5040	250	90	160	0	100	400								↓	
				ы обучения		143		ļ _					4	1290.0												
ПП	Педагогиче					10	<del>  </del>	7		7				300											<b></b>	
ПИ	Исследова	тельска	я праі	тика		10	1	3, 5		5	,			300											<b></b> -∔	
нир Д	Научно-исс	пеловат	епьск	ая пабота локтопа	нта, включая выполнение докторской диссертации	123				1, 2, 3, 4, 5, 6, 7, 8, 9				3690												
ИА	Итоговая а			расста доктора		12	1	t		1,0,5				360.0				l -	<del>                                     </del>		l —				-+	—
<del>,,,,</del>			•	кторской диссерта	ШИИ	12	1	<u> </u>		9				360											-	-
	Итого			,	•	180	1				5400	250	90	160	0	100	400									-

Appendix 3. The matrix of achievement of the educational result formed by the educational program with the help of educational subjects.

№	Name of discipline	Short description of discipline	of 1				_	educ						
			Amount credits	ON 1	ON 2	ON 3	ON 4	ON 5	9 NO	ON 7	8 NO	6 NO	ON 10	ON 11
		Cycle of basic subjects University component												
2	Methods of scientific researches  Academic writing	concepts, processes, methods, technologies, tools, operations for the implementation of scientific activities; Formation of knowledge about: methods of planning and organization of scientific research; a general methodology of scientific design, creativity, a general scheme for organizing scientific research; conducting scientific research, analysis, experiments.  Development of relevant competencies of doctoral students aimed		v	v		V		V	V				
		at developing the willingness and ability to implement research projects and present results in writing in accordance with the norms of the international academic community. Familiarization with the requirements for the design and structure of the presentation of research results in scientific articles, dissertations, patents.												
3	Pedagogical practice		10											
		Cycle of basic subjects Option component												
4	Engineering Experimentation & Uncertainty Analysis	This is knowledge in the field of methodology for conducting engineering experiments and analyzing the uncertainties necessary for research. As a result, the doctoral student has the skills to conduct all stages of a simple active (planned) experiment. Conduct analytical and simulation experimental studies. As well as the ability to critically analyze and evaluate the obtained theoretical and experimental data and draw conclusions									V			
5	Methods of empirical and	2,	3								V			

6	theoretical research  Mechanical	research, problems, hypotheses, concept, problem of demarcation, basic philosophical and methodological concepts, logical empiricism, scientific theory, essence, structure and functions, procedures of scientific research.  This is knowledge in the field of mechanical properties of	3					v	
U	Performance of Materials	materials used in mechanical engineering for the design, improvement and hardening of parts, mechanisms, machines and equipment.					•	v	
7	Mechanical characteristics of new structural materials	Classification of nanostructured materials. Basic methods for obtaining nanostructured functional and structural materials. Processes of severe plastic deformation (SPD). Classification of SPD processes. Technological parameters affecting the structure and properties of materials. Analysis of technological features of SPD processes. Examples of implementation of SDI processes. Classification of methods for obtaining nanopowders. Gas-phase synthesis. Method of thermal decomposition of salts. Obtaining nanosized powders by dispersion. Technological characteristics of nanopowders. Cold pressing of nanopowders. Sintering of nanopowders. Hot extrusion of nanopowders. Application of special methods of compaction of nanostructured powder materials. Application of nanotechnologies for obtaining new structural materials.	3						
8	Theoretical foundations for the design of control systems	Studying the stages of designing automation and control systems from the point of view of modern regulatory and technical documentation and using the most common software and computer equipment in practice, developing skills in compiling various types of technical documentation within a single project. Formation of theoretical and practical skills in the field of designing control systems from the development of technical specifications to the creation of project documentation							V
9	Theory and Design of Control Systems	•	3						V

		emphasis on applications to mechanical systems. Doctoral students have the opportunity to work with specific systems of automated modeling and design to master the skills of developing mathematical models of processes and control objects in the CAD environment and to improve methods design tools and control systems within the subsystems of CAD							
		Cycle of professional subjects University component							
10	Mechatronics and robotics	This is integrated knowledge based RS advanced domestic and			V				
11	Dynamics of processes in mechanical systems	This course forms professional competencies and is based on knowledge of methods for constructing a dynamic model of mechanical system processes and the ability to apply them to solving problems in mechanical engineering, which are necessary when doing a doctoral dissertation in the field of "Mechanical Engineering".				V		V	
12	Research practice		10						